Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa

by

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DECLARATION

I, *Mousin Omarsaib*, declare that:

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(ii) This thesis has not been submitted for any degree or examination at any other university.

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Signature: *Mr. Mousin Omarsaib*
Date: 11 December 2022

Signature: Dr M. Rajkoomar
Date: 21 March 2023

DEDICATION

Dedicated to my wife, Anisa, my inspiration

This thesis is dedicated to my wife, Anisa Mohamed Musthan. My soulmate, confidante and companion that has journeyed with me through the seasons of life. The reality of life is that it's like the ocean. It brings seasons of calmness, joy, happiness, peace, and serenity. The ocean also projects turmoil, unrest, disturbance, and commotion. People are like the ocean in your life, bringing all these different seasons in the form of emotions, depending on what they may be experiencing at any given moment. Anisa, you have stood by me through every season of life like the ocean. You have always believed in me as we journeyed through the seasons of life experiencing wave after wave. You have been my inspiration, encouragement, and motivation through beautifully sunny and dark cloudy days. I dedicate this study to you, my love.

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Lastly, I would like to express my love to my wife Anisa, and my children, Aminah and Humza. I hope that this study inspires you to always be spirited in life. You were my inspiration, motivation, and the reason for persevering with this research. Remember kids, reach for the stars and beyond…ABBA's always got your back!

ABSTRACT

Globally, the Fourth Industrial Revolution has disrupted teaching philosophies at higher education institutions. This disruption beyond physical walls into virtual spaces has allowed academic librarians to explore teaching roles as online mediators and facilitators in the digital environment. However, historically, literature has challenged the pedagogical competencies of academic librarians when teaching in a face-to-face environment. In recent years, the ability to integrate suitable technologies with teaching methods in a digital environment has further questioned the competencies of academic librarians. Therefore, worldwide, the online teaching role of academic librarians is under the microscope. Thus, the objectives of this study were to ascertain, explore and establish the emerging role of academic librarians in relation to digital pedagogy and the online environment at UoTs in South Africa. Digital pedagogy can be defined as a process to effectively connect relevant pedagogical and technological knowledge to enhance teaching in multimodal environments. The Community of Inquiry (COI) and Technological Pedagogical Content Knowledge (TPACK) frameworks was used to probe the pedagogical and technological knowledge of academic librarians as teachers in the digital environment. A sequential explanatory mixed method design framed the research approach. During the quantitative first phase, a web-based exploratory survey was administered to academic librarians at UoTs in South Africa. The emerging themes from the web-based exploratory survey was used to design the interview schedule for the second qualitative phase. The results from both phases were analysed and interpreted to present the findings. The results from data collected were then triangulated with the theoretical frameworks and reviewed literature. The overall findings revealed academic librarians at UoTs in South Africa lacked in digital pedagogies juxtapose digital environment. Consequently, academic librarians need to acquire pedagogical and digital skills when teaching in a digital environment. The study recommends system, methods, and processes that the Library and Information Science sector can implement to ensure academic librarians gain the necessary expertise to teach in a digital environment. Ultimately, the study proposes a design of an online training model on digital pedagogies for academic librarians at UoTs in South Africa.

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LIST OF ABBREVIATIONS

The most important and frequently used acronyms in this study are listed below:

4IR	Fourth Industrial Revolution
CHELSA	Committee of Higher Education Libraries South Africa
CK	Content Knowledge
CoI	Community of Inquiry
ICTs	Information Communication Technologies
LIASA	Library and Information Association South Africa
LIS	Library and Information Science
LISMIE	Learn Integrate Screen Modify Implement Evaluate
LMS	Learning Management System
MMR	Mixed Method Research
MOOCs	Massive Open Online Courses
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
RO	Research Objective
SAMR	Substitution, Augmentation, Modification and Redefinition
SPSS	Statistical Package for Social Science
TCK	Technological Content Knowledge
TIM	Technology Integration Matrix
TK	Technological Knowledge
TPACK	Technology Pedagogy Content Knowledge
TPK	Technological Pedagogical Knowledge
UoTs	Universities of Technology
ZPD	Zone of Proximal Development

LIST OF TERMINOLOGY

The following terminology are defined for this study.

Active learning: *an instructional approach that involves students in the process of learning through engagements.*

Digital pedagogies: *ability to effectively connect pedagogical and technological knowledge to enhance the learning experience of students in an environment enabled through information communication, technology.*

Digital skills: *ability to effectively use technology to enhance teaching in the digital environment.*

Digital tools: *ability to identify and seamless use education resources for teaching in the digital environment.*

Fourth Industrial Revolution: *rapid growth and acceleration in the use of technologies such as Internet of Things, artificial intelligence and robotics that has disrupted and shifted the way we live as humans.*

Information Communication Technologies: *convergence of information, communication and technologies that integrate to engage in the digital age.*

Learning theory: *explains how students internalise knowledge and use information during the learning process while focusing on the internal including external influences from the environment.*

Passive learning*: an instructional approach that involves students listening to the facilitator and internalising the information during the learning process.*

Pedagogy: *the science and logic applied through teaching methods and practice to achieve learning outcomes.*

Professional development: *process of improving and learning new skills related to an individual's job description.*

CHAPTER ONE
INTRODUCTION AND BACKGROUND

1.1 Introduction and background

The 21st century has seen higher education institutions transition towards the digital environment in leaps and bounds (Pongsakdi, Kortelainen and Veermans 2021: 5041-5042). According to Cabañero (2022: 63-67), the use of multimodal teaching methods such as blended learning, flipped classrooms, interactive activities, collaboration, and innovative assessments is rapidly becoming important at higher education institutions due to the digital environment. The key factor in influencing digital teaching and learning has been technology. This has resulted in the emergence, development, and use of digital pedagogy. Digital pedagogy is busy transforming the process of teaching and learning. However, academia must throw '*caution to the wind'* because the use of digital pedagogies needs pedagogical assumptions based on technological proclivities (Väätäjä and Ruokomo 2021:1-12). Therefore, the current global higher education system needs technologically bound and digitally mastered pedagogy, irrespective of a pandemic or any other issue that may impact society (Nanjundaswamy, Baskaran and Leela 2021:179-181).

Digital pedagogy is impacting teaching methods at higher education institutions. It has immersed the tertiary educational spectrum into teaching techniques that allow students to learn using technology at their own pace and understanding. Historically, educators did not have the flexibility or the privilege to use innovative teaching techniques with technology to provide an adequate solution for many problems in learning (Wieland 2020: 84-92). However, with the emergence of digital pedagogies, educators have the mobility to enhance teaching practices and engage with students using multiple technologies. However, according to Valverde-Berrocoso *et al*. (2021: 14-22), it is important for educators to find the right balance when using digital pedagogies. This will harmonise the teaching process and make the learning experience valuable for students. Therefore, it is fundamental for educators to re-evaluate their pedagogical and digital skills as this will provide opportunities to strengthen teaching practices in multimodal environments.

The importance of digital pedagogies within higher education institutions also resonates in academic libraries (Omarsaib *et al*. 2022: 1-13). Although library instruction is not ubiquitous at higher education institutions, academic librarians are profiled as teachers in their job descriptions

and in practice (Raju 2017: 251-269). Library instruction in the form of information literacy is delivered in various formats at higher education institutions. This includes once-off training, credit-bearing modules, integrated assignments, and self-paced assessments (Naicker 2016, Naidoo 2011). These types of library instructional offerings may include scheduled lectures, exercises, activities, formative and summative assessments. Academic librarians with a history of limited pedagogical and technological background in education must consequently demonstrate their ability in designing, teaching, assessing, evaluating and provide feedback to students at higher education institutions (Withorn and Willenborg 2020: 1-17). Therefore, academic librarians with a teaching profile also need to re-position themselves in higher education and embrace the concept of digital pedagogies.

Generally, the role of the academic librarian as teacher has been scrutinized and questioned (Omarsaib *et al*. 2022). Over the past thirty years, literature has been pointing towards academic librarians being lacking in the pedagogical skills related to library instruction (Davies-Hoffman, Alvarez, Costello and Emerson 2013: 9-23). This has been the trend as numerous studies probed the effective teaching practices of academic librarians (Corrall and Jolly 2019, Hensley 2015, Hay and Studebaker, 2019). The emphasis on online teaching and the influence of technology further questions the ability of academic librarians as educators. However, despite the criticisms in the literature academic, librarians at higher education institutions continue to teach library instruction. This is critical since it reveals that although academic librarians may have limitations in their pedagogical skills, library instruction is valued at higher education institutions (Raju, 2017). Therefore, library instruction is offered through various formats, although academic librarians may lack pedagogical skills.

The American Library Association (2017) has listed instructional design and teaching skills as key areas of proficiency when describing the job profile of an academic librarian. Worldwide, during the past decade and in keeping with the American Library Association, proficiency standards research undertaken focused on bridging the gap that existed between pedagogy and academic librarians. Recently, the current role of academic librarians as educators has shifted with the influence of technology on pedagogy (Trembach and Deng 2018: 297-315). However, the literature fails to illustrate this or provide solutions. A benchmark study that did reveal this possibility a decade ago was Shank, Bell and Zabel's (2011: 105-110) concept of a blended

librarian being characterised as a disruptive innovation. Later, the Blended Librarian model was used as a measure in a South African study presenting the disparities in the job profiling of academic librarians at universities in South Africa (Raju 2017). However, Raju (2017) recommended that pedagogical and digital skills for academic librarians be explored and probed through a well-designed study. Similarly, studies in developed knowledge economies such as Australia, America, Canada, and the United Kingdom revealed the growing limitations of academic librarians as educators in higher education (Ciccone and Hounslow, 2019: 2).

Previously, the literature pointed at academic librarians not having the necessary grounding in the rudiments of pedagogy (Wheeler and Mckinney 2015: 111-128). Recently, the role of academic librarians has further shifted as being the *'sage on the stage'* to '*guide on the side'* juxtapose digital pedagogies. The use of technology is being emphasised in the form of digital pedagogies in the literature, but with limitations related to the competencies of academic librarians in using multimodal methods of teachings (Omarsaib *et al.* 2022: 1-13). Thus, a new reality is slowly emerging that points to academic librarians lagging in their understanding of pedagogy, adoption of instructional design, practice, and educational technologies (McTavish, 2019: 76) for online teaching. Therefore, globally, the discussion on digital pedagogy is critical as academic librarians in the higher education sector consider their position within circles of teaching and learning at their institutions.

The literature also describes digital pedagogy as a critical pedagogical approach (Michael and Evangelia 2016). The teacher reflects on how to effectively structure the learning outcomes by mixing the appropriate digital tools in multimodal environments. In a recent study, Crawford *et al.* (2020: 9-18) affirm that technologically bound and digitally mastered pedagogy is necessary for online facilitators. It succors educators in combining pedagogy, technology, and content seamlessly for online teaching. Thus, a fluid understanding of 21st century pedagogical frameworks, learning theories and curriculum design, combined with the use of relevant digital tools, can lead to the desired outcomes when teaching in an online environment.

The present study aimed to contribute to the knowledge base of research in Library and Information Science by understanding how digital pedagogies juxtapose academic librarianship within the South African context. Furthermore, it will provide guidance in preparing academic librarians to teach with technology in an online environment. This study scanned the literature, identified,

delved and presented a South African perspective of digital pedagogies at Universities of Technology (UoTs) in relation to academic librarianship. The purpose of the study was to explore, probe, deliberate, determine and make recommendations on the emergence of technology intersecting with pedagogy, thereby influencing academic librarians who provide online library instruction at UoTs in South Africa. Moreover, this study probed the emerging role of the academic librarian in relation to digital pedagogies by applying the Community of Inquiry (CoI) and Technological Pedagogical Content Knowledge (TPACK) frameworks.

1.2 Contextual setting

Historically, the emergence of UoTs is the result of mergers between technikons in South Africa (Chiware and Becker 2018: 469). These technikons were principled scholarly environments within the South African educational landscape that strove to deliver career-orientated graduates during the apartheid era. In 1994, South Africa's independence was assimilated into the cultural, economic, and educational norms of society. At this point, the South African government mobilised to re-configure the educational landscape of technikons, with the outcome being the birth of UoTs. This saw technikons across the country merging, resulting in the emergence of six UoTs and recently, another UoT has also been established (Garraway and Winberg 2019: 38-60).

The vision and mission of these UoTs are like traditional universities in South Africa, although their focus differs. At traditional universities, the focus is largely on developing graduates underpinned through historic principles of commercial and social benefit to society. In this instance, traditional universities are driven by programmes that emphasise development and production, resulting in effective research outcomes for society. However, UoTs are fundamentally positioned to address current issues within commerce and industry. Universities of Technology are shaped to deliver outcomes that provide solutions to current problems in their flexibility, design, and innovativeness of research programmes. Although UoTs still lag traditional universities in South Africa in terms of research outputs, these types of educational institutions are fast developing as research hubs in the production of scholarly knowledge.

The study involved the seven Universities of Technology in South Africa that support teaching, learning and research. These UoTs share many commonalities, namely emanating from previous disadvantaged communities; similar student populations; type of location; curricula; libraries,

physical and digital infrastructure. While the reality is that there may be differing expertise in either teaching, learning or research at these UoTs, the social, economic and political make-up are very similar. Therefore, the rationale for selecting the academic librarians from UoTs is that their patterns of transformation and development in South Africa remain comparable. These UoTs include the following institutions:

- Central University of Technology
- Cape Peninsula University of Technology
- Durban University of Technology
- Mangosuthu University of Technology
- Tshwane University of Technology
- Vaal University of Technology
- Walter Sisulu University of Technology

1.3 Statement of the problem

The emergence of technology and its instructional influence on pedagogy has further disrupted the role of the academic librarian as a teacher in the higher education sector. Technology has accelerated whilst simultaneously shifting traditional teaching practices or methods from face-to-face to blended, hybrid and online instruction. Currently, the use of multiple technologies and relevant pedagogic practices in online teaching are new to academic librarians. Parramore (2019:476) states that although online information literacy is a reality, literature is limited in discussing the competencies of academic librarians involved in online teaching. This has been a 'grey area' for scholars worldwide (Austin and Bhandol 2013: 15-35). Recent studies in the Philippines by Ramos (2022: 2-19) and South Africa by Omarsaib *et al*. (2022: 1-13) concluded that there is a need for academic librarians to have both technological and pedagogical understanding to be proficient as teachers within the online environment. According to Ciccone and Hounslow (2019: 2), the pedagogical and digital skills of academic librarians related to the online environment has been explored by a handful of researchers compared to the South African context. Thus, the aim of this study is to explore the emerging online teaching role of academic librarians in relation to digital pedagogies within UoTs in South Africa.

1.4 Research objectives

The overarching aim of this study was to explore the emerging online role of academic librarians in relation to digital pedagogies within UoTs in South Africa. This aim is achieved through the following objectives:

[RO1]: To ascertain the digital pedagogies of academic librarians in the current digital environment at UoTs in South Africa;

[RO2]: To explore the pedagogical and digital skills of academic librarians within a digital environment at UoTs in South Africa;

[RO3]: To establish the type of online teaching presence of academic librarians when engaging with students in a digital environment at UoTs in South Africa;

[RO4]: To design an online training model on the pedagogical and digital skills required for the current Library and Information Science environment.

1.5 Significance of the study

The discussions, deliberations, conceptualisation and framing of digital pedagogies for online teaching are crucial for the 21st century academic librarian. Worldwide, this topic is important and has relevance for the Library and Information Science sector. The researcher, being positioned within the South African context, explored, and probed digital pedagogies with reference to academic librarians at UoTs in South Africa. However, the benefit to academic librarians with a teaching profile extends beyond UoTs in South Africa. Globally, a pedagogical underpinning would benefit academic librarians as educators in a digital environment. Further, when teaching a digital environment pedagogical knowledge can be enhanced with a germane understanding of technology. Therefore, this study aimed to contribute to and build the knowledge base for academic librarians involved in online teaching *vis a vis* digital pedagogy at UoTs in South Africa and worldwide.

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1.7 Outline of research methodology

The researcher used a sequential explanatory mixed method research (MMR) design for this study. In the sequential explanatory mixed method design, the quantitative phase precedes the qualitative phase. The quantitative phase was foremost, with the qualitative phase following in relation to data collection and analysis. Pragmatism as a research philosophy framed the research approach, design, and data collection procedures. Sarantakos (2013 28:30) states that philosophical underpinning charts the path that researchers will navigate in a study. This determines the research approach, methods and tools used to establish the objectives of a study. In this study, the researcher selected a mixed method approach using an explanatory sequential design. Mixed method research was considered relevant to address the research problem, critical questions, and objectives of this study. According to Ngulube (2019: 85-100), the use of the MMR design is effective as it incorporates more than one approach to ascertain the relevance of a study. It also exemplifies the critical lens through which the researcher explores and probes the research problems. In the context of this study, MMR was most suitable to address the research problem.

In exploring digital pedagogies and academic librarians at UoTs, the researcher used both quantitative and qualitative methods as a mixed method approach. The quantitative approach, at a surface level, involves collecting numerical data or data that can be counted, whilst qualitative data involves methods which collect textual or verbal data (Bertram and Christiansen 2020). In terms of the former, the survey method through a web-based exploratory questionnaire was used involving academics librarians from all UoTs in South Africa. The survey method was appropriate and applicable as the objectives included reflection, exploration, integration and finding resolutions in determining digital pedagogies of academic librarians at UoTs in South Africa. Furthermore, in the case of higher education institutions within the South African context, findings from survey approaches are key to understanding various themes in academic libraries. De Jager and Nassimbeni (2005: 31-38) concur, stating that survey interventions including workshops have produced meaningful results in South African higher education institutions' libraries.

The term used to survey an entire population and all its elements is 'census' (Logan 2018: 543). In certain instances, when the population size is small, the researcher can choose to survey the entire population, including all the elements, using a census. According to Babbie (2021), a census can be defined as a count of all the elements in a population. Furthermore, Schofield (2006: 52) posits that a census can determine the characteristics of a population based on the information gathered from the elements. Censuses are usually planned and implemented in a survey format (Rasmussen *et al*. 2019). In this study, a census was deemed appropriate to be used through a web-based questionnaire to explore digital pedagogies in academic librarians at UoTs in South Africa as the population size was small.

The use of MMR is based on the grounds that research is complex and diversified in practice and cannot be perceived in terms of separated compartments (Creswell and Plano Clark 2018). This is substantiated in Bryman (2016), who posits that there are situations and topics in research that are better served by a marriage of two traditions. In addition, Cohen, Manion and Morrison (2013) suggest that paradigms can be used together to demonstrate co-existing validity from both methods. Hence, mixed methods were most suitable for the purposes of this study. The mixed method approach through the web-based exploratory survey and semi-structured interviews was the pragmatic path to chart as the researcher aimed to obtain the views of the academic librarians at UoTs in South Africa, who are embracing the digital environment at higher education institutions.

The researcher used triangulation as a method of checking the validity of the data collected for this study. Webb *et al.* (1981) were amongst the first to introduce the term 'triangulation' into the social science discipline as a research approach. The use of triangulation in the social sciences originated from the work of Campbell and Fiske through their idea of 'multiple operationism' towards validating research results (Hussein 2015: 5). According to Singleton *et al.* (1999: 391), *"social scientists have borrowed the term triangulation to help describe how the use of multiple approaches to a research question can enable the researcher to 'zero in'"* on the answers or information sought. Thus, a mixed method approach applied through data triangulation provided greater insight, validity, and reliability to this study. Hence, in exploring digital pedagogies and academic librarians at UoTs, the researcher used both quantitative and qualitative approaches as a mixed method design.

1.8 Scope and delimitations of study

This study confined itself to UoTs in South Africa. The aim of this study was to explore digital pedagogies in relation to academic librarians at UoTs in South Africa. Theofanidis and Fountouki (2018: 157) define delimitations as the boundaries that the researcher sets to exclude factors from the research. Delimitations assist researchers to narrow the scope of research. In the case of this study, the researcher opted to include only academic librarians at UoTs who are identified as teachers or educators. However, this study can be extended to academic librarians at traditional universities in South Africa with a teaching role.

Furthermore, this study is within a specified context, which is the pedagogical and digital skills of academic librarians at UoTs in South Africa. Therefore, the researcher cannot make general claims for all fields within higher education. However, the frameworks, findings and recommendations may be interrelated and therefore transferable with adaptations if necessary to other fields within the higher education sector in South Africa. This study was conducted with seven UoTs in South Africa that offered library instruction.

1.9 Research Output

The research outputs of this study are presented below, which includes two publications and a conference presentation.

- Omarsaib, M., Rajkoomar, M., Naicker, N. and Olugbara, C. T. 2022. Digital pedagogies for librarians in higher education: a systematic review of the literature. *Information Discovery and Delivery*, 1-13. https://www.emerald.com/insight/content/doi/10.1108/IDD-06-2021-0066/full/html
- Omarsaib, M., Rajkoomar, M. and Naicker, N. 2022. Digital Pedagogies of Academic Librarians in the Fourth Industrial Revolution. In: *Innovative Technologies for Enhancing Knowledge Access in Academic Libraries*. IGI Global, 247-270. https://www.igi-global.com/chapter/digital-pedagogies-of-academic-librarians-in-the-fourth-industrial-revolution/306441
- Omarsaib, M., Rajkoomar, M. and Naicker, N. 2022. Students' Perception of the Engineering Librarian using Multimodal Teaching Methods at the Durban University of Technology for the provision of Information Literacy (conference paper). International

Conference on Information Literacy (ICIL). https://library.nwu.ac.za/sites/library.nwu.ac.za/files/files/icil-2022/icil-2022-abstracts_updated_20_Oct.pdf

1.10 Structure of the thesis

This study is presented in six chapters, which are arranged in the following manner:

Chapter One: Introduction and Background to the study

This chapter provided an introduction and background to the research problem. It provided an overview, as well asoutlined and contextualised digital pedagogies in relation to academic librarians within the higher education sector in South Africa. The statement of the problem was followed by the objectives, which led the researcher to address the significance of the study. The contextual setting and outline of the methodology was described. A summary of the scope and delimitations of the study was explained, followed by the research output and the structure of the thesis.

Chapter Two: Theoretical Framework

Chapter two provides the theoretical frameworks of the research. Chapter Two explores various frameworks used when teaching with technology. These include the Technological Pedagogical Content Knowledge (TPACK); Community of Inquiry (CoI); Substitution, Augmentation, Modification and Redefinition (SAMR); and Technology Integration Matrix (TIM) in relation to technology and 21st century pedagogy for the digital environment. The different theoretical frameworks are discussed. The chapter concludes with the Technological Pedagogical Content Knowledge (TPACK) and Community of Inquiry (CoI) frameworks in relation to the pedagogical, technological and online teaching presence of academic librarians in a digital environment.

Chapter Three: Literature Review

Chapter Three consists of the literature reviewed when discussing digital pedagogies and academic librarians in higher education. The discussions include pedagogy and learning theories, digital pedagogies, conceptualising digital pedagogy, a history of academic librarians and teaching, pedagogy and academic librarians, digital pedagogy and academic librarians, digital skills of academic librarians and the Fourth Industrial Revolution (4IR)

Chapter Four: Research Methodology

This chapter provides a detailed explanation of the paradigms, research design, approach and methods used in the study. A mixed method research approach within the pragmatic paradigm is employed to examine the pedagogical, digital skills and online teaching presence of academic librarians in a digital environment. The methods and instruments used to collect data, including a brief explanation of the data analysis, are also provided.

Chapter Five: Presentation of Results and Discussions

This chapter presents the findings emanating from the analysis of the data collected. The chapter includes the main findings from the quantitative and qualitative phases of this mixed methods study. Quantitative results are presented using inferential and descriptive statistics including correlations supported through regression tables. The qualitative results are described through narratives, word frequencies and tree themes that emerged from a process of coding aligned to this study.

Chapter Six: Summary, Conclusions, and Implications of the study

The main findings within the context of the theories framing the study are discussed. Relevant literature is combined with the analysed results that emerged through the inferential and descriptive findings to address the objectives of the study. Based on these discussions, conclusions are drawn, and recommendations are made, including the presentation of a training model for academic librarians who teach online library instruction at UoTs in South Africa.

1.11 Chapter summary

The introductory chapter of this study outlined the background to the study and the research problem. It provided an overview, delineating and contextualizing digital pedagogies and academic librarians within the context of the higher education sector in South Africa. The statement of the problem followed by the objectives of the study were generated to address the significance of the study. A summary of the scope and delimitations of the study were explicated, followed by the research output and the structure of the thesis. The next chapter describes the frameworks selected for the study.

CHAPTER TWO
THEORETICAL FRAMEWORKS

2.1 Introduction

The purpose of research is to probe a phenomenon within a specific discipline (Wisker, Robinson and Leibowitz, 2019). Research is a systematic process that requires background knowledge on the phenomena being investigated (Engel and Simpson Reeves, 2018). Background knowledge is key when framing the phenomena into a research problem. The theoretical framework charts a path to coherently navigate through the research process (Hennink, Hutter and Bailey 2020: 36-37) as the research problem is being established. The theoretical framework underpins the systematic research process by helping to discover and unpack the research problem. This is achieved through the research methodology/design, data collection and the theory that explicates the data, establishing itself within the theoretical framework.

Online teaching with technology in higher education has been linked to specialised theoretical frameworks (Bond *et al*. 2020: 13). Within the context of this study, understanding how academic librarians with an online teaching presence acquire pedagogical and technological knowledge is crucial. Therefore, in this instance, the theoretical frameworks used for online teaching with technology can assist in understanding the pedagogical and digital skills of academic librarians in an online environment. These types of theoretical frameworks can be the catalyst in enabling effective change in online instructors such as academic librarians. It can provide guidance in the pedagogical and technological development linked to academic librarians with an online teaching identity.

One of the objectives of the study were to design an online training model in relation to the pedagogical and digital skills required for the current Library and Information Science (LIS) environment in South Africa. A well-designed online training model would offer guiding principles in pedagogical and digital skills for academic librarians. Moreover, it can support academic librarians with an online teaching presence in higher education to develop, design, deliver and evaluate online library instruction programmes. This type of online training model will also enhance the ability of academic librarians to create innovative teaching and learning resources for the online environment. Theoretical frameworks used for online teaching with technology can

support the design of such a training model. Thus, this chapter examines various teaching-with-technology frameworks related to the study. The researcher also aims to justify the theoretical frameworks selected for this study and its relevance to the research objectives.

2.2 Theoretical frameworks transforming pedagogy with technology

Globally, pedagogical principles were challenged over the past two years, delineated by the Covid-19 pandemic (Anderson 2020: 457). Online teaching negated 'old age' pedagogic practices that relied on face-to face interaction at higher education institutions. These physical barriers created by the pandemic led to an increase in online education and exposed the under-preparedness of tertiary institutions in digital teaching processes (Houlden and Veletsianos 2020). This is an important point to reflect upon as facilitators at higher education institutions were resistant to use the online environment for teaching and learning prior to Covid-19. Hence, the lack of flexibility and the resistance towards online teaching and learning processes spanning over a decade became transparent during the pandemic. However, the pandemic also provided opportunities for employees within higher education with their online teaching presence. It allowed online instructors to re-assess, re-evaluate, and reflect upon their pedagogic methods using theoretical frameworks supported by technology.

Numerous frameworks and models have been designed in the 21st century underpinning online teaching and learning using technology in higher education. However, a crucial component when using technology to teach in a digital environment is connecting with the pedagogy. Pedagogic principles can determine the teaching, social and cognitive competencies of online instructors for the digital environment. Theoretical frameworks such as TIM, SAMR, TPACK and COI provide diverse pedagogical designs and reflect upon deep learning skills using technology. These deep learning skills include critical thinking, communication and creating a collaborative culture of online learning. Technology has therefore infused deep learning skills using pedagogic principles for online teaching and learning. Moreover, technology has simultaneously promoted the use of devices such as laptops, mobile devices, and digital educational resources (e.g., Massive Open Online Courses-MOOCs) as online teachers engage with student communities in blended, hybrid and online environments.

Theoretical frameworks in teaching and learning with technology can also ascertain the pedagogical and digital skills of academic librarians identified as teachers. Online teaching has

increased the demand for academic librarians to participate, collaborate, facilitate, and engage with students in a digital environment at higher education institutions. According to English, West and Jackson (2019: 284), online teaching requires digital skills and pedagogical strategies that may be completely new to an academic librarian with only previous face-to face teaching experience. Therefore, it is crucial for the purpose of this study to delve into the relevant theoretical frameworks that can be applied when teaching with technology for academic librarians within the South African context. This will provide insight, guide, and assist academic librarians with a teacher identity in the digital environment at UoTs in South Africa.

2.2.1 Technology Integration Matrix

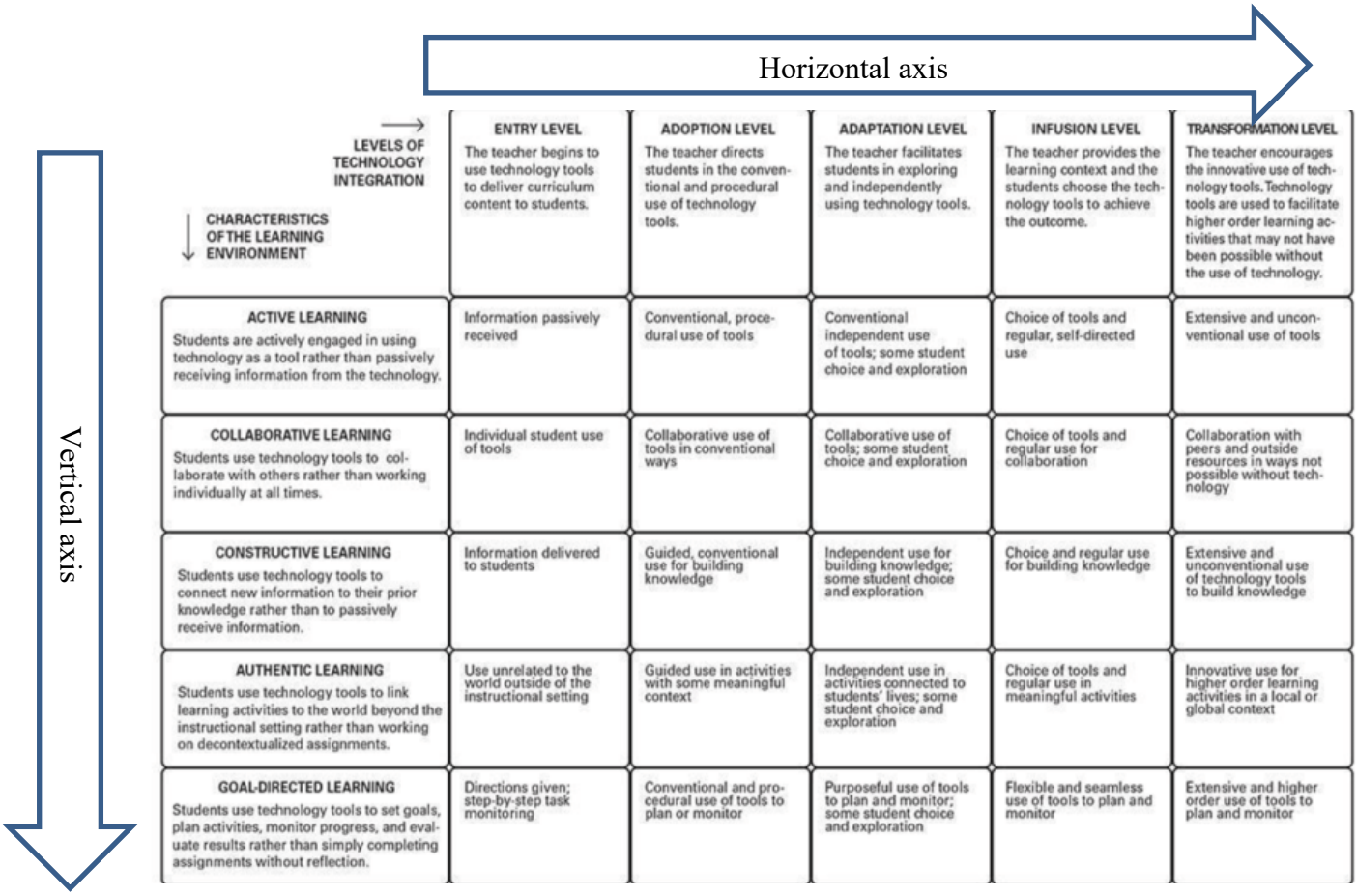
The Technology Integration Matrix framework was originally created to support the teaching needs of educators at school level. However, it became widely used when integrating technology in all forms of online teaching. It enables pedagogically driven technological integration for teachers, librarians, researchers, and online facilitators. The Technology Integration Matrix (TIM) enhances online instructional offerings by strengthening the pedagogy with effective technological integration. This theoretical framework has constructive learning characteristics and is based on research related to online teaching practices (Watson and Rockinson-Szapkiw 2021: 3).

The Technology Integration Matrix (TIM) includes five interrelated characteristics within the learning environment. These five characteristics are labeled as active, collaborative, constructive, authentic and goal directed. The matrix is completed by these five characteristics in the learning environment, combined with the five levels of integrated technology. The five levels of integrated technology include entry, adoption, adaptation, infusion, and transformation. This creates a matrix of twenty-five cells directing teaching with technology at every level of the learning process.

2.2.2 Unpacking the Technology Integration Matrix framework

The TIM framework constitutes two axes. These imaginary lines are referred to as the horizontal and vertical axes. The horizontal axis on the matrix provides an array of technological integration that is continuous within the framework. The start is the entry, followed by adoption, circling through a process of adaptation, moving to infusion, and culminating in transformation. The vertical axis incorporates the five interrelated characteristics within the learning environment (active, collaborative, authentic, constructive, and goal-directed). Harmes, Welsh and Winkelman

(2016: 140) posit that 'cells represent a level of technology integration for each of the interdependent characteristics of the learning' within the TIM framework.



CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓ / LEVELS OF TECHNOLOGY INTEGRATION →	ENTRY LEVEL The teacher begins to use technology tools to deliver curriculum content to students.	ADOPTION LEVEL The teacher directs students in the conventional and procedural use of technology tools.	ADAPTATION LEVEL The teacher facilitates students in exploring and independently using technology tools.	INFUSION LEVEL The teacher provides the learning context and the students choose the technology tools to achieve the outcome.	TRANSFORMATION LEVEL The teacher encourages the innovative use of technology tools. Technology tools are used to facilitate higher order learning activities that may not have been possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	Information passively received	Conventional, procedural use of tools	Conventional independent use of tools; some student choice and exploration	Choice of tools and regular, self-directed use	Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	Individual student use of tools	Collaborative use of tools in conventional ways	Collaborative use of tools; some student choice and exploration	Choice of tools and regular use for collaboration	Collaboration with peers and outside resources in ways not possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	Information delivered to students	Guided, conventional use for building knowledge	Independent use for building knowledge; some student choice and exploration	Choice and regular use for building knowledge	Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	Use unrelated to the world outside of the instructional setting	Guided use in activities with some meaningful context	Independent use in activities connected to students' lives; some student choice and exploration	Choice of tools and regular use in meaningful activities	Innovative use for higher order learning activities in a local or global context
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	Directions given; step-by-step task monitoring	Conventional and procedural use of tools to plan or monitor	Purposeful use of tools to plan and monitor; some student choice and exploration	Flexible and seamless use of tools to plan and monitor	Extensive and higher order use of tools to plan and monitor

Figure 2.1: Florida's Technology Integration Matrix (Welsh et al. 2011)

The TIM framework is a two-fold overlapping approach between the learning environment and integration of technology. At each level of technological integration are the five interrelated characteristics within the learning environment (active, collaborative, authentic, constructive and goal- directed). These characteristics ensure that technologically enhanced learning is not limited to the technology only but is derived from meaningful outcomes within the learning environment. It can therefore be assumed that the TIM framework is focused on the movement of technology within pedagogic principles. It creates a technologically enabling learning environment at every level, eventually leading to students taking ownership of their learning using technological tools at the infusion and transformation stages.

The concept of the matrix within the TIM framework is to connect the learning environment by integrating technology at every level of the learning process for students. The outcome is the progressive infusion of technology at every level of the 'meaningful learning environment' for students. As an example, if a student is actively engaged in an online library instruction about referencing while the academic librarian shares an instructional video on referencing, that would be a lower-level learning type with the use of technology according to the TIM framework. This is an appropriate introductory lesson in transferring basic referencing skills. However, the TIM matrix illustrates that students should have diverse higher order learning experiences. This is achieved through applying the various levels of the learning environment and the use of technology within the TIM framework. The topic on referencing should therefore include resources, activities, exercises, and assessments being enabled through integrated technology from the entry point to the transformative level. This will enhance students' understanding of referencing as it will be synchronised to include active, collaborative, constructive, authentic, and goal-directed online learning. Ultimately, this will ensure that students engage in the learning process in understanding the concept of referencing at higher levels of the framework, making their experiences original and self-reflective.

The online instructional design of the teaching methods, content, resources, activities, and types of assessment is crucial when using the TIM framework. Online facilitators, teachers or librarians need to ensure teacher-student activities, instructional settings and an environment that provides opportunities towards the maximum use of technology to support online teaching and learning. This will result in meaningful learning infused by effective technological implementation in the online classroom as understood by the horizontal and vertical axes within the TIM framework. Moreover, it will provide holistic development and a student-centered learning experience in the digital environment.

The design of the TIM theoretical framework is influenced by constructive learning characteristics. The focus is on higher order thinking skills, self-reflection and evaluating the pedagogy as part of the learning process. The emphasis is not on the technology per se but rather on meaningful learning, active engagement, critical thinking and collaboration in online teaching and learning supported by technology. Furthermore, the Technology Integration Matrix (TIM) connects to

digital pedagogies as being probed in this study and academic librarians who have a teaching identity. However, the framework is restrictive for guiding this research in probing the pedagogical and technological knowledge of academic librarians at UoTs in South Africa.

2.2.3 Substitution Augmentation Modification Redefinition (SAMR)

The Substitution Augmentation Modification Redefinition (SAMR) Model was designed and engineered by Dr. Ruben Puetendura (2021: para. 1 line 1), a consultant in the field of education. The SAMR Model was designed with the aim of integrating technology into teaching and learning processes. According to Aprinaldi, Widiaty and Abdullah (2018: 2), SAMR is a succinct model, with the focus being on the integration of technology into learning processes using a comprehensive design. The prerequisite in engaging with the SAMR Model for online instructors is technological knowledge. This has relevance within the context of using the SAMR Model for online teaching as technological knowledge will enable facilitators to identify how best to replace lessons, activities, and resources into a technology-based learning outcome.

The SAMR Model is a driver of technologically based learning processes that encourages learning through technology (School 2021). This model dictates that online facilitators must have a grounded understanding of technology, otherwise the use of digital tools will be less meaningful in the teaching and learning process. SAMR demands teacher-student based collaboration, critical thinking skills, communication, and innovative development in a digital environment. The technological approach using SAMR introduces students to online learning activities such as digital stories and video creation. It develops students' presentation skills, including text, images, videos, audio, and animation. The effectiveness of the model is also visible in essay writing skills and group activities.

2.2.3.1 SAMR relationship with Bloom's Taxonomy

The Substitution Augmentation Modification Redefinition (SAMR) model is a well-defined model moving from lower- to higher-order learning skills. The pattern of SAMR identifies itself with Bloom's Taxonomy model. Bloom's Taxonomy Model and SAMR share a hierarchical and cognitive relationship in the teaching and learning process. The SAMR Model is reliant upon technology to drive the cognitive levels of the learning process. However, Bloom's Taxonomy is not dependent on the use of an online environment. It guides learning through the hierarchical

processes of remembering, understanding, applying, evaluating, and creating. Similarly, SAMR facilitates learning through a ranked process of Substitution, Augmentation, Modification and Redefinition. The SAMR Model can therefore be paralleled with Bloom's Taxonomy Model as the levels are congruent with stages of Bloom's Taxonomy (Muktiarni 2021: 87).

However, therein is the academic discussion in understanding Blooms Taxonomy Model. It lacks adaptability and flexibility in online visual learning using a blended and scaffolding pedagogical approach (Johnston *et al.* 2021: 58). Although a well-recognised and used model in teaching, it identifies with learning as being a hierarchical and a linear process in a face-to-face environment. Furthermore, Bloom's Taxonomy Model visually resolves to illustrate cognitive processes as being discrete from each other. The ranked approach of Bloom's Taxonomy Model visually also seems to be indicative that one stage is more important or difficult than the other. Hence, it needs to provide clarity on the visual learning approach.

Figure 2.2 illustrates the relationship between SAMR and Bloom's Taxonomy Model. The first level in the SAMR Model is *substitution,* which is representative of the stages of *remembering and understanding* within Bloom's Taxonomy Model; whilst the *augmentation* level and *applying* stage are similar in their teaching and learning approach. This is followed by the *modification* level of the SAMR Model, and Bloom's Taxonomy Model shares the same understanding within the *analysing* stage. The relationship culminates within the *redefinition* level of SAMR and the evaluating and creating stage of Bloom's Taxonomy Model.

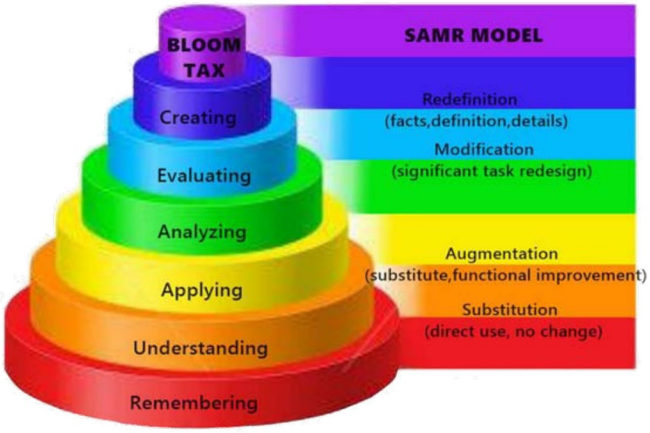


Figure 2.2: The relationship of SAMR and Bloom's Taxonomy Models (Nair and Chuan 2021)

2.2.3.2 Understanding the SAMR Model

The SAMR Model is recognisable by four levels:

1. *Substitution*: At this level, technology (e.g., laptops) is introduced and replaces any outdated form of equipment (e.g., desktop computers) used in the teaching and learning process. The function of introducing the new technology is to allow students to complete the same activities, as in the past with the old equipment, in achieving the learning outcome;
2. *Augmentation:* At this level, the same technology (e.g., laptops) is used. This introduces students to advance functions when using the device, allowing them to explore, navigate and complete tasks through a process of learning;
3. *Modification:* This level drives change in the learning process as the technology modifies teaching methods. The curriculum does not change. However, the influence of technology allows students to develop new skills whilst learning; and
4. *Redefinition:* The educator re-formulates teaching using innovative technological methods that students have engaged with, demonstrated a keen interest in and adapted to achieve the learning outcomes.

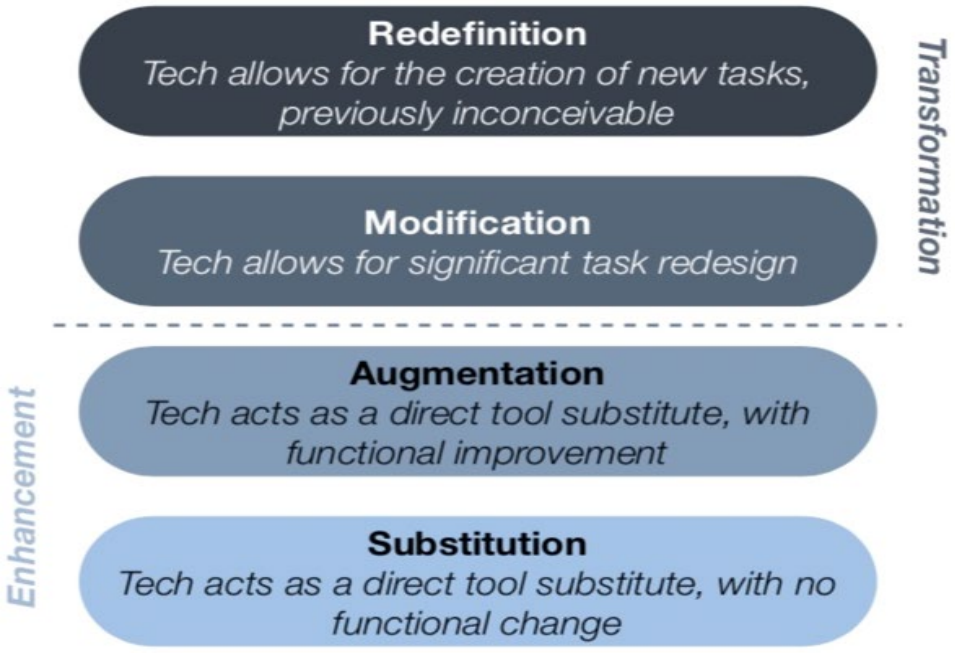


Figure 2.3: The SAMR Model (Puentedura 2013)

The SAMR Model is interpreted as being a conceptual rather than an established framework. According to Reich, Rooney and Lizier (2021: 95), the SAMR model is criticised as it lacks in being based on any form of research in the literature. Hamilton, Rosenberg, andAkcaoglu (2016: 433-435) point out the following:

- the SAMR Model is guided largely from the developer's website and there is no theoretical underpinning, leaving it exposed to multiple interpretations;
- the focus on technology and limitations in learning through technology for students; and
- there is a lack of understanding of how technology improves student learning.

These limitations clearly indicate the focus on technology and a clear absence in learning supported by learning theories. The purpose of this study is to explore the pedagogical and digital skills of academic librarians at UoTs in South Africa, specifically for the digital environment. Thus, the SAMR and Bloom's Taxonomy models are inadequate for this study.

2.3 Technology Pedagogy Content Knowledge (TPACK) framework

The Pedagogical Content Knowledge (PCK) framework was founded by Shulman (1986: 4-14). The framework describes teaching as combining pedagogical principles and content knowledge whilst directing student learning. It guides the instructional design, teaching methods, educational resources, activities, assessments, evaluation, and feedback in the classroom. Pedagogy Content Knowledge infused teacher-student activities through various learning styles such as visual, verbal, and logical styles. It steers teaching through grounded pedagogical and expert content knowledge, thereby empowering the instructor to understand various topics within the curriculum.

Pedagogical Content Knowledge was later revised by Koehler and Mishra (2009: 62) to include technology. The correlation between technology, pedagogy and content knowledge displayed ground-breaking synergy. Shulman's work in conceptualising the importance of PCK was thus updated as the relationship between technology, pedagogy (including content) was invaluable. This resulted in the Technology, Pedagogy, Content Knowledge framework (TPACK). Technology added a new dimension to the PCK framework. The TPACK framework provided teachers and online facilitators an opportunity to reflect upon their knowledge constructs when

teaching in a digital environment. The aptitude to reflect, critique and evaluate one's own knowledge construct is the key element to implement the TPACK framework in various learning environments in the 21st century. These includes face-to-face, blended and hybrid learning ecosystems.

The knowledge constructs of the TPACK framework are anchored in the theory of Social Constructivism (Koehler and Mishra 2009: 62). Social Constructivism is defined as meaningful engagements and interactions experienced by individuals transcending through the learning process. This is supported by Vygotsky and Cole (1978: 86) in his Theory of Learning and Development in which he 'contends that knowledge is co-constructed, and individuals learn from others during experiences'. One of the key constructs in Vygotsky's Theory of Learning and Development is based on the Zone of Proximal Development (ZPD). The ZPD circles around the individual learning patterns versus a guided approach by experts such as teachers and peers that are more capable in understanding certain knowledge constructs in the learning approach. The purpose of ZPD is to enhance social interactions and cognitive functions in child development through an individual with more expertise. However, ZPD has also been applied in the development of individuals with a teaching identity by scholars in the field of education (Awadelkarim 2021: 829).

2.3.1 TPACK and the Zone of Proximal Development

Vygotsky and Cole (1978) posit that the Theory of Learning and Development is linked to the culture, context and cognitive influences directing an individual's mindset. The theory involves two steps, namely social interaction with people and personal cognitive development. The purpose of these steps is expressed as shared meanings connected to culture, content, and cognitive understanding as defined by Vygotsky. Shared meanings emanate when an individual engages with people in the same cultural and contextual settings. This results in an individual creating a perception of the environment which is internalised.

Human interactions and engaging experiences also drive the learning and development of individuals involved in online teaching at higher education institutions (Farrell and Brunton 2020: 19). This leads to the intrinsic development of these individuals, creating a personalised understanding of their own reality as lecturers, academic librarians, and support staff, irrespective

of the setting. This could be face-face or within the context of an online environment as instructors. It also enables individuals to adjust to the norms of online teaching at higher education institutions. Thus, at higher education institutions. culture, context, and cognitive behaviour impact individuals with an online teacher identity.

The other fundamental factor that influences individuals with an online teaching identity at higher education institutions is ZPD (Kuusisaari 2014: 47). The relationship of ZPD and individuals with an online teaching identity at higher education institutions is described in their ability to work independently as an online teacher compared to needing support from experts. This support is provided in the design of the online curriculum, online instructional materials, innovative online teaching methods, creating online class activities, online resources, reinforcing concepts, online assessments, evaluation and reflecting upon learner feedback. It also includes technological, cognitive, and social support. Thus, the process of learning and development for individuals with an online teaching identity in higher education hinges on social interaction, cultural context, and cognitive development, including ZPD. This is key in developing a holistic individual, linking their pedagogical, technological, and content knowledge practices including their social-cultural engagements within the digital environment.

The Social Constructivist approach in accordance with Vygotsky's Theory of Learning in the Zone of Proximal Development underpins the TPACK framework. The Zone of Proximal Development is epistemologically rooted in social constructivism. The theory determines intrinsic learning experiences using a social-cultural context and extrinsic engagements through learning from experts to develop an individual's online teaching identity. The empirical evidence of the ZPD approach is reflected in the layout of the TPACK framework. The Technology Pedagogy Content framework (TPACK) is articulated through the lens of the Zone of Proximal Development using the social constructs from the Theory of Learning and Development (Polly and Byker: 2020: 6). These social constructs within the context of the TPACK framework are Pedagogy, Technology and Content Knowledge.

2.3.2 The design of the TPACK framework

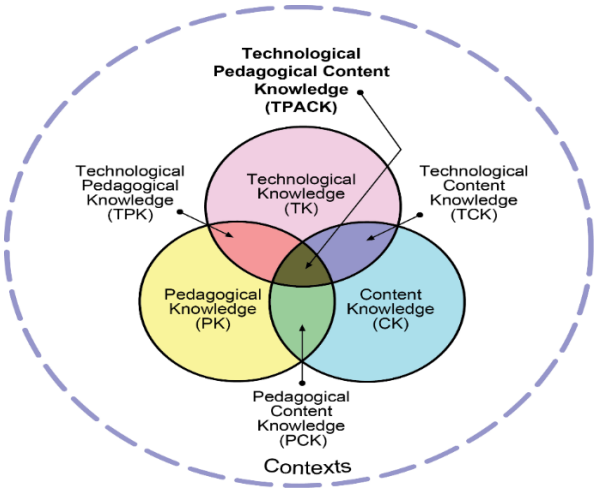


Figure 2.4: The TPACK Framework (Koehler 2011)

Technology Pedagogy Content Knowledge is characterized using a Venn diagram as illustrated in Figure 2.4. Technology Pedagogy Content Knowledge (TPACK) refers to knowledge constructs that guide the process of online teaching and learning. The framework merges and integrates technology into the design of online teaching, including learning. It is also used to determine the pedagogical and technological competencies of individuals for teaching in a digital environment (Schmidt *et al*. 2009: 125). The framework identifies three overlapping areas of knowledge that co-exist and are interrelated, namely Pedagogy, Technology and Content Knowledge. The correlation amongst these components exists because of their intersecting dependence on each other. This is further categorised into Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK).

Figure 2.4 illustrates the synergies between the components of the TPACK framework. Pedagogical Knowledge (PK) represents the grounded educational theories that an individual should possess as a philosophy to teach. This understanding of PK at various levels, such as primary, secondary, and tertiary, will guide the process of teaching in face-to-face, blended, hybrid and online learning environments. The knowledge of PK can therefore be addressed as the ability to use effective teaching methods, practices, and strategies. The ability to determine teaching methods irrespective of the learning environment is the outcome of a professional qualification in education that is applied in practice.

The second component in the TPACK framework is Technological Knowledge (TK). The integration of technology in the TPACK framework is an important element for teaching and learning in the digital environment. The use of TK is based on having expert knowledge in using digital tools to support pedagogic principles (Maor 2017: 71-86). Traditionally, as an example, a teacher will facilitate learning in a face-to-face environment with students using an instrument to write, such as a pencil. This pencil will be used for students to write concepts, notes, and complete their assessments. The pencil is the tool in the learning process. Similarly, in an online environment, there are digital tools such as portable computers, mobile devices, software, applications and online educational platforms that impact teaching and learning. The possibilities when using digital tools as online facilitators to engage with students in the learning process are interminable. The use of TK pervades adaptable teaching practices in the digital environment. An online facilitator with a succinct understanding of TK combined with PK will have the ability to make informed decisions as to which digital tool is most suitable for the learning process.

The third component Content Knowledge (CK) is the expertise an individual with a teaching identity displays when designing the curriculum in a subject-specific area. The quality of the CK is illustrated as students engage with the module. Moreover, the excellence of the content is linked to the teacher's experience, competencies, aptitude, and criteria used in creating the module. Within the digital environment, the background of PK and the expertise in TK guides the online facilitator (Lee and Kim 2014: 437-460). This outlines the purpose, objectives, scope, and sequence of the curriculum. The understanding of CK is represented in the effectiveness in which students grasp the concepts related to the online facilitator's succinct knowledge of PK, blended with their expert skills in selecting and using TK for optimal learning outcomes.

Figure 2.4 also demonstrates the overlapping relationships of PK, TK and CK in the TPACK framework. The most common interrelated components in the TPACK framework are the relationship shared between PK and CK, which is identified as Pedagogical Content Knowledge (PCK), which was first interpreted in Shulman's work (1986) to distinguish the unique connection PK and CK shared when merged in the classroom setting. Pedagogical Content Knowledge is the combination of teaching methods established in PK and expertise in subject-related matter in CK. For example, within the South African context, the academic librarian uses expert knowledge on how to search for credible information on the history of apartheid in South Africa (CK). This is

combined within the social cultural context of the class linked to stimulate a role-play of events about the types of credible searching techniques that can be applied to search for information on apartheid in South Africa for the activity (PK). The use of PCK in this instance will encourage shared meaningful experiences by students on the importance of understanding about apartheid using reliable sources of information.

Technological Pedagogical Knowledge (TPK) is the interdependence between technology and pedagogy (Schmidt *et al*. 2009). This is labeled as TPK in the TPACK framework. The use of TPK is the integration of technology (TK) with teaching methods (PK). The same example mentioned earlier on the history of apartheid in South Africa can be used in the learning process using TPK. The academic librarian can explain the history of apartheid in South Africa to students using YouTube videos. This is once again connected to the socio-cultural context of the student and can encourage meaningful discussions as students visually learn about the topic using TPK. Students can then provide their feedback related to their experiences, understanding and deliberations on the topic.

Technological Content Knowledge (TCK) is the correlation between TK and CK. The relationship of TCK is based on the approach wherein the content is combined with the technology to immerse the learning experience. The academic librarian with an online teaching identity would reflect upon the technological skills needed and the relevance in engaging with the technology (TK). The CK is selected by determining the appropriateness of the content with the support of TK. An example of the correlation using TCK is when the academic librarian evaluates the suitability of the YouTube videos to explain the history of apartheid in South Africa and the seamless access to the content.

Scholars having engaged with the TPACK framework and established it is "a useful frame for thinking about what knowledge teachers must have to integrate technology into teaching and how they might develop this knowledge" (Schmidt *et al*. 2009: 125). Academic librarians are also using the TPACK framework to experiment with online teaching and learning. Sobel and Grotti (2013: 257) concurs that academic librarians with a teaching identity are showing a keen interest in using the TPACK framework. Technology Pedagogy Content Knowledge (TPACK) is a fluidly designed framework that directs the teaching and learning process for individuals who teach in the digital environment. The objective for the online facilitator is to reflect on these knowledge constructs

and to adapt how to enhance learning using technology with pedagogy in teaching practices. This is fundamental in creating an interpersonal digital learning environment for students. The TPACK framework is flexible, adaptable, and designed for teaching using multimodal approaches. Hence, the interrelatedness of the components seamlessly supports the correlation between the TPACK framework and ZPD in the learning process.

2.4 Community of Inquiry (CoI) Framework

Garrison, Anderson and Archer (1999: 1-19) pioneered and then shaped the concept Community of Inquiry (CoI) framework. Swan, Garrison and Richardson (2009: 3) describe the CoI as the "heart of higher education experience" formed by "purposeful, open, and disciplined critical discourse and reflection". According to Akyol and Garrison (2011:235-237), the objective of the CoI framework is to create meaningful experiences in online learning. The online teacher seeks to attain meaningful outcomes in an online learning environment through purposefully interacting with their audience using a collaborative approach.

The CoI framework establishes itself within the literature as being epistemologically connected to Dewey's philosophy of Collaborative Constructivism (Cremin 1959: 171). The philosophy of Collaborative Constructivism emanates from an individual's ability to solve practical problems whilst engaging in an environment influenced by culture and society. The ability and skill an individual display in solving practical problems is determined by their intrinsic knowledge to construct valuable meaning through their experiences in such environments. Thus, the fabric of Collaborative Constructivism is rooted in the essence of individuals merging their responsibilities whilst being able to effortlessly fuse their public and private worlds.

Globally, the Collaborative Constructivist approach is critical in developing and enhancing an individual's online teaching identity in the higher education sector. Research has underscored the value of teaching through meaningful social interactions in the digital environment (Corrall and Jolly 2019: 121-122). The design of the digital environment dictates that those individuals with an online teaching identity need to understand the importance of interacting and engaging with students. These interactions and engagements can guide online facilitators to direct students in making sense of their learning experiences in a digital environment. Hence, the outcome of a collaborative approach underpinned in constructivism using the COI framework can create individuals who display independent, objective, and critical thinking skills when learning in a

digital environment. Ultimately, this will develop holistic individuals with the ability to adapt, be flexible and engage in diverse social settings.

2.4.1 The correlations in Community of Inquiry

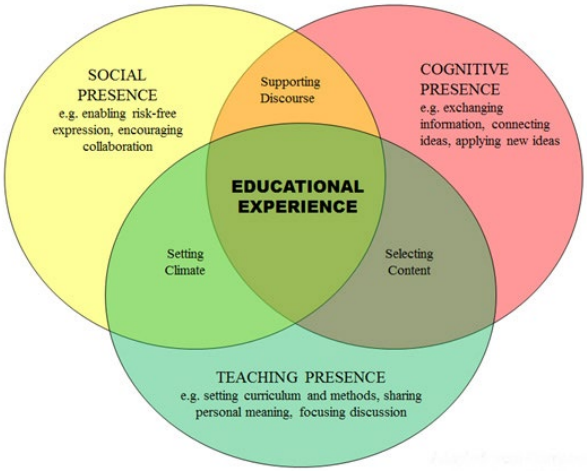


Figure 2.5: Community of Inquiry (Garrison, Anderson and Archer… 2011)

The CoI framework constitutes three core elements, namely teaching, social and cognitive presence. The CoI framework is a representation of the pragmatic relationships that exist between these elements that overlap, are interdependent and interrelated in nature. Furthermore, this framework is developed to enable meaningful engagements in online teaching and learning practices. It is designed to demonstrate high levels of collaboration when applied amongst students and online facilitators (Picciano 2017: 173). Moreover, it directs a deep learning approach in blended, online or hybrid environments. Thus, the CoI framework has become one of the popular frameworks for online and blended learning courses.

The first of these elements, **teaching presence**, permeates from the online instructor's knowledge of pedagogy. The understanding of pedagogic principles enables the online instructor to design course content reflective of the social and cognitive elements. In the design phase, the online instructor also considers the educational background of the student. These considerations include socio-economic background, culture and context of previous learning environments. This supports the development and design of the online course content. It helps to merge and create an active instructor-student relationship within the digital learning environment, simultaneously overlapping the three elements of the CoI framework. Hence, the teaching presence directs the

design of the online course content, which is instituted through a systematically reflective process including the social and cognitive elements.

Teaching presence as an element of the COI framework is central to the selection, organisation and presentation of the online course content. According to Garrison, Anderson and Archer (2001: 22), key aspects such as learning activities and assessments during the design process are also important, including teacher-directed instruction in the digital environment. However, the purpose and objective of the teaching presence in the CoI framework is to reinforce the social and cognitive elements in the learning process. The interrelatedness of the three elements in the CoI framework becomes apparent when online instructors and students start actively engaging. The design of the online course content through the teaching presence exhibits fruition in the social and cognitive elements during the online learning process.

The second element, **social presence**, encourages learning through active instructor and student engagements in the digital environment. It emphasises the need for coherent social structures that are non-divisible. Social presence allows participants "to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people'" (Garrison, Anderson and Archer 1999: 89). The primary objective of social presence is to support the cognitive element within the CoI framework. It endeavors to elucidate the importance of cognitive presence. Hence, it is key to supporting the process of critical thinking linked to cognitive presence. Anderson *et al*. (2001) posits that social presence also includes transparency in two-way communication and group cohesion in the digital environment.

Cognitive presence as the third element refers to the production of knowledge through shared meaning and interaction (Garrison *et al*. 2001: 11). It analyses the critical thinking skills of participants using three phases as underlined in the CoI framework. These phases are:

- initiation (e.g., online instructor communicates the learning outcome of the course);
- exploration (e.g., individuals merging their responsibilities whilst being able to effortlessly fuse their public and private worlds to develop online social identities through a process of self - reflection); and
- integration (e.g., an individual merges their ideas into constructs of knowledge as part of the online learning process)

2.5 Mapping of research to theoretical frameworks

Table 2.1 shows the research objectives and the alignment to the theoretical framework for this study. It aligns each research objective and critical question to either TPACK or the CoI theoretical frameworks. The other frameworks and models examined in this chapter, such as TIM and SAMR including Bloom's Taxonomy related to SAMR, are valuable in developing lessons, activities and assessing students in an online environment. These frameworks and models excluding Bloom's Taxonomy are not underpinned by philosophies in education. The TPACK and CoI frameworks are guided by educational theorists such as Dewey and Vygotsky. These are grounded in social and collaborative constructivism. Furthermore, the purpose of Bloom's Taxonomy, SAMR and TIM are to facilitate teaching and learning in a digital environment. The TPACK and CoI frameworks share similar perspectives as SAMR and TIM. However, the key difference is in the ability of TPACK and CoI to also determine the pedagogical, technological, and social competencies of online instructors when compared to SAMR and TIM.

Table 2.1: Selecting a theoretical framework for digital pedagogies and academic librarians at UoTs in South Africa

RESEARCH OBJECTIVES	THEORETICAL FRAMEWORK SELECTED	USEFULNESS TO THIS RESEARCH
To ascertain the digital pedagogies of academic librarians in the current digital environment in South Africa towards developing an online training model	Technology Pedagogy Content Knowledge (TPACK)	Construction of survey instrument and interview schedule – Chapter 4 and 5
To explore the pedagogical and digital skills needed by academic librarians within a digital environment at UoT's in South Africa	Technology Pedagogy Content Knowledge (TPACK)	Construction of survey instrument and interview schedule – Chapter 4 and 5
To explore the pedagogical and digital skills needed by academic librarians within a digital environment at UoT's in South Africa	Technology Pedagogy Content Knowledge (TPACK)	Construction of survey instrument and interview schedule – Chapter 4 and 5
To establish the type of online presence of academic librarians when engaging with students in a digital environment at UoT's in South Africa	Community of Inquiry (CoI)	Construction of survey instrument and interview schedule – Chapter 4 and 5
To design an online training model in pedagogical and digital skills required for the current LIS environment in South Africa	Community of Inquiry (CoI) and Technology Pedagogy Content Knowledge (TPACK)	Construction of survey instrument and interview schedule – Chapter 4 and 5

The purpose of this study is to probe, investigate and ascertain the pedagogical and digital skills of academic librarians at UoTs in South Africa when teaching in a digital environment. The research objectives and critical questions as illustrated in Table 2.1 delve into this role of the academic librarian as online instructors at UoTs in South Africa. It probes the intersection of technology and pedagogy related to academic librarians and the digital environment.

Thus, the TPACK and CoI frameworks were selected to guide this study. The components of the TPACK framework, namely pedagogical, technological, and content knowledge, can assist in

determining the skills of academic librarians as online instructors. The justification in using CoI with TPACK is to explore the online role of the academic librarian as an instructor in the digital environment. The elements of teaching, social and cognitive presence in the CoI framework can probe the types of engagement that exist between academic librarians and students when teaching and learning in the digital environment. Hence, the TPACK framework can provide insight into the pedagogical and technological grounding of academic librarians as online instructors in the digital environment, whilst the CoI framework is important in understanding the interactions between academic librarians and students.

2.6 Summary

This chapter examined the relevant theoretical frameworks related to the study. The point of entry of this chapter was the transformative nature of using technology with pedagogy. Different theoretical frameworks were explored and their relevance to the topic of digital pedagogies and academic librarians at UoTs in South Africa were explained. Finally, the researcher considered the Technology, Pedagogy, Content Knowledge (TPACK) and the Community of Inquiry (CoI) frameworks. The position of these frameworks within the context of this study is appropriate as both can be used in designing an online training model in pedagogical and digital skills required by academic libraries in South Africa. The next chapter reviews literature related to digital pedagogies and academic librarians.

CHAPTER THREE
LITERATURE REVIEW

3.1 Introduction

This chapter examines extant literature through the lens of the research objectives emanating from the research problem. The purpose of scrutinizing and deconstructing the critical questions is to review the keys areas identified in the study. Reviewing the literature is fundamental to the research process as it explores and places the study into perspective (Snyder 2019: 335). Furthermore, Paul and Criado (2020: 6) state that the purpose of a literature review is to exemplify the importance of an emerging topic in a particular field. Within the context of this study, the researcher explores the pedagogical skills of academic librarians when teaching in the digital environment. In addition, the digital skills and online teaching presence of academic librarians is investigated. The objective was to establish whether academic librarians are competent to teach in a digital environment.

The present study is based on digital pedagogies and academic librarians in the higher education sector in South Africa. The literature reviewed provided the researcher with the opportunity to examine the scope of digital pedagogies related to academic librarians nationally and globally. As part of this process, the researcher aimed to ascertain the types of research conducted on this topic, specifically within the higher education sector. The review of the literature presented the researcher with valuable insight into the online teaching identity and digital skills of academic librarians. The discovery, evaluation and reflection of scholarly works enabled the researcher to discuss digital pedagogies. It supported the research process by identifying gaps in the literature. The scholarly works also acknowledged that further contributions are needed in probing this emerging theme of digital pedagogies and academic librarians globally.

Since the study aimed to design a digital pedagogies model for academic librarians who have a teaching identity, literature globally and within the South African context was explored. Therefore, it was essential to unpack digital pedagogies and academic librarians related to key aspects like pedagogy, learning theories, digital pedagogy, history of academic librarians and teaching, digital

pedagogy, and academic librarians, including the fourth industrial revolution and academic libraries.

3.2 Pedagogy and learning theories

Loughran (2013: 119-121) defines *'pedagogy'* against the backdrop of learning theories that develop an instructor's acumen on how to teach. Pedagogy is a methodical approach used to understand how a student engages with content, activities, the educational environment and the instructor (Stewart 2021: 3-5). Furthermore, Thornberg *et al*. (2020: 2-3) aver that pedagogy supports learning theories by elucidating teacher-student interaction and how it influences the level of cognitive engagements through learning. This determines the level of knowledge acquired, retained, created and re-used by a student. Learning theory is also the foundational pillar of course design, learning outcome and teaching practice (Loughlin, Lygo-Baker and Lindberg-Sand 2021: 122). It guides instructors in creating and delivering instruction to meet outcomes within the context of a specified educational setting.

An expert understanding of pedagogy and learning theories enables a teacher to reflect upon their practices. This reflection is a reminder to the instructor that the student should be placed at the epicentre of the educational experience in order to achieve effective learning objectives and goals (Slade *et al*. 2019: 7-8). These include the instructor's understanding of teaching strategies, learning styles, activities, assessments and student engagement whilst in the learning environment. Learning theories are a critical component of pedagogy (Garnjost and Lawter 2019: 268). In addition, learning theories chart a path for pedagogy to consider the political, social, cultural and economic and climate (Ladson-Billings 2021: 71-72) when students are learning. Therefore, pedagogy as a concept in education is based on learning theories.

Historically, classical learning theories are rooted within two schools of educational psychology, namely Behaviourism and Cognitivism. According to Illeris (2018: 87-89), behavourist and cognitive scholars pioneered learning theories in education prior to the 20th century. Constructivism, which is the third traditional learning theory, is recognised as a branch of cognitivism (Picciano 2021: 83-84). Cognitivism is therefore categorised into two branches of knowledge in education, namely Cognitive Constructivism and Social Constructivism (Chowdhury and Halder 2019: 227-231).

During the cusp of the 19th century, other learning theories emanated, such as Communities of Practice and Situated Learning. However, according to Picciano (2021: 85), the modern learning theories in education are derivatives of the classical. Therefore, for the purpose of this study, the researcher examined pedagogy in relation to the classical learning theories such as Behaviourism, Cognitivism and Constructivism. This provided the researcher with a succinct understanding of pedagogy. It also delineated what to consider when designing a digital pedagogical training model for academic librarians. Furthermore, it provided guidance on how to explore the current literature in relation to digital pedagogies as the researcher probed the pedagogical and digital skills of academic librarians globally.

3.2.1 Behaviourism

Behaviourism as a theory in education focuses on observing the extrinsic conditions of the environment during the learning process (Oommen 2020: 28). Behaviourism highlights external factors as being influential when observing, measuring and assessing the intrinsic actions of students during the process of learning (Banihashem and Macfadyen 2021: 5). These external factors determine the outcome of the learning experience for a student. Behavourists postulate external factors as being fundamental in shaping learning, and not the student (Rajkoomar 2015: 16). Therefore, the behavourist places emphasis on the role of the instructor in controlling the environment during the process of learning.

The principles of Behavourism are associated with the pedagogical fluency of the instructor. The effectiveness of the instructor's pedagogical fluency is demonstrated in the ability to:

- reinforce concepts and develop skills in the memorisation of content;
- structure daily routines and activities to cover the curriculum;
- direct learning through the understanding of the content;
- clearly define learning objectives and use assessments, such as formative and summative, through a structured timeline; and
- ensure that regular feedback is provided to learners, thereby creating awareness of the targeted outcomes.

Behavourism as a learning theory provides a valuable and insightful understanding of the learning process. However, there is a lack of flexibility in the behavourist approach as identified in the

literature (Stewart 2021: 5). The instructor is presented as the *'sage on stage'*. The importance of the instructor is critical to the teaching and learning process. However, within the behavourist approach, the instructor is characterised as the owner of the knowledge to be transferred (Ahmad, Sultana and Jamil 2020: 21-22). Instructors also condition the environment in the learning process whilst the students are mere passive recipients of knowledge. Thus, behavourism does not stimulate critical thinking skills. Additionally, it does not mould students to reflect and question through active engagements with the instructor.

3.2.2 Cognitivism

Cognitivism is defined as an intrinsic process occurring in the mind of a student engaging in learning (Hawthorne, Vella-Brodick and Hattie 2019: 1-2). Learning in Cognitivism is reconnoitered to information being present in the mind of a student prior to understanding a specific concept. Clark (2018: 179) further elucidates that in Cognitivism, new knowledge relevant to a specific concept also enters the consciousness of a student intrinsically. This intrinsic form of learning focuses on key areas such as discovery, thinking, memory, analysis, and reflection as students learn a concept (Hirst, Yamashiro and Coman 2018: 438-451). Furthermore, the cognitive approach is concerned with how the learning process is unpacked within the mind of a student. It explores how a student transfers knowledge into information through organising, long-term storage in the brain and re-using the information when the need arises during learning (Peng 2021: 3-5).

Omar (2018: 3) asserts that the principles of cognitivism are associated with schemata development during the learning process. Schemata development purports that every student's knowledge constructs are unique in the mind. Leschziner and Brett (2021: 1208) posit that schemas reflect a student's self-knowledge inherently while learning. The key factors that influence schemas include cultural-political contexts, events and artifacts (Daniels and Tse 2021: 6). This impacts how a student internalises, organises, processes and decides to use the information whilst actively engaging in learning.

Instructors use schemata development as a foundation to trigger cognitive learning when engaging with students (Thomson *et al*. 2022: 7). This provides the stimulus for students to process

information in methods suitable to learning needs (Michela 2020: 2-4). Some of the teaching methods instructors exploit using cognitivism and schemata development include:

- identifying, selecting and developing existing relationships whilst engaging in the understanding of new concepts and knowledge in the learning process;
- engaging students in activities such as group work and discussions regularly, thereby alleviating marathon teaching sessions when applying a cognitive approach in the classroom;
- prompting students to provide feedback on prior learning through reflective activities such as discussions and questioning;
- use a variety of engaging activities linking existing information to new knowledge;
- encourage students to engage in activities to assimilate, encode and memorise content for a specific subject; and
- create activities using a range of instructional techniques to accomodate students' diverse sensory preferences when adopting cognitivism in teaching practices (Caskurlu *et al.* 2021: 584-605).

Cognitivism as a learning theory aims to stimulate a student's mind in the process of learning. However, Blacksmith *et al*. (2019: 606-609) indicates the criticism of cognitivism lies in the student's exclusive reliance upon mental processes and inferences when learning. The cognitive approach lacks in underscoring the importance of external social factors that impact a student during the process of learning (Martin and Guerrero 2020: 280-295). Cognitivism as a theory does not emphasise the importance of the environment, direct observation, culture and interaction as students learn (Bonesso *et al.* 2018: 219-221). Hence, although cognitivism encourages systematically using the brain, it lacks in connecting external social factors that influence a student's development during the process of learning.

3.2.3 Constructivism

Constructivism is a process wherein students develop knowledge constructs while learning (Pande and Bharathi 2020: 1-2). Furthermore, Matriano (2020: 216-217) posits that Constructivism is based on personal experiences and level of engagements with the environment. Hence, according to Lee and Branch (2022: 298-305), the process of learning is linked to a student's attitude, beliefs,

and experiences. This is fundamental in building a student's knowledge constructs. These elements facilitate the construction of meaning for students whilst engaging in learning. Additionally, student's experience of learning juxtaposed with the role of facilitators become key in creating conditions for assimilating and building knowledge constructs (Devi 2019: 10).

Constructivism and the notion of knowledge constructs can be divided into two broad categories, namely social and cognitive constructivism (Gao 2021: 443). Taber (2020: 281-283) describes Social Constructivism as a theory of learning introduced by Lev Vygotsky. This theory conceptualises learning as a process in which students give meaning to information through social interactions with others such as facilitators and classmates (Venkatesh 2021: 24-25). According to Newman and Latifi (2021: 10-11), Vygotsky also introduced the Zone of Proximity Development (ZPD) in social constructivism. The Zone of Proximity Development articulates that a student can expand levels of meaning while learning on their own. However, according to Vygotskian theory, students involved in learning using ZPD can produce even higher meaning in knowledge constructs after interacting with facilitators and classmates (Jarvis and Baloyi 2020: 1-7).

Cognitive Constructivism was pioneered by Jean Piaget (Sulistyowati 2019: 92-93). Central to this theory is building knowledge using assimilation, accommodation, and equilibration (Efgivia *et al*. 2021: 208-212). The significance of building knowledge in cognitive constructivism is aligned with the development of the brain. This learning theory proposes that as the brain matures through experiences and assimilation, it constantly gathers new information, resulting in the development of flexible frameworks. Piaget termed these flexible frameworks 'schemas' (Varga, Morton and Preston 2022: 1-6). Schemas emanate over many years as a student continuously engages with information while learning. Therefore, during the process of developing schemas, there is an upward movement from simple to complex schemas as the brain matures into adulthood. Within the educational context, schemas also create an institution of assimilations, accommodations and equilibrations whilst learning (Sharkey and Gash 2020: 2-3).

Thus, cognitive, and social constructivism overlap and are similar as both:

- facilitate knowledge constructs through meaningful engagements either intrinsically or extrinsically, and
- highlight the importance of social interaction, environment, experience, and culture in creating meaningful knowledge constructs.

However, social, and cognitive constructivism also differ:

- social constructivism focuses on collaborating with peers to enable meaningful learning experiences, including exploring the importance of culture and accommodation to assimilate knowledge during the learning process, and
- cognitive constructivism focuses on the importance of internalising experiences to develop new knowledge constructs as an individual develops through the stages of the learning process.

Although social and cognitive constructivism are distinguishable, they have similar standpoints, suggesting that both can co-exist to enhance pedagogy in multimodal environments (Kusuma *et al*. 2021: 110). Hu *et al*. (2021: 286-292) assert that the fusion of social and cognitive constructivism can provide the grounding for instructors on how to actively engage students in the learning process. Hence, constructivism can chart a path for instructors in designing cutting-edge curricula underpinned with social, cultural, and cognitive learning. This will improve the learning experience of students intrinsically and extrinsically. Furthermore, Mullen (2020: 670-688) expounds that when designing these types of curricula, the instructor should consider interactive lessons and reflective activities, including innovative assessments suitable for synchronous and asynchronous learning. Thus, constructivism as a learning theory provides an inclusive pedagogical solution in developing the pedagogical skills of instructors and creating engaging learning experiences for students.

3.3 Digital pedagogies

Recently, the term ‘digital’ used with the word ‘pedagogy’ created a *‘buzz phrase’* amongst teachers, facilitators, and academics (Pongsakdi, Kortelainen and Veermans 2021: 5048-5051). According to Väätäjä and Ruokamo (2021: 1), the Covid-19 pandemic was fundamental in creating this euphoria about digital pedagogies during the past three years. Globally, the pandemic caused mayhem in education (Ratneswary and Guptan 2020: 14). During the pandemic, instructors rushed to use the digital environment to teach. The phrase ‘digital pedagogy’ gained momentum as facilitators at all levels from primary to higher education explored, probed, and experimented with the concept of digital pedagogies to deliver online instruction (Oke and Fernandes: 2020: 12-18). Therefore, these two terms were used in unison during the pandemic for online teaching.

However, digital pedagogies are not limited to online teaching. Digital pedagogy as a methodology is also applicable to other multimodal environments. Prior to the pandemic, digital pedagogies have been used to teach in face-to-face and blended learning environments (Mali and Lim 2021: 14-15). However, according to Valverde-Berrocoso *et al*. (2021: 14-22), the implementation of digital pedagogies was at a superficial level during the pandemic.

The concept 'digital pedagogies' shares a similar path as the Fourth Industrial Revolution (4IR) prior to the pandemic. Romero *et al*. (2021: 8-11) posits that during the pandemic, 4IR gained momentum in shifting private and public sector enterprises. However, 4IR technologies such as genetic engineering, artificial intelligence and robotics were a reality prior to Covid-19 (Hoosain, Paul and Ramakrishna 2020: 4-7). Nevertheless, during the pandemic, companies realised the usefulness of these tools to inform change in systems and processes worldwide. Similarly, within an educational context, the pandemic shifted pedagogy. It re-introduced the term '*digital*' and the cohesive relationship it has with pedagogy when teaching in multimodal environments (Siegel *et al*. 2021: 597-598).

The term 'digital pedagogies' remains a *'grey'* area in the literature. Experts are grappling to provide an inclusive definition of digital pedagogies (Volkova, Lizunova, and Komarova 2021: 3-4). Therefore, it is important to understand and explain the boundaries of digital pedagogies for this study. The term 'digital pedagogies' is examined through the lens of pedagogy, technology and digital skills when teaching in an online environment. Furthermore, although digital pedagogies may apply to multimodal environments in teaching and learning, for this study the researcher unpacks digital pedagogies within the context of an online environment related to academic librarians at UoTs in South Africa.

3.3.1 Conceptualising Digital Pedagogy

Digital pedagogy is a difficult concept to define as it can be used in multimodal teaching and learning environments. Väätäjä and Ruokamo (2021:2) concur that digital pedagogy can be examined from many perspectives and is therefore a challenging concept to reconnoiter. Although complex to understand, adding the term *'digital'* to pedagogy provides new opportunities for instructors to explore in teaching practices. However, Kapilas and Devaki (2021: 6-10), when

describing digital pedagogies, underscore technology as a support mechanism in enhancing effective and interactive teaching methods.

The use of technology is seen as secondary compared to pedagogy. Pedagogy is recognised as the primary force when using digital pedagogies. Golub, Kovalenko and Zhgzhytoya (2022: 7) posit pedagogy as a science emanating from the foundations of education, hence it should be prioritised when using digital pedagogies. Thus, the term 'digital' is not the primary driver in teaching and learning. However, it provides new opportunities to the field of education when combined with pedagogy. It enables instructors to broaden the scope of teaching strategies and allows students to actively engage while learning in multimodal environments.

In Western Europe, Cyprus, Antoniou (2021: 9-18) explored digital pedagogies in multimodal learning environments to ascertain the benefit of integrating technology with pedagogy in the classroom. The findings suggested that technology must be infused into pedagogy as an active component rather than just a tool for learning. This is important as the need for multimodal methods of learning has increased. Similarly, in South Asia and India, Nanjundaswamy, Baskaran and Leela (2021:181-185) developed a conceptual model relating to digital pedagogies and sustainable learning. The introduction of a digital pedagogies conceptual model resulted in:

- increased student engagements in learning;
- students being motivated to actively engage with the content using technology;
- the use of information, communication and technology, allowing seamless access to course material;
- students asynchronously collaborating with facilitators during the learning process using videos, learning management systems and apps; and
- millions of teachers being able to share course materials easily to facilitate learning.

Although the term digital pedagogy is challenging to define, one can consider certain values and possibilities when using technology to teach in an online environment. These values and possibilities include the socio-economic context, professional development, curriculum design, information communication technologies (ICTs) and global research outputs to benchmark online teaching practices. In Figure 3.1, the researcher constructs and presents a conceptual understanding of digital pedagogies and online teaching. Furthermore, the researcher proposes a definition of

digital pedagogies, representing the concepts as illustrated in Figure 3.1. The suggested definition states: *digital pedagogy is a process to effectively connect pedagogical and technological knowledge to enhance the learning experience of students in an environment enabled through information communication and technology.*

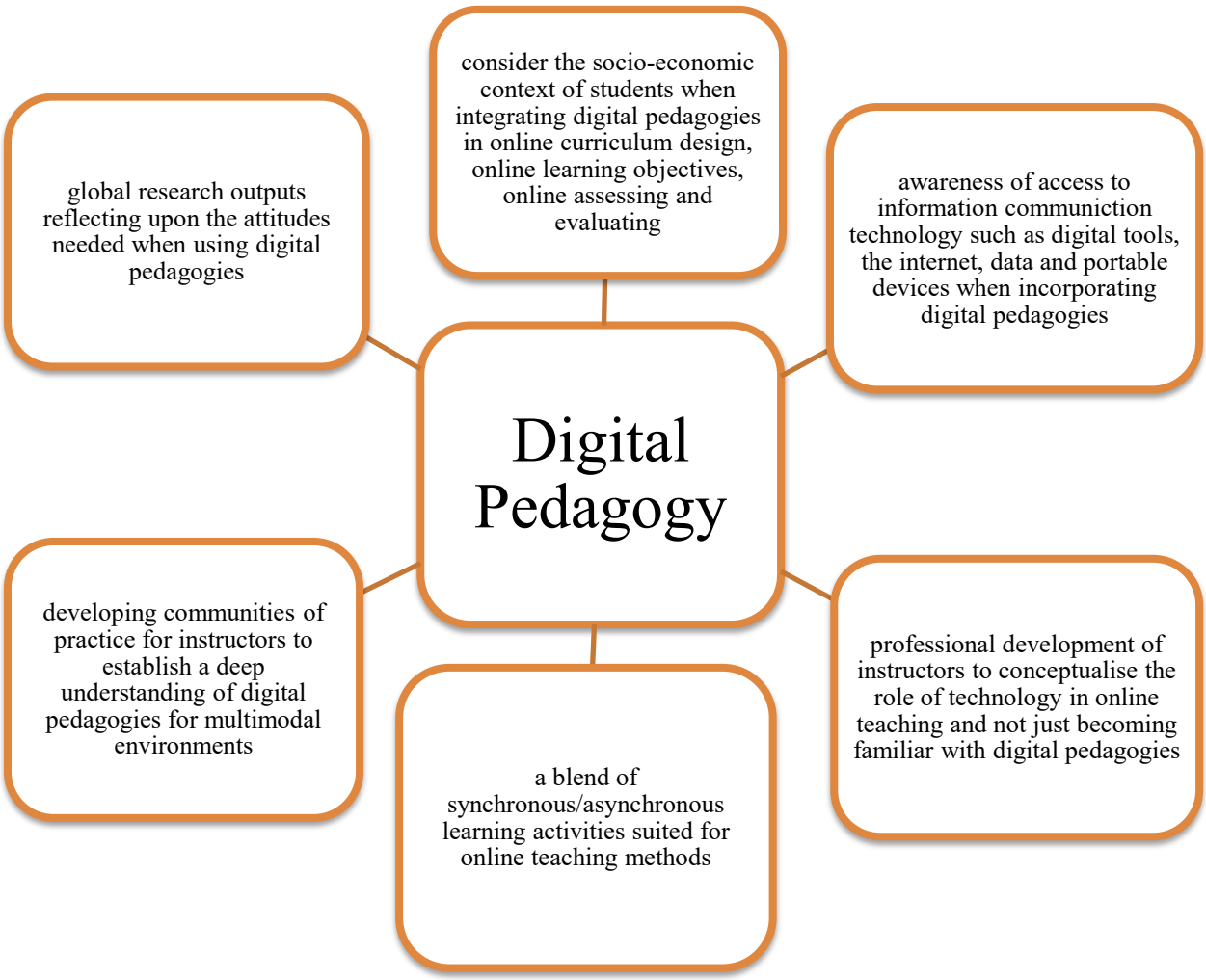


Figure 3.1: Conceptualising digital pedagogies for online teaching

3.3.2 Digital pedagogy and the Covid-19 pandemic

Globally, the pandemic disrupted and caused a rising interest in digital pedagogies. However, this disruption had immense value for the development of a digital pedagogy approach for online teaching. It provided the impetus for instructors to reflect upon teaching and learning processes. Väätäjä and Ruokomo (2021:1-12) explored digital pedagogies at the University of Lapland,

Finland. The study aimed to understand digital pedagogies based on three dimensions. These dimensions were pedagogical orientation, pedagogical practices, and the digital pedagogical competencies of instructors. The methodology used was a systematic review, surveying articles between 2014 and2019. The literature from the study revealed that:

- pedagogical orientation is identified as a social constructivist learning theory within the context of digital pedagogies;
- instructors are integrating pedagogical practices into learning using collaborative approaches for online teaching; and
- digital competencies were lacking in instructors in relation to technological, pedagogical, and content knowledge.

Similarly, at the University of Portsmouth in the United Kingdom, Anderson (2020: 463 - 464) found due to the pandemic, a ten-year digital strategy plan was revised into months to address challenges in online teaching and learning. The findings recommended that higher education institutions need to transition in response to the digital pedagogy pivot and the pandemic. This transition must include flexibility in online course design focused on a student-centered approach in online teaching; the ICT infrastructure at higher education institutions must be mindful of students' access to learning in an online environment; and the professional development of staff is critical to driving digital pedagogies meaningfully in an online environment.

Likewise, a thought-provoking self-reflective study emanated from Australia. It presented the observations of Wieland (2020: 84-92) during the pandemic. The author had been facilitating online learning for the past fifteen years and reflects on how digital learning transitioned from Microsoft PowerPoint to using tools such as Zoom and MS Teams during the pandemic. The study challenges facilitators by stating that teaching practices must be re-envisioned to embrace innovative content design post pandemic. Facilitators must afford students the opportunity to engage with educational tools and create cutting- edge learning experiences using technology. Divisional departments such as Centres for Excellence in teaching and learning at higher education institutions must guide facilitators and not be prescriptive on how instruction is delivered using technology. This will present facilitators with the space to develop technological skills to enhance teaching practices. Furthermore, it will help facilitators to develop, create and deliver content that is discipline appropriate, using technology with pedagogy. Thus, teaching with technology must

provide ease of access to digital content, be engaging and should be reinforced with pedagogical principles.

In the United States, Nickerson (2020: 101-105) also identified with the importance of digital pedagogies for online teaching placed alongside Covid-19. However, using a qualitative approach through interviews, key themes were unearthed that need to be addressed for the viability of digital pedagogies. The findings pointed to a lack of organisational support for developing digital instructional design skills, and a limited understanding of learning theories aligned to pedagogy. Suggestions included formal training or certification for digital pedagogies; establishing a community of practice for teaching with technology; and the formulation of digital pedagogies policies and procedures since academic dishonesty can exist when creating, delivering, and assessing students in a digital environment.

The Covid-19 pandemic accelerated the use of digital pedagogies. Seasoned experts had to abandon decades of traditional teaching methods as the world embraced using technology to teach during the lockdown. Globally, society has finally entered the endemic phase of the pandemic. This is the moment for key stakeholder to plan, design and implement a dynamic digital pedagogical approach. The use of technology must permeate with pedagogic principles to enhance teaching and learning in the digital environment.

3.3 History of academic librarians and teaching

Historically, the academic librarian as a teacher can be attributed to Harvard College (Hernon 1982: 16-38). The institution implemented library instruction in the 1820s. It identified library instruction as being beneficial to the university community. This is the earliest recorded example of academic librarians being involved in teaching library instruction. Salony (1995: 31-32) concurs that the earliest findings in the literature identifying academics librarians in a teaching role emerged at Harvard college. Moreover, Salony (1995: 32) further explains that in the late 1860s, the American Library Association was established. One the objectives of the American Library Association was to improve the library profession. Hence, the aim to improve the library profession under the tutelage of the American Library Association also created an impetus for academic librarians to adopt a teaching role at higher education institutions globally.

Murdock (1995: 26) posits that traditionally, academic librarians in the late 1800s and early 1900s focused on "*short range, library-centered, print bound instruction*" when teaching library instruction. During the latter part of the 1900s, there was shift in the curriculum content aligned to library instruction at higher education institutions. The focus changed from print bound instruction to search strategies. Globally, academic librarians eventually underpinned the teaching of search strategies to Zurkowski's concept of information literacy (Sample 2020: 2). Zurkowski described information literacy as a set of skills an individual demonstrated while exploring, finding, understanding, and using information responsibly. Thus, in the late 1990s and 21st century, information literacy as a concept was used, adapted, and modified to teach library instruction at higher education institutions. Worldwide, the term 'information literacy' became synonymous with academic libraries and library instruction. It influenced the teaching identity of the academic librarian in the higher education sector. This resulted in academic librarians becoming custodians and being recognised as teachers of information literacy skills.

The teaching role of academic librarians in the late 1990s and early 21st century also coincided with the advent of the information explosion and digital age. During this period, information became easily accessible through the rapid development of the internet, which led to the information explosion. Kadiri and Adetoro (2012: 22) defined information explosion in relation to three key aspects, namely a rapid increase of published information; information overload outweighing data analytics; and the lack of understanding on how to handle information by experts, including users. This, coupled with the dawn of the digital age *vis a vis* the internet, created the information explosion.

As the information explosion gained momentum, the role of the academic librarian as a teacher at higher education institutions became fundamental (Odede 2018:57). Higher education communities started engaging with information in the digital age. These higher education communities needed skills to use and analyse information (Roetzel 2019: 497). The knowledge academic librarians imparted to university communities in finding and using information responsibly in the digital environment was seen as an important contribution. This also included critical thinking and evaluative skills when using information from the internet. These skills formed an integral part of the job description for the 21st century academic librarian (van Laar *et al*. 2020: 3). Furthermore, library associations such as the Australian Library Information

Association explored and designed information literacy frameworks. Globally, these frameworks were used as a stimulus during the emergence of the information explosion and currently juxtapose the digital age to support teaching, learning and research in the higher education sector (Onyancha 2020: 115). However, globally, library instruction in the form of information literacy is not ubiquitous as a module in higher education institutions (Matteson and Gersch 2019: 2019).

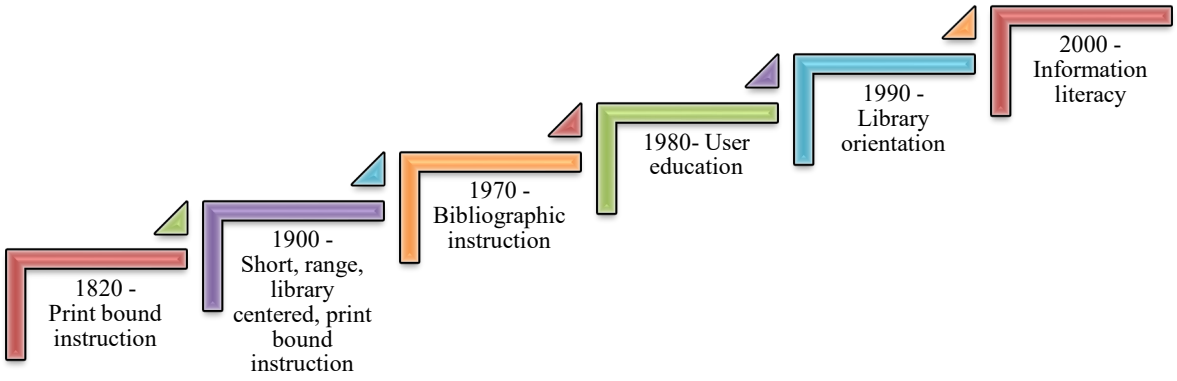


Figure 3.2: Historical teaching timeline of academic librarians

In Figure 3.2, the researcher constructed a time-line visualising the instructional growth of library instruction in higher education spanning over three centuries. This is also evident in the current digital era. Worldwide, Zanin-Yost (2018: 150-163) posits that academic librarians are collaborating with faculties to deliver library instruction. Corrall and Jolly (2019: 121) agree that academic librarians are partnering with academics to teach at higher education institutions. Thus, academic librarians are developing a teacher identity at universities to support teaching, learning and research in the 21st century.

3.4 Pedagogy and academic librarians

Extant literature highlights library instruction as an important thread at higher education institutions. This is evident as library instruction navigated itself through different ages supporting technology, information explosion and currently, the digital era (Tewell 2018: 11-12). Furthermore, Howard, Wood and Stonebraker (2018: 545-547) mention that library instruction provides invaluable support to higher education communities in understanding the research process from undergraduate to postgraduate levels. Therefore, the chronological development of library instruction over the seminal and recent times has justified its value at higher education

institutions, as illustrated in Figure 3.2. Whilst Figure 3.2 provides insight into the advancements of library instruction, one assumes that academic librarians being custodians would be able to transfer this knowledge as teachers. However, the literature over the past three decades have questioned the pedagogical knowledge of academic librarians to teach library instruction at higher education institutions (Hays and Studebaker 2019: 1-4).

Julien, Gross and Latham (2018: 180-190) conducted an online national survey in the United States with the aim of understanding the challenges facing professional librarians involved in instruction. The stimulus for Julien, Gross and Latham (2018: 190) was a longitudinal study facilitated over 20 years in Canada between 1995 and 2017 (Polkinghorne and Julien 2018: 69-79). The difference in the Canadian and the American approaches was in the method used to distribute the survey. While in America, participants with a teaching background in library instruction were selected from the American Library Association listserv, and the Canadian surveys were sent directly to institutions. However, the key findings in both studies revealed a lack of pedagogical knowledge prevalent in professional librarians responsible for library instruction. One of the key recommendations was to provide opportunities for professional librarians to develop skills in content design, assessments and the evaluation of library instruction programmes.

Ducas, Michaud-Ostryk and Speare (2020: 61) investigated the shift in the role of academic librarians working at research-intense universities in Canada through a quantitative online survey. The findings explicated the emerging roles of academic librarians in teaching, research support and digital scholarship. A critical issue addressed was a need for academic librarians to develop pedagogical competencies as Library and Information Schools did not include this type of module in a qualification. Traditionally, academic librarians at these universities in Canada developed pedagogical knowledge through professional work experience and self-teaching. Therefore, academic librarians suggested that opportunities are needed for developing pedagogical skills to support library instruction.

The debate related to academic librarians and pedagogy has dominated the literature for over thirty years (Davies-Hoffman *et al*. 2013-10). However, globally, academic librarians and pedagogy are seen as a minor part of professional development, although it features prominently as a much needed requirement when being advertised in job descriptions such as ‘subject librarian’, ‘faculty librarian’, ‘research librarian’ and ‘postgraduate librarian’. In an empirical investigation of the

pedagogical grounding needed for academic librarians jobs in South Africa, Raju (2017: 251-269) analysed 108 job advertisements in the literature. The research method used was a process of content analysis probing academic library job advertisements. The study also explored findings from the websites of South African Library and Information Schools. Furthermore, it was strengthened with using relevant data from a 2015 national survey of academic librarians in South Africa. The findings revealed that academic librarians in South Africa who were identified as instructors lacked in pedagogical knowledge and skills. The pedagogical knowledge and skills included understanding learning theories, teaching methods, learning styles, lesson plans, asssessment methods, classroom management, reflective practice, analysis and diagnostics. However, the study established that academic librarians had a preponderance in the generic understanding of pedagogy, the 'writing was on the wall'. The findings under the heading 'pedagogical competency requirements' uncovered that academic librarians in South Africa displayed limitations in deeper levels of pedagogical knowledge juxtaposed within the context of the working environment.

Likewise, McTavish (2019: 10), using the South African perspective as impetus, examined academic librarians in Canada. The study used two instruments in the research design process to examine the teaching role of academic librarians. The first instrument in the form of content analysis was used to analyse academic library job postings. The second instrument, an online national survey, was administered to academic librarians. The findings in the Canadian study confirmed the outcomes of the South African perspective. In Canada, academic librarians also experienced problems with pedagogical aspects such as learning theories, instructional design and assessments.

In the United Kingdom, Marzoukou (2021-266-276) reflected on the key changes impacting the job description of academic librarians in higher education. This was critiqued from an educational perspective in preparing future librarians for the field at Library and Information Schools. The study, presented as a conceptual paper, announces that academic librarians could emerge as partners in teaching and learning at higher education institutions. Therefore, it is critical that the evolving role of the academic librarian is re-envisioned. It must include ongoing professional development in pedagogical principles, teaching methods and online curriculum design.

Pedagogy cannot be understated when reflecting upon the future role of academic librarians in teaching. A solid understanding will enable academic librarians to realise the connection between society, culture, environment and learning theories and pedagogy (McGuinness 2011). It will conscientise academic librarians to consider the context of students' learning needs when designing, instructing, assessing, analysing, and providing meaningful feedback in multimodal environments. Expertise knowledge of pedagogic orientation will also enhance academic librarians' teaching practices. Thus, pedagogical knowledge is fundamental to the teacher identity of academic librarians in higher education institutions.

3.4.1 Digital pedagogy and academic librarians

Henrikson *et al*. (2021: 2091-2108) explain that an individual who effortlessly uses digital pedagogies has grounded knowledge in pedagogic orientation and is fluent with technological skills. This cohesive relationship between pedagogy and technology will positively impact online learning. The researcher identified with this elucidation of digital pedagogies as it suggests that facilitators must have an educational and technological background to teach in a digital environment. Therefore, this research aimed to explore if academic librarians at UoTs in South Africa had the digital and pedagogical skills to teach in a digital environment. The researcher was also interested in ascertaining the depth of online teacher presence that academic librarians demonstrated in a digital environment. Hence, the critical areas explored were digital pedagogies, pedagogical skills, digital skills, and the online teaching presence of academic librarians at UoTs in South Africa. Thus, the outcome of this research was to establish whether an online training model on digital pedagogies is needed for the Library and Information Science environment of South Africa.

Prior to the Covid-19 pandemic, online teaching was scarce at higher education institutions (Oducado 2020: 4737). The primary form of teaching and learning was face-to-face instruction. Globally, the Covid-19 pandemic caused pandemonium in workplaces such as enterprises, organisations, and educational institutions (Schwartzman 2020: 502-503). The momentum shifted in the blink of an eye as the world was shaken into a hard lockdown. Higher education institutions had to re-envision teaching, learning and research strategies to cater for what became a buzzword, the *'new norm'* (Kanwar and Carr 2020: 326-333). Academic librarians providing support to

university communities also rapidly transitioned to serve re-defined institutional goals and objectives during the pandemic.

However, higher education institutions and subsidiaries such as academic librarians need to deeply reflect in the endemic period as to the condition of online teaching and learning prior to the Covid-19 pandemic. This would provide a glimpse into what was available prior to the pandemic. These include technologies such as learning management systems, video conferencing and gamification resources (Bonk 2020: 590). Covid-19 merely accelerated and forced academia into a space to utilise the digital environment, including technological resources that existed prior to the pandemic, but was isolated due to preferred traditional face-to-face teaching methods (Jesionkowska *et al*. 2020: 1-13). Instructors such as academic librarians did not diversify teaching methods to include blended or hybrid learning approaches in a face-to-face environment to include digital tools prior to the pandemic (Singh *et al*. 2022: 309). However, during the pandemic academic librarians had to abandon traditional teaching methods to suit the digital environment. Therefore, literature points to digital pedagogies as being a reality prior to the pandemic, accelerated during the pandemic and critical to be incorporated in multimodal methods of teaching and learning post pandemic (Sappington and Bedford 2017: 798-799).

The role of academic librarians as teachers has been constantly challenged in the literature (Sanches 2018: 2-4). Scholars argue that academic librarians lack the pedagogic orientation, learning theories and foundational knowledge that is critical for teaching (Yevelson-Shorsher and Bronstein 2018: 538-539). Recently, the inclusion of technology in the form of digital pedagogies has further disrupted the skills that an academic librarian requires when teaching in multimodal environments (Givens *et al*. 2020: 97-120). Technology as a prerequisite has added a new dimension to the teaching role of academic librarians (Lewitzky 2020: 32-40). Thus, a new reality has emerged in the literature for academic librarians. There is clearly a need to explore digital pedagogies and their relevance to online teaching for academics at higher education institutions.

Omar Saib *et al.* (2022: 1- 13) provided an insightful in-depth analysis using a systematic review of the global literature in relation academic librarians and digital pedagogies. The systematic review explored, scanned, examined, and engaged with the literature between 2015 and 2020. It identified articles that discussed digital pedagogies, the digital environment, and academic

librarians. This included prominent studies across many continents such as North America, South America, Asia, Middle East, Oceania, Africa, and Europe. The study probed the relationships between pedagogies, using technology for online teaching and the digital skills of academic librarians. The research method used was PRISMA Statement Guidelines for Systems and Meta-Analyses when selecting the articles. Additionally, a machine learning algorithm, Latent Dirichlet Allocation (LDA), was used as a visualisation technique to discover relationships, themes, and relevant topics from the selected articles.

Table 3.1: Themes and keywords on digital pedagogies and academic librarians extracted using LDA (Omarsaib et al. 2022)

Topic	**Theme**	**Keywords**
0	Digital literacy	digital literacy, skill, librarian, emerge, indicate, tool, technology, finding, competency
1	Session design	session design, active, view, question, form, technological, job, group, element
2	Online academic	online, academic, role, learn, finding, teacher, librarian, institution, development, learning
3	Academic library	academic, learn, library, practice, study, skill, technology, learning, student, information
4	Librarian teaching	Librarian, teaching, teach, help, millennial, feel, technology, instructional, understand

The systematic review uncovered critical findings on a global scale, connected to disparities between digital pedagogies, academic librarians, and online teaching. The articles from the systematic review either focused on pedagogy or the digital skills of academic librarians. These concepts are discussed in isolation from each other in the literature. The interrelatedness and interdependence of the term *digital pedagogy* is lacking in the current literature. Furthermore, the study suggests that future research should consider the following topics:

- academic librarians transforming pedagogy with technology online instruction;
- learning theories and online library instruction; and
- digital and pedagogical skills of academic librarians in a digital environment.

Ramos Eclevia (2022: 2-19) examined the competencies of academic librarians to teach online library instruction in the Philippines. An exploratory descriptive research method was used to design an online survey. The survey examined the pedagogical and digital competencies of academic librarians to execute student-related activities in online library instruction synchronously or asynchronously. Findings revealed that Filipino academic librarians lacked in pedagogical and

digital competencies/skills related to online teaching. This was due to no formal teacher education training in pedagogy and digital technologies prior to facilitating online library instruction. Filipino academic librarians also lacked in the creation of the online curriculum, online instruction, online assessments, and evaluations. The study also emphasised that academic librarians must be introduced to new educational technologies to enhance teaching and learning in an online environment.

O'Neil and Pegrum (2018:439-445) used a five-year longitudinal study aiming to evaluate the development of academic librarians at an Australian University. Academic librarians had to learn pedagogical and digital skills through participating in professional development seminars. The Kirkpatrick Model of Training Evaluation underpinned the data collection process during the study. The data was collected using two survey instruments. This included two focus group interviews and an observation of participants. The observation was based on a project. Participants had to use the pedagogical and technological skills learnt during the seminar in cohesion to develop innovative teaching methods.

The comments that participants made after the five-year longitudinal study included '*I think participating in these workshops and seminars has had a profound effect on how I approach my work and my career. It gave a clear pedagogical underpinning to many of the tools and technologies'*, '*We're not just implementing technology skills but also partnering with academics, helping change the curriculum… [the seminar] enhanced our ability to talk with academics about curriculum and technology'*, '*The course was a wonderful opportunity for us to gain an understanding of the pedagogy underpinning the use of new technologies, as well as being introduced to a wide range of these tools'*, '*Growth in [one's] own confidence is also important and has been underpinned by the course, for example I introduced a change to my class learning design – it was a bit of a leap into the dark. I had to manage the class and technical difficulties, but the students liked it*'. The narratives and the conclusions suggest that these seminars had a positive influence in developing the pedagogical and technological skills of academic librarian with a teaching identity.

Prior, during and post pandemic, technology has been constantly shifting the pedagogical landscape in online teaching. This has impacted the job description of academic librarians with an online teaching identity. Traditionally, academic librarians have been branded as '*support staff*'. However, in the present digital environment, it is becoming increasingly clear that academic librarians play an important role as online teachers at higher education institutions. Therefore, it is important that academic librarians understand and embrace digital pedagogies as higher education institutions transition in the 21st century.

3.4.2 Digital skills of academic librarians and pedagogy

Globally, the literature scanned presented an ambiguous understanding of digital skills and pedagogies relating to academic librarians as online facilitators. In developing economies such as Chile, Nigeria, Pakistan and Zambia, digital skills for academic librarians point to being competent in digitisation processes and information services (Chewe and Zulu 2020:3-4; Baro, Obaro and Aduba 2019: 177-185). There is also emphasis on a lack of support to acquire digital skills for academic librarians due to poor technological infrastructure at higher education institutions (Khan 2020: 168-171). This has compromised the readiness of academic librarians for the digital environment. Furthermore, academic librarians have not highlighted the importance of pedagogic practices and salient digital skills for online teaching (Chanetsa and Ngulube 2017: 190).

In developed economies such as America, Australia and Canada, academic librarians have the digital skills to function optimally in an online environment. Academic librarians are digitally competent in different literacies and the ethical use of information related to the online environment (Martzoukou 2021: 266-276). Worldwide, a deeper exploration of the empirical evidence presented in the literature on digital skills is also connected to information literacy (Becker 2018: 1-8; Rafi, Jianming and Ahmad 2019: 203-217; Hiremath and Bankapur 2019: 11-18). Information literacy is the focus of library instruction at higher education institutions. Digital skills related to information literacy for academic librarians are seen as being competent in demonstrating to students how to search online resources such as databases, electronic books, databases and institutional repositories. This is epitomised as the primary objective of library instruction in multimodal environments at many higher education institutions (Withorn and Willenborg 2020: 1-17; Zakharov and Maybee 2019: 215-225; Uzwyshyn 2018: 63-86).

At the Bar-llan University in Israel, Aharony, Julien and Nadel-Kritz (2020: 964-971) borrowed an on online survey from Julien, Gross and Latham (2018:179-188). The online survey was translated into the local language, Hebrew, and facilitated to academic librarians. The purpose was to explore the responsibilities, challenges, and opportunities that academic librarians faced in library instruction using a similar research design applied in America and Canada. The American and Canadian studies were facilitated on a national scale, whilst the Israeli study focused on the Bar-IIan University. The key difference with the studies in America and Canada when compared to Israel was the instructional objectives. In America and Canada, the focus was to stimulate students towards using critical thinking skills when evaluating information, whilst in Israel the focus was on how to locate library resources. The American, Canadian, and Israeli studies recognise the importance of digital skills in teaching and the impact of technology. However, there is no indication as to how digital skills were used to enhance teaching methods and learning activities in the library instruction.

Fernandez-Batanero *et al*. (2020: 1-18) conducted a systematic review related to ICTs and the digital competences of teachers. The literature reviewed was between 2008 and 2018. The research method was based on PRISMA Statement Guidelines for Systems and Meta-Analyses. The systematic review emphasised that instructors need to demonstrate a high level of understanding in pedagogical knowledge with digital fluency for designing content, teaching, and assessing students as education is immersed in the digital era. The findings from the selected articles reveal a lack of professional training in using ICTs for instruction in multimodal environments. The recommendations included:

- create opportunities for teachers through ongoing training programmes to improve and deeply explore the digital skills and technologies needed to support pedagogical principles for teaching;
- review curricula to incorporate a teaching with technology module for future teacher professionals; and
- management must drive the promotion of innovation in teaching and learning to support instructors' teaching practices.

Similarly, within the context of academic librarians in Mexico, Fernandez-Ramos (2019: 242-251) probed the level of implementation of the online library instruction, experiences, attitudes and opinions of academic librarians when teaching in a digital environment. A survey was designed in the form of a questionnaire and distributed to academic librarians at Mexican public universities. The findings commensurate with the Israeli, American and Canadian perspectives recognising the importance and usefulness of digital skills in library instruction (Aharony, Julien and Nadel-Kritz 2019 and Julien, Gross and Latham 2018). However, these digital skills referred to in the Mexican findings are also synonymous with the focus globally in terms of library instruction. Worldwide, digital skills refer to academic librarians having the ability to demonstrate to university communities the use of library online resources such as discovery tools, electronic books, online journals, and online academic databases (Grombly and Anderson 2020: 6-17; Tshuma and Chigada 2018: 1-7). Furthermore, some academic librarians also focus on critical thinking skills when using information for research purposes (Davids and Omar 2018:1-9). The Mexican study also points to a lack of opportunities to develop digital skills on how to search online resources based on financial and technological constraints.

In addition, the literature is vague in discussing the digital skills and pedagogic principles related to academic librarians' implementation of online library instruction (Omar Saib *et al.* 2022: 1- 13). The limitations in the literature point to an apparent gap that needs to be addressed in the field of Library and Information Science. The issue is two-fold but refers to one concept, digital pedagogies. The two issues are pedagogy and digital skills connected to digital pedagogies. The aim of integrating pedagogy with digital skills is to make online library instruction meaningful for students. Yet, the use of technology in the form of digital tools such as learning management systems, web authoring software, digital educational resources and video conferencing applications is reliant on academic librarians displaying fluent digital skills for online teaching (Omar Saib *et al*. 2022: 247-270).

Furthermore, using these technologies with expert digital skills is only an aspect of implementing digital pedagogies in online library instruction. It is even more critical that academic librarians have foundational knowledge of which learning theories can guide pedagogy. This will provide academic librarians with the background knowledge to design online library content, adopt

innovative teaching methods, create stimulating learning activities, produce insightful online assessments coupled with germane digital skills. Hence, academic librarians need to constantly deliberate and reflect upon their online teaching practices. This will enable academic librarians to make informed decisions underpinning digital pedagogies for online library instruction. Thus, the limitations of academic librarians to combine pedagogical and digital skills in producing digital pedagogies to enhance online teaching is a topical issue. Therefore, digital pedagogies need to be addressed as it will support the development and strengthen the teaching identity of academic librarians in an online environment.

3.5 The Fourth Industrial Revolution (4IR)

The First Industrial Revolution had an impact on civilization (Hirschi, 2018: 193). It changed the economic landscape from agrarian and handicraft to one powered by machinery. It set the tone for the Second Industrial Revolution, dominated by steel, electricity, and oil. However, the world changed and 'curtains were opened' with the Third Industrial Revolution. The advent of technology synced with the computer age led global communities to explore the efficacy of using automated systems (Dholakia and Firat 2019). Automated systems refer to the hardware and software components of electronic devices such as computers programmed to enable minimal human intervention (Lu, Xu, and Wang 2020:317). The use of automated systems also produced highly efficient knowledge economies, resulting in the digital age leading to the Fourth Industrial Revolution (4IR).

The dawn of 4IR clearly represents the transition from an industrialised society to one reliant on information, technology, and the internet (Tella *et al.* 2021: 1481-1503). The key drivers in the 4IR includes digitisation, internet of things, knowledge production and research. These drivers enable seamless access to cutting edge communication channels, data management tools, machine learning, artificial intelligence, software, and other technologies. These are identified as crucial elements in the digital age. The ability an individual demonstrates in optimising the use of these elements in various settings such as work, home and socially has proven to be beneficial. It enables limitless access to communicative channels, data, software, digital learning, digital tools, and other technologies.

Furthermore, these drivers of change have transformed communities of practice in relation to work, personal and social structures, creating avenues for individuals to network in enabling virtual spaces by connecting them to their communities of practice. This in turn supports the creation of new knowledge to solve work and personal issues in the digital age. The outcome in the design of new knowledge constructs improves systems and processes in communities of practice. These drivers of change in the form of digitisation, the internet of things, knowledge production and research also allow an individual to promote their digital identity whilst belonging to various communities of practice. It has enriched an individual within the context of their work, personal and social spaces aligned to the digital age.

Ultimately, the Third Industrial Revolution unearthed the benefit of using information with technology. This ended the era of manual mass production as understood in the previous industrial ages. However, the ingenuity of the 4IR is clear in the modern world setting. 4IR allows individuals to construct their own learning processes and systems within the context of their communities of practice. The 'punchline' of the 4IR is in its ability to create new knowledge through collaboration, thereby solving work and personal issues in the digital environment. It also effortlessly connects people to the global village to construct, produce and share knowledge related to a specific field.

4IR built on its predecessor and is rapidly transforming the global village. It brings dynamic change socially, financially, and politically (Grybauskas, Stefanini and Ghobakhloo 2022). "When compared with previous industrial revolutions, the fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. The breadth and depth of these changes herald the transformation of entire systems of production, management, and governance" (Schwab, 2015). Thus, the solution in adapting to 4IR in the current global context is using the expert knowledge gained from the communities an individual belongs to (e.g., work) and innovatively merging their practices into digital spaces. This will produce outcomes that are purposeful, digitally sustainable, economically suitable, and socially decisive as one transcends into 4IR. Furthermore, expertise coupled with relevant technological skills will ensure an individual keeps pace with 4IR and avoiding becoming obsolete in their communities of practice.

The exclusivity of 4IR is also recognisable in the ground-breaking technologies that emanate from merging the digital, physical, and biological spheres. However, the lines are blurred in relation to 4IR within these physical, digital, and biological spheres (Xu *et al*. 2018: 91). The global village is going through a learning curve in understanding 4IR. Every situation must be addressed in accordance with a specific context, be it personal, work, or social. An example of 'blurred lines' is remote working versus workplace demands. Employees find working from home conducive compared to restrictive workplace conditions. These include flexible lunch breaks and working hours juxtaposed pre-Covid with the drawbacks in the conditions of service for employees. Simultaneously, employees also feel obliged to demonstrate their work ethics when working remotely. Corfe (2018: 35) states that employees feel compelled to work after-hours responding to work-related matters, thereby demonstrating 'going beyond the call of duty'. Within the South African context, Weideman and Hofmeyer (2020) interviewed eight subject matter experts and 15 employees from six different industries. The data was analysed using a thematic analysis approach. The findings revealed that flexible working arrangements positively influenced staff well-being and productivity. Hence, in the design of remote working as made possible due to the pandemic and 4IR, there needs to be a review and revision of work vs remote working policies. There are other such examples in many industries, such as education, that need robust discussions and clear elucidations as people engage with 4IR in the 21st century (Lam 2020: 1-20).

The fourth industrial revolution is not limited to technological advancements using automated systems. Neither is it limited to the physical and biological spheres. It is also powered by the internet, positively influencing core sectors such as health, education, and business in the digital age. In terms of higher education, the internet has been key in shifting institutions into the digital environment (Davidson-Shivers*et al*. 2018). This is primarily due to the ease in accessing the internet for higher education communities in digital learning spaces. Worldwide, higher education institutions have embraced 4IR supported by the internet to accelerate integration into the digital environment (Rotatori, Lee and Sleeva 2021: 98-99). Higher education institutions have engaged with their student communities using multimodal methods of teaching, learning and research. Thus, 4IR, prompted through an automated technological environment supported by digitisation, the internet of things, knowledge production and research, has shifted the world in all sectors to a digital global village.

3.5.1 Academic libraries and 4IR

Globally, the concept of 4IR in academic libraries is limited since inception (Catalano *et al.* 2018:7). Certain aspects related to 4IR such as information management, digital scholarship, open access systems, open educational resources, and cyber systems amongst others, have been implemented in academic libraries. However, Ocholla and Ocholla (2020:363) posits that academic libraries need to improve their understanding in makerspace initiatives, research data management, artificial intelligence, and robotics in order to establish themselves as key stakeholders at higher education institutions to be identifiable in the 4IR. Therefore, although higher education libraries bear 4IR characteristics, there is a lack in strategizing and planning in preparation for the digital age (Tella *et al*. 2021). This has resulted in academic libraries only gradually adapting to the latest trends in response to 4IR. Therefore, there is a need for academic libraries to address these issues. The risk of poor strategizing and planning whilst providing support in teaching, learning and research in the digital age can lead to academic libraries becoming obsolete. This can occur as higher education institutions align their institutional goals and objectives to 4IR. Thus, academic libraries must respond with exactitude and innovative creativity to 4IR.

Recently, the key factor steering academic libraries to explore and re-envision their position has been the Covid-19 pandemic (Chisita *et al*. 2022: 1-7). Post pandemic, academic libraries are charting a path to navigate and engage with the latest technologies in the digital age. However, the 'wheels turn slowly' at academic libraries largely because their role is subsidiary to the strategic goals of the host institution *'vis a vis'* the university. The availability of resources in the form of funding to develop library infrastructure at academic libraries can be limited. Consequently, the dust of the digital age is beginning to quickly settle two decades into the 21st century. The global village witnessed the importance and value of 4IR during the recent pandemic. Prior to the pandemic, academic libraries like many other organisations, operated within the confines of physical spheres when using the digital environment (Tunga 2021: 94-96).

During the Covid 19 pandemic, academic libraries had to navigate through uncharted virtual spaces to support teaching, learning and research in digital spheres. This was an 'eye-opening' experience as the limitless opportunities of the digital environment compared to the physical sphere was discovered. Yu, Lam, Chiu (2022: 9-14) provided an Asian perspective discussing the

management of major university libraries in Hong Kong during the Covid 19 pandemic. A qualitative approach using semi-structured interviews was used with academic librarians. The themes from the findings assert the importance of the following:

- connecting with library users remotely to provide access to information resources and research support,
- using technological applications such as MS Teams and Zoom to communicate with staff and students,
- reliance on new technological tools to engage the university communities in teaching, learning and research support. These technological tools include gamification, immersive learning, and artificial intelligence,
- the lack of time for staff to test multimodal methods of engaging library users,
- anxiety related to the pandemic including health issues post pandemic, and
- adapting a hybrid model for e-teaching, e-learning, and e-resources for academic libraries in Hong Kong.

Globally, the challenge for many academic libraries during the pandemic was linking the physical to the digital sphere (Oyelude 2022:13-14). This problem existed because there was limited strategic direction to lead academic libraries into the digital environment prior to the pandemic. 4IR was not an area of focus pre-Covid-19. Hence, there was a gap in how to strategically position academic libraries amidst the pandemic at universities globally. This is apparent as discussed through the lens of Sukula *et al*. (2020: 77-92) in a systematic review titled, "*Reinventing Academic Libraries and Learning - Post-Covid (19) in the Perspective of Collaboration among Key Stake-holders in Higher Education: A brief Assessment and Futuristic Approach"*. The review of the literature between 2001and2020 in this study points to strategically re-envisioning the future of academic libraries and information services within the digital environment. The main findings expound on re-designing the digital landscape of academic libraries; enhancing research support in the digital environment; developing collaborative partnerships with faculties; and unpacking library instruction through a digital information literacy module. These findings revealed the context of academic libraries within 4IR prior and post pandemic.

Post pandemic, academic libraries need to focus their strategic direction aligned within the context of 4IR. This is critical if academic libraries want to be positioned as key stakeholders in the executive structures of higher education communities at universities. Therefore, the focus for academic libraries should not be on only demonstrating their value in supporting teaching, learning and research in the digital environment at higher education institutions. Rather, they need to institute an inclusive shift into the digital environment to enhance teaching, learning and research at higher education institutions. Covid-19 was just the unfortunate impetus that accelerated academic libraries to embrace the changing digital landscape of higher education. Thus, the time to embrace change through re-purposing physical and digital spheres at academic libraries has arrived with the re-emergence of '4IR as the new norm', as trended during the pandemic.

3.6 Summary

This chapter reviewed the literature on digital pedagogies and academic librarians in the twenty-first century. Literature on the pedagogical and digital skills of academic librarians in higher education was examined, including other themes such as the history of academic librarians as teachers, learning theories, digital pedagogies, and Covid-19. Furthermore, it was also important to explore the literature related to 4IR and academic libraries. This reflects the global trends in Library and Information Science and in South Africa. The next chapter will focus on the methodology used in this study.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

Research is a systematic process used to gather scientific evidence about a phenomenon in a specific field (Pandey and Pandey 2021: 5-15). This phenomenon articulates itself as the research problem in a study. The research process is unbiased and provides a critical examination of the phenomenon in one's profession using relevant methodical approaches. Phaladi (2021:102) concurs that research involves the systematic collection of evidence through relevant methodical approaches. Welman *et al*. (2005: 2) also affirm that research is a scientific process that questions a phenomenon in a specific field. In this process, a researcher examines the phenomenon using scientific methods and tools. The aim is to chart a scientific path that questions, discovers, answers, and suggests solutions to a research problem. Hence, Leedy, Johnson and Ormrod (2021: 2) define the term 'research' as a "systematic process of collecting, analyzing and interpreting information for well-defined problems in order to obtain a greater understanding of a phenomenon".

Research can be divided into two broad categories *vis a vis* research methodology and research method (Al-Ababneh 2020: 76-77). Research methodology is the overarching approach that is connected to the theoretical framework and paradigms (Crotty 1998: 1-4). The paradigm or theory for a better understanding is the foundational philosophy that underpins the research problem. According to Davis and Fisher (2018: 21-25), there are various research paradigms, namely pragmatism, interpretivism and positivism. The research method refers to the systematic process that is adhered to when exploring the phenomenon through data collection and analysis (Morgan 2017: 2). Data collection and analysis tools include surveys, interviews, and software. The data tools provide a clear understanding of the phenomenon being investigated through the findings, presentations, analysis, and interpretations. Therefore, research is governed by paradigms that ensure that the process of scientific inquiry is grounded. Research is also a disciplined approach guided through methodical approaches in unearthing knowledge about a particular phenomenon.

Guba and Lincoln (1994: 105-117) define paradigm as a belief that guides researchers' actions when exploring a particular phenomenon. When scanning, reviewing, and selecting the most

appropriate paradigm for a study, the researcher delves into the literature to understand the human constructs offered in the philosophical foundations of research. This leads to an intrinsic reasoning that occurs in the mind of a researcher after reviewing the philosophical foundations of research and paradigms (Denzin 1970, Denzin and Lincoln: 2000). The researcher reflects on the paradigm best suited for exploring the phenomenon in a particular study. The selected paradigm underscores the methodical approach when probing the research problem. Hence, it becomes central to the methodology and methods adopted in the research process. In terms of this study, pragmatism was the philosophical foundation chosen to understand the phenomenon.

Sarantakos (2013 28:30) posits that a philosophical paradigm controls the research methods and techniques that the researcher adopts when exploring the phenomenon. Furthermore, Ngulube (2015: 125-143) expounds that the selected paradigm positions the researcher into understanding the methods and instruments best suited in understanding a particular phenomenon. In terms of this study, mixed methods research (MMR) was selected to guide the design and systematic data processes. The three types of MMR are exploratory sequential design, explanatory sequential design and convergent. The researcher selected the explanatory sequential design to address the problem, examine the objectives and explore the research questions for this study.

The research problem addressed in this study was the digital pedagogies of academic librarians at Universities of Technology in South Africa. The aim was to ascertain, explore and establish the pedagogical skills, digital skills, and online teaching presence of academic librarians as online facilitators in a digital environment. The intended outcome of this study was to design an online training digital pedagogies model for the current LIS environment in South Africa. Therefore, the research objectives were as follows:

[RO1]: To ascertain the digital pedagogies of academic librarians in the current digital environment at UoTs in South Africa;

[RO2]: To explore the pedagogical and digital skills of academic librarians within a digital environment at UoTs in South Africa;

[RO3]: To establish the type of online teaching presence academic librarians have when engaging with students in a digital environment at UoTs in South Africa;

[RO4]: To design an online training model in pedagogical and digital skills required for the current Library and Information Science environment.

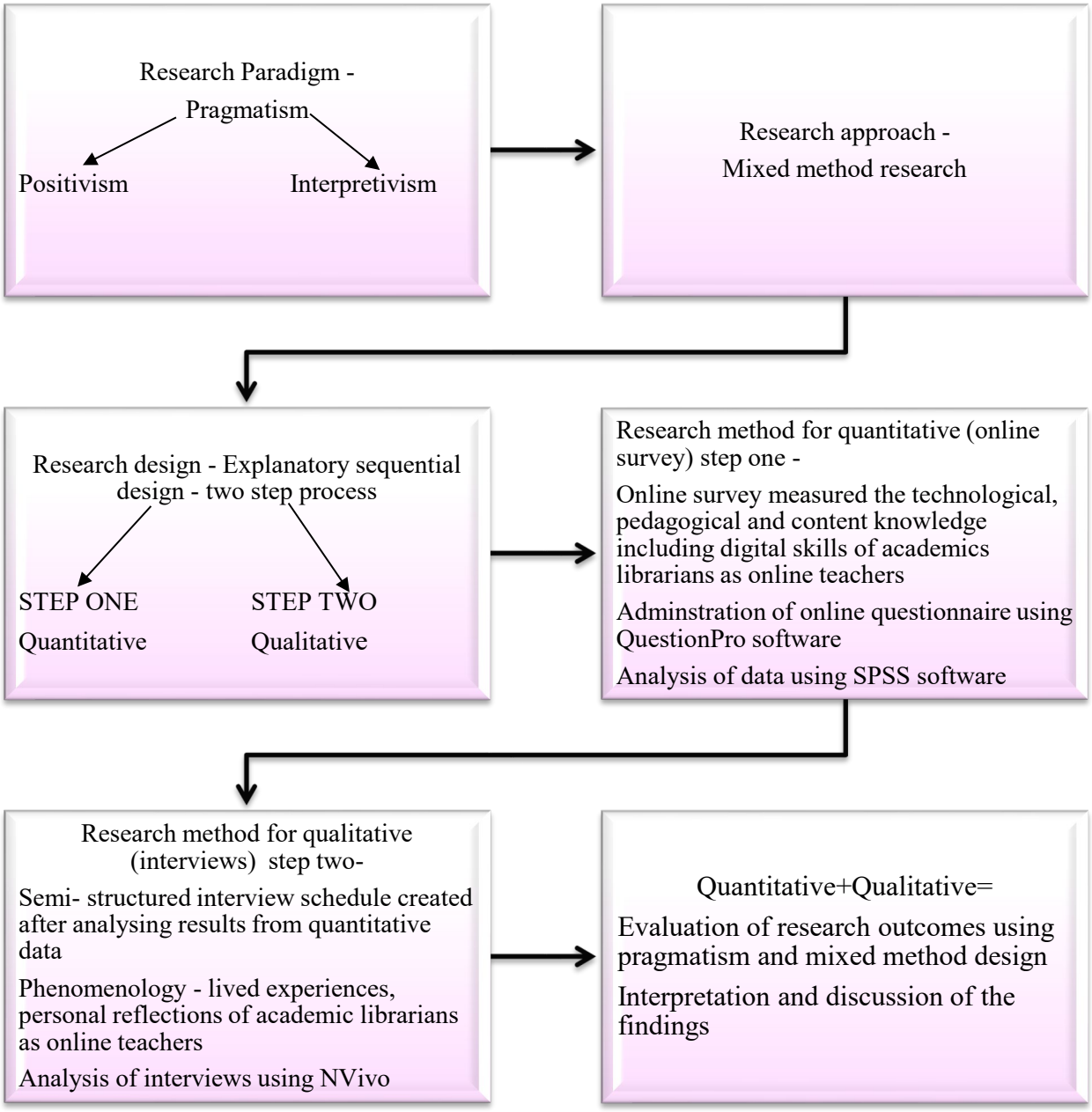


Figure 4.1: Research methodology roadmap for digital pedagogies and academic librarians at UoTs in South Africa

In Figure 4.1, the researcher constructed a roadmap for the research methodology chapter of this study. The roadmap as illustrated in Figure 4.1 highlights the step-by-step process when applying

the explanatory sequential design to a research study. Figure 4.1 provides a bird's eye view of the systematic progression from selecting paradigms, approach, design methods, evaluation of research outcomes, resulting in interpretations and discussions for this study.

4.2 Research paradigm

The word 'paradigm' has its roots in Greek methodology where it means *'pattern'.* Historically, Kuhn (1962: 1-10) first used the word 'paradigm' in philosophy. Mackenzie and Knipe (2006 193:205) posits that when used in an educational context, the word 'paradigm' is connected to a researcher's '*worldview'*. In research, a worldview positions an individual in terms of perspective, thinking and shared beliefs linked to the phenomenon being explored (Kivunja and Kuyini 2017: 26). The outcome of a worldview is that a researcher navigates the meaning and interpretation of data using a set pattern of beliefs and norms aligned to the chosen paradigm in a study.

Lather (1986: 257-278) further elaborates on a worldview as the intrinsic reflection and belief of a researcher through a particular lens. Similarly, Creswell and Creswell (2020) states that a worldview is when a researcher views, reflects, and identifies on how the research process should unfold through scientific inquiry. This reflective process results in the intrinsic absorption of beliefs and principles shaping the researcher's worldview. At this stage, the researcher begins to interpret the world through their own philosophical assumptions (Creswell 2014:5). Hence, paradigms provide a whole system of inherent thinking for the researcher that guides the researcher in selecting the most appropriate paradigm as a worldview when exploring a phenomenon.

Paradigms are also the philosophical foundations of research when assimilating theory and practice (Kuhn 1970). Paradigms are instrumental in influencing the theory and practice of methodology, design and procedures during the research process (Kelly, Dowling and Millar 2018: 9-12). Paradigms contain a set of shared beliefs and valuable assumptions that also frame the research inquiry (Cohen, Manion and Morrison: 2018). Therefore, when framing the research, a paradigm links to the ontology, which is the nature of reality; connects the epistemology to the development of knowledge; considers the axiology related to ethical issues; and positions the phenomenon that an individual has identified as the research problem (Terre Blanche and Durrheim 2006: 6). Moreover, Mckenzie and Knipe (2006:2) postulate that the choice of a paradigm provides insight

into the researcher's intent, motivation, and expectation of the study. It also sets the marker for the subsequent research processes such as methodology, design, and methods.

Numerous paradigms are proposed in research, but Candy (1989: 95-99) suggests that paradigms can be grouped into three main categories. These are positivist, interpretivist, and critical paradigms. However, Tashakkori and Teddlie (2010) introduced a fourth paradigm that logically derives elements of foundational philosophies from positivism, interpretivism and critical theory. This has become known as the pragmatic paradigm. Pragmatism as a philosophical strand has ontological, epistemological, and methodological underpinnings of both the positivist and interpretivist paradigms (Phaladi 2021: 106). In terms of this study, positivism and interpretivism were both relevant to the researcher's worldview regarding the research problem. Therefore, the discussion focuses on positivist, interpretivist, and pragmatic paradigms. The researcher also justifies the selection of the pragmatic paradigm, including its appropriateness for this study.

4.2.1 The Positivist research paradigm

Positivism as a worldview is grounded in using scientific methods to discover the objective truth (Kelly, Dowling and Millar 2018: 10). At the core of positivism is the use of empiricism to determine the objective truth in research (Shah *et al*. 2020: 7). Empiricism maintains that what is apparent to an individual through observation is factual (Aliyu, Bello and Kassim *et al*. 2014:86). According to Chirkov and Anderson (2018: 715-717), the purpose of positivism is to measure the relationships between variables logically, systematically, and statistically during the research process by using empirical methods to discover the reality. Therefore, positivism is primarily positioned when using the quantitative approach because positivism orientates researchers in methodological issues to scientifically explore the reality of the objective truth using quantitative approaches through empiricism (Younus and Zaidan 2022: 65-66). In quantitative approaches, tools such as questionnaires, surveys and experiments are used to collect, analyse and interpret data in an unbiased measured method, consequently making the research process acceptable in the positivist paradigm.

Saunders, Lewis and Thornhill (2021: 148-150) states that ontology, epistemology and axiology are three key elements that shape positivism. However, the underpinning of positivism is

epitomised through objectivism and empircism (Park, Konge and Artino 2020: 692). Within the context of an epistemological perspective in positivism, only objectivism portrays the '*true reality'*. Therefore, these key elements must demonstrate the nature of reality through an objective philosophical position. This means that only objective truth is considered as acceptable knowledge through the lens of ontology, epistemology, and axiology in the positivistic paradigm (Majeed 2019: 120-122).

The exploration of social realities from an objectivist ontological position in positivism is based on comprehending human behaviour through sensory experience, observation, and experimentation (Kumatongo and Muzata 2021: 17). Hence, positivism as a social reality is measured against the objectivity of the researcher (Raqib 2019: 99-112). This means that researchers hold an ontological position in the social realities of positivism with boundaries. In this controlled parameter of the positivistic paradigm, researchers design and administer procedures detached from the experience of the reality to remain neutral. Thus, researchers are excluded from influencing the findings of the phenomenon in the research process. This is critical in ensuring accuracy in data collection methods and correlations.

The deliberations of the researcher for this study in understanding positivism as a paradigm uncovered a reality. Objectivism hinges on natural science principles to unpack a research phenomenon (Cordero 2013: 61-84). These naturalistic values include objectivity, transparency, respect for the integrity of knowledge, the ethical use of knowledge and fairness that guide the art of research methodology (Vilma 2018: 19-43). Furthermore, the use of empirical unbiased methods and validity to interpret the findings when examining a social phenomenon is also a reality of positivism. Thus, the researcher believes that positivism is underpinned through objectivism using natural science and depends on empirical methods to scientifically measure as well as validate a phenomenon. Plano Clark and Ivankova (2016:196) concur that the purpose of positivism as a paradigm is to measure variables and make deductions and generalisability about reality.

Epistemology is another critical element when discussing positivism. The purpose of a positivistic epistemological stance is to conceptualise *'how can'* a researcher unearths the reality.

Maree (2020) and Wagner, Kawulich and Garner (2013) agree that epistemology is concerned about ways of knowing. Positivists also opine that the only formula to know reality is to distance oneself from the process of influencing the phenomenon. Therefore, according to Leedy, Ormrod and Johnson (2021), positivists advocate using deductive reasoning to navigate predetermined ideas and theories in research. This notion is affirmed through the work of Park, Konge and Artino (2020: 690), who posit that positivism is associated with the *hypothetico-deductive model of science*. This model maps the research in a circular process. It begins with the researcher exploring the literature within the context of a particular field. This leads to one identifying and building a testable hypothesis, what follows is the framing of a methodological process, then the facilitation of an empirical study, resulting in findings and interpretations. Ultimately, this process is circular, as it begins with literature and concludes with the researcher's contribution to the body of knowledge in a particular field. This helps gain a clearer understanding of the testable hypothesis and strengthens the knowledge for a specific community.

Axiology is the third piece of the puzzle and the moral fibre of positivism (Hartman 1962: 416). It is a branch of philosophy that alludes to prodding the researcher's morals and ethics during the research process in the positivist paradigm. Axiology subscribes to the positivist ontological reality connected to the researcher's objectivity. This neutrality of the researcher delineates the axiology of the research process. It is epistemologically represented in the logical scientific methods the researcher uses to gather data in a study. Therefore, the knowledge that emanates after the analysis of the data is unbiased, objective and measured. Additionally, the eventuality in the outcome of the study corresponds with the axiological values of the researcher within the positivistic paradigm.

Positivism is one of the paradigms attested to by the researcher in this study. The ontological reality, epistemological discoverability and axiological awareness that frames positivism is applied with ferocity in the mixed method design of this study. The quantitative approach in the first phase of this study is connected to the objective reality of positivism as represented in Figure 4.1. Therefore, the philosophy of the positivistic paradigm is important in understanding the pedagogical and digital skills of academic librarians at UoTs in South Africa for online teaching. The other philosophical paradigm linked to this study is interpretivism.

4.2.2 Interpretivism research paradigm

The interpretivist paradigm holds an opposing standpoint when compared to positivism in social science research. Positivism positions itself in the paradigm of true reality as directed through objectivism and empiricism. The ontological reality, epistemological knowledge, and methodological worldview of interpretivism is socially constructed. According to Aliyu, Bello, Kassim *et al*. (2014: 84), interpretive researchers posit that social reality can only be ascertained through social constructs such as shared meaning. Chipindi, Serenje-Chipindi and Daka (2020: 109-110) concur that interpretivism as a paradigm engages itself with the reality or truth as being socially constructed and fluid. Furthermore, Creswell (2020: 8) asserts that interpretivist researchers tend to depend on the perceptions of the participants involved in the research study. Thus, unlike positivism that uses empirical methods to deduce the reality of people, interpretivism places emphasis on discovering how people feel about lived experiences.

The researcher found the differing philosophies of positivism and interpretivism intriguing and critical to explore. The examining of these paradigm provided the researcher with the opportunity to ascertain the most suited ontological, epistemological, and axiological worldview for the current study. Therefore, the researcher also delved into the nature of the interpretivist paradigm. Kumatongo and Muzata (2021: 23) describe the unique nature of the interpretivist as being subjective. This is the key ingredient in unpacking the interpretivist standpoint. Subjectivism is fundamental because it perceives that every individual has their own reality created through personal experiences. An example of this is academic librarians who teach at higher education institutions with varied pedagogical skills. The reality of designing learning activities and resources for students is described from the viewpoint of academic librarians with varied backgrounds of pedagogy. The critical component in the interpretivism paradigm is to understand that the pedagogical skills related to learning activities and resources are the actual *academic librarians*. In contrast, in positivism, elements that are used include objectivity and empirical methods as in the case of academic librarians and pedagogy, whereas the interpretivist paradigm conceptualises the social reality of individuals such as academic librarians through interpretive data (Al-Ababneh 2020: 80).

Interpretivism as a research paradigm is underpinned in the epistemological arena of subjectivism (Alharahsheh and Pius 2020: 42). The reason for this is that interpretivism provides a distinct link between the inquiry, uniqueness, and social reality of every individual. Saunders, Lewis and Thornhill (2021) agree that the interpretivist paradigm is connected to the personalised lived experiences of every participant. It allows participants to share knowledge and meaning about a phenomenon through their own experiences. Neuman and Robson (2014: 102) concurs and elaborates that interpretivists probe the inherent knowledge people identify with in a particular field through extrinsically interpreting feelings, behaviour, and beliefs during the research process. The interpretive paradigm is dependent on an individual's own social reality related to a phenomenon. Therefore, interpretivism is subject to the knowledge constructs that exist intrinsically and occur in the mental makeup of an individual. Thus, the interpretivist ontological position differs from the positivists because it seeks to explore the nature of reality through direct involvement as others experience it, and not through the process of neutrality, as with objectivism.

Methodologically, interpretivism can be unpacked against the backdrop of qualitative approaches (Frechette *et al*. 2020: 3-5) because interpretivism orientates researchers to explore human experience through qualitative designs such as interviews and focus groups (Heotis 2020: 2). The use of these types of methods to collect data, underscored within the interpretative paradigm, narrows the focus of the researcher to probe rich lived experiences and descriptions of the phenomenon. Furthermore, Prosek and Gibson (2021: 169-170) assert that qualitative approaches provide an individual the opportunity to make meaning of the experiences and reflect upon their social reality. It also directs the researcher to make sense and reflect whilst interpreting the social reality of an individual in relation to the phenomenon.

Interpretivism provides opportunities to understand rich thematic patterns of individualistic thinking as opposed to the empirical data subscribed to in a positivist paradigm. However, in a positivist worldview, direct involvement is refuted as this can open the window to a biased outcome; whilst in the interpretivist social setting, the interaction with participants is critical to extract data for the research process. Thus, the biased nature of researchers can be questioned in the interpretive paradigm. Consequently, in terms of interpretivism in social research, the ontology of researchers must be value-bound and value-laden. However, this is the ideal but not the absolute

reality (Maarouf 2019: 9). Moreover, Phaladi (2021: 109) states that researchers are influenced by their value systems when selecting a paradigm. These values inform the type of paradigm chosen, topic, research strategy, data collection methods, data analysis, interpretation and how researchers report the findings of the research.

Social scientist working in an interpretivist paradigm concede that personal values can interfere with a researcher's axiological position and compromise their neutrality during the research process (Gillani 2021: 187-188). Ultimately, what needs to be accepted is that this is the social reality of interpretivism. It manages research processes through qualitative and naturalistic approaches to develop a knowledge base in a field (Denzin and Lincoln 2018). The interpretivist paradigm is positioned to share meaning and experiences with humans. It is not determined through using statistical models, as with positivism. Therefore, in shared experiences between humans, there are certain inferences that could be perceived as positive or negative depending on the context and how it applies to an individual.

Epistemologically, the philosophy of interpretivism uses inductive reasoning to interpret and theorise the scientific process (Gunbayi and Sorm 2018: 63-64). Inductive reasoning in interpretivism allows researchers to navigate a phenomenon through observation, experience, and reflection. Researchers begin to recognise the mechanics of the world through its empirical nature. This includes the daily functions and involvement of human beings in life. Robert *et al*. (2021: 5) posit that interpretivism also charts a path for researchers to steer when using inductive reasoning. The process of inductive reasoning starts slowly with vague ideas. This develops steadily into refined concepts and finishes with personified precision. Inductive reasoning can be associated with using a body of knowledge interpreted through observations to derive a general principle. The outcome of inductive reasoning is that the researcher obtains answers to specific questions through observations (Cramer-Peterson, Christenson and Ahmed-Kristensen 2019: 39-70).

Interpretivists should not have preconceived ideas, truth, or assumptions (Urcia 2021: 1-14). The approach of the interpretivist should be to transcend beyond pre-determined idiosyncrasies and choose to begin with observation and then progresses into abstract thinking. Therefore, Neuman (2020: 70) states that it is common that interpretivists may use inductive methodologies to

understand a phenomenon. An inductive methodology provides a systematic guideline for the interpretivist to collect, refine, analyse, and understand qualitative data. This results in the interpretivist addressing pertinent issues using inductive reasoning. Thus, it is crucial to understand that whilst positivism is geared towards testing a hypothesis using quantitative methods, the interpretivist paradigm is conceptualised in developing theory using qualitative approaches.

Furthermore, the methodological processes that guide a researcher in the interpretivist paradigm have tendencies to be more flexible (Thompson, Thorne and Sandhu 2021: 342). It does not follow a rigid methodological path as is evident within a positivist paradigm. Therefore, researchers using an interpretivist paradigm refrain from focusing too much on methodological functions related to the generalisability, reliability, and replication of research findings (Jacobs *et al.* 2021 -177-190). This is the nature of interpretivism, since the purpose is to develop theory related to a phenomenon. The researcher's view, the shared meanings and lived experiences of participants are what is accepted and justified in the literature for interpretivism. Thus, in interpretivism, the researcher and participants are both essential to the construction of suitable findings and developing the body of knowledge in a field (Straits and Royce 2018).

Figure 4.2 presents two opposing paradigms in the social sciences that the researcher constructed from the literature. These two paradigms, as illustrated is Figure 4.2, are incompatible. It is evident that positivism and interpretivism have extremely contrasting worldviews. The vast differences in the ontology, epistemology, methodology and data collection methods as conceptualised between these two philosophies is termed in social science research *'paradigm war'* (Cheema 2018: 36-41). The level of disagreement and friction of these paradigms is also apparent in Figure 4.2. Therefore, the researcher decided to explore further and probe if there were another paradigm that would maybe allow the co-existence of philosophies in the research process.

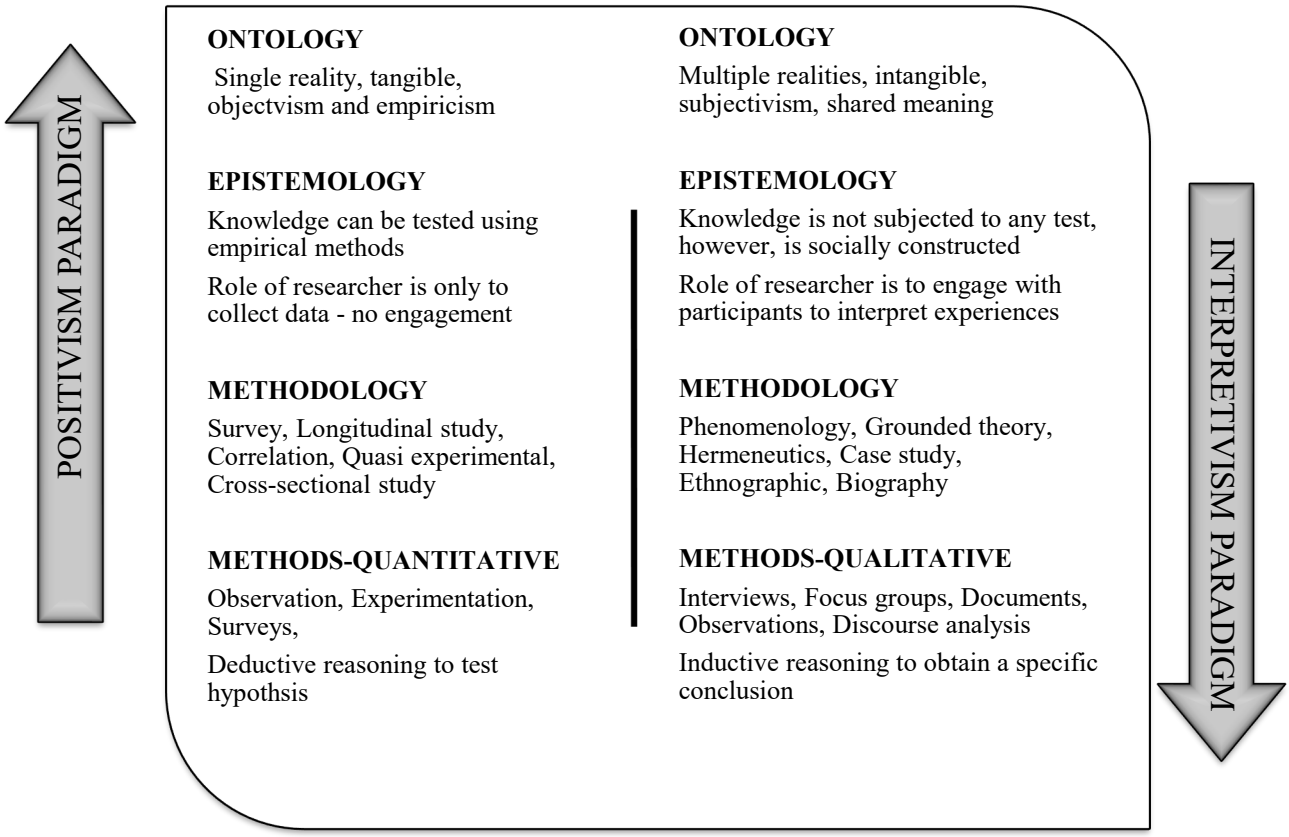


Figure 4.2: Positivism vs Interpretivism (Alharahsheh and Pius 2020: 39-43)

The illustration in Figure 4.2 is the researchers' own construct of the positivist and interpretivist paradigms as understood from the literature on research methodology. The researcher thus far has presented the worldview and relevance of both these paradigm in the research process. The researcher also presented positivism and interpretivism through the lens of experts when discussing paradigms in the literature. However, within the context of this study, the researcher could still not make an informed choice as to which paradigm would be appropriate. Hence, the researcher delved further into the literature on paradigms to find a solution for this study on digital pedagogies and academic librarians. This was important because positivism and interpretivism were both suitably positioned to frame the study. The researcher did not want to choose between these two paradigms. The contribution of positivist and interpretivist philosophies in probing, exploring, and ascertaining the digital pedagogies of academic librarians at UoTs in South Africa were both valuable. In a nutshell, both these paradigms had a pivotal role to play within the context of this study. Thus, the researcher travelled further and examined the pragmatic paradigm as an option for this study.

4.2.3 Pragmatism

Pragmatism is the result of subjective ontological, epistemological, methodical, and axiological preferential positioning either towards positivism or interpretivism (da Silva *et al*. 2018: 1314). The strong affiliation of social scientists either towards a positivist or interpretivist philosophy created what is known in the literature as the 'paradigm war'. However, this argument presented an apparent fact about both positivism and interpretivism as paradigms. These paradigms established the reality of research from a mono-paradigmatic orientation (Mandefro 2022: 5-6). This meant that in terms of a positivistic worldview, the truth can only be determined by a single scientific method. It also implied that whilst the interpretivist approach advocated multiple realities in research, it is confined to the social constructs of individuals through shared meaning and lived experiences.

Discussions began to rage in the literature linked to paradigms (Ikram and Kenayathulla 2022: 39-49). A solution was needed to provide scientific direction when exploring phenomena that would remove the barriers and differences between paradigms, allowing them to co-exist in the research process. Theorists rigorously investigated scientific approaches that would interlink paradigms in research (Alise and Teddlie 2010, Tashakorri and Teddlie 2021). This was purposefully targeted as the objective was to direct practical and pluralistic results in the philosophy of methodology (Mertens 2012: 2-12). The aim was to establish a paradigm that would derive meaningful perceptions from participants through understanding their patterns of behaviour and beliefs, irrespective of the paradigm (Johnson and Onwuegbuzie 2004: 14-26). Research in social sciences needed clarity in terms of behaviour patterns, shared meanings, and the lived experiences of participants through interconnecting paradigms. Ultimately, the outcome was anticipated to be an inclusive perspective through varied research approaches and multiple realities. Thus, the stage was set for the emergence of a new paradigm termed 'pragmatism'.

Pragmatism as a philosophy interconnects positivism and interpretivism (Klockner *et al*. 2021: 1-8). It encourages the use of both paradigms in research. Theorists who advocate using pragmatism state that two paradigms with varying differences can co-exist to solve a research problem (Mitchell and Education 2018: 269-277). Therefore, the ontological, epistemological, methodological, and axiological position of the pragmatist is clear in the literature. The ontology of pragmatism is based on individuals having their own unique understanding of reality, termed

'non-singular reality' (Ugwu, Ekere and Onoh 2021: 118). This can be interpreted as individuals having their own perspective of social realities simultaneously, diffusing that there is a single reality. Epistemologically, pragmatism identifies the origin, nature, and scope of knowledge from a relational lens. In terms of epistemology, pragmatists assert that a study is rationalised through the choices of the researcher (Kelly, Dowling and Millar 2018:13). Methodologically, pragmatism uses a mixed methods approach. Mixed methodology uses quantitative and qualitative approaches in a sensible, systematic, and logical pattern (Mumtaz 2022: 1249). Axiologically, the behaviour of the researcher in the pragmatic paradigm is value-laden (Maarouf 2019: 1-12). The primary goal is to conduct research that would benefit the community of practice within a particular field with integrity.

Pragmatism is a worldview that stems from a research problem experienced within a specific environment (Rajkoomar 2015: 69). This results in the researcher positioning oneself within a pragmatic paradigm to solve the problem practically. Therefore, pragmatism is not concerned with assumptions about the nature of knowledge, but rather it is focused on an action-oriented approach using research procedures (Creswell 2014; Hall and Shannon-Baker, 2016). The epistemological nature of pragmatism is dependent on the choices of the researcher in understanding the nature of knowledge through action and what will work to find a solution to the problem (Cameron 2011). Thus, the researcher within a pragmatic context is focused on *what and how* of the research problem (Creswell 2013: 11).

The flexibility of pragmatism is visible through the lens of its epistemology (Morgan 2014: 1045-1053). Pragmatism provides the researcher with the elasticity to navigate the research problem using objective or subjective meanings (Creswell and Clark 2018). According to Subedi (2016: 571), pragmatists indicate that research is a world independent of the scientist's mind. Therefore, pragmatists reject both positivist and interpretivist ontology as they are polarised but embrace both the objective and subjective epistemological orientations of these paradigms whilst finding solutions to a research problem (Kamau 2022: 51-55). Teddlie and Tashakorri (2009:90) explain this within the context of social science research. During various stages of the research process, the researcher will interact and engage with participants depending on the requirements of the study. Hence, pragmatism as a philosophy acknowledges that a single study may have multiple realities, either being objective or subjective. The result is that the researcher can chart a path

wherein there are allowances to implement both positivist and interpretivist perspectives to find the best possible solution to the research problem. However, the charted path must be steered through a scientific and systematic research approach. This is critical to underpin the research process within the pragmatic paradigm.

In terms of a scientific approach, the methodological strength in pragmatism is visible through mixed method research. Therefore, whilst the epistemology of pragmatism is adaptable, the methodology is associated with mixed method research as a '*philosophical partner'* (Shah, Shah and Khaskhelly 2019: 94). According to Green and Caricelli (1997), the mixed methodology is a combination of quantitative and qualitative '*data combined within a single study complementing each other by integrating their strengths*'. Furthermore, Creswell and Plano Clark (2011) posit that mixed methodology has been described in the literature by researchers as a hybrid, combined and multi-method design. The mixed method in the form of a multi-method design increases the reliability of subjective findings and empirical evidence, whilst simultaneously counteracting any probable limitations in using a single approach (Caruth 2013; Creswell and Plano Clark 2011; Tashakkori and Creswell 2008). Thus, the mixed method used in pragmatism can provide a greater depth of understanding of a research problem (Hoover and Krishnamurti 2010). This forms an integral part of the research process in pragmatism.

Pragmatism as a paradigm is also linked to the work of Dewey (Audi, 2015). The Deweyan school of thought provides impetus within the annals of education for pragmatism. The philosophy of Dewey resonates with using pragmatism to test hypotheses and social constructs through shared meaning as an educational approach in research (Rylander Eklund *et al*. 2022: 29-30). Therefore, Dewey underpins pragmatism theoretically and philosophically in research (Dixon 2020). This alignment is also apparent in the TPACK and CoI theoretical frameworks selected for this study, underpinned with Deweyan and Vygotskian educational approaches. Moreover, these theorists shared similar views within the context of learning and development in education (Glassman 2001: 3). Therefore, it is no wonder that the philosophical and theoretical foundations of pragmatism can be conceptualised as a social construct that can be used to improve pedagogic knowledge and teaching practice in education. According to Tomlinson (1997: 377-378), '*teachers were not technicians following the dictates of university-based experts … but problem solvers who must*

inevitably generate their own practices'. Therefore, individuals in an educational context with a teaching identity need to reflect upon their own instructional methods and practices framed through pragmatism. This will provide credible and valuable learning outcomes for students.

4.2.4 Choice of paradigm

Positivism and interpretivism are polarised paradigms as unearthed from the literature in this study and deduced in Figure 4.2. While positivism illustrates objectivity and empiricism, the interpretive paradigms represent a subjective approach to the research process. However, pragmatism opens the door to inter-subjectivity. Pragmatism reveals that ontologically, epistemologically, methodically and axiologically, paradigms can co-exist to address a research problem. Creswell (2014: 11) agrees that '*pragmatism opens the door to multiple methods, different worldviews, different assumptions, as well as different forms of data collection and analysis'*. Therefore, pragmatism was the philosophy that underpinned this study. Pragmatism provided the researcher with the lens to epistemologically view the objectives and critical questions within the context of this study. At this point, it is important to reiterate the overarching aim to address the study.

The broad aim of this study was to explore the emerging role of academic librarians in relation to digital pedagogies at UoTs in South Africa and design an online training intervention. Therefore, the purpose was to explore the digital pedagogies of academic librarians at UoTs for online teaching. The critical questions drawn from the objectives needed to address multiple explanations. Hence, this study did not favour a positivist epistemological position. Positivism assumes objectivity as a single reality that provides a generalisability of the truth. However, this study was positioned to explore a single reality with multiple explanations.

In terms of the interpretivist worldview, it does support multiple realities. However, interpretivism is strongly inclined towards a subjective standpoint and negates empirical methods. This study was more suited to an inter-subjective reality since the researcher intended a flexible research methodology to probe the digital pedagogies of academic librarians in UoTs in South Africa. Positivism and interpretivism both contain epistemological, methodological, and axiological importance for this study, however, because of the polarising effect of positivism and interpretivism in their ontology, epistemology and methodology, these paradigms were not selected for this study. This study needed a paradigm that could borrow from both these

philosophies to present a clear picture of digital pedagogies and academic librarians at UoTs in South Africa.

Pragmatism was chosen for this study as the preferred philosophical framework to underpin this investigation. The pragmatic approach as mentioned earlier concerns itself with an action-oriented approach using research procedures that are practical; merges data methods; and is unbiased. This study explored, probed, and engaged in ascertaining the digital pedagogies of academic librarians at UoTs in South Africa. In terms of exploring this phenomenon, an online survey was administered to academic librarians with a teaching identity at UoTs in South Africa. However, to further probe the digital pedagogies, using a phenomenological design in the form of interviews was selected to understand the lived experiences and reflections of academic librarians. Thereafter, this study used a mixed method design to triangulate the quantitative and qualitative data to unearth the reality of this study. Thus, the roadmap as illustrated in Figure 4.1 unpacks the stages of the research process for this study. Figure 4.1 represents the importance, relevance, and scientific logic in the co-existence of both positivism and interpretivism for this study. Therefore, the researcher selected pragmatism as it is practical and inter-subjective to this research problem.

Furthermore, this study aimed to explore the digital pedagogies of academic librarians related to online teaching at UoTs in South Africa. In terms of digital pedagogies and academic librarians at UoTs, pragmatism extended the research context to assume multiple explanations juxtaposing the research problem. Therefore, pragmatism framed this study to objectively explore the digital pedagogies of academic librarians for online teaching at UoTs in South Africa, as indicated in Figure 4.1. Additionally, the researcher intended interacting with academic librarians to understand their lived experiences and reflections in terms of pedagogical and digital skills when teaching in an online environment. Once again, pragmatism provided the philosophical underpinning for the researcher to subjectively probe the digital pedagogies of academic librarians as indicated in Figure 4.1. Thus, pragmatism provided the research context to develop and design a digital pedagogies training model for the LIS profession in South Africa.

Fundamentally, the researcher's choice in selecting pragmatism as the paradigm to philosophically position this study is well founded in the literature on research methodology (Kelly and Cordeiro 2020: 2). The literature on pragmatism emphasises that paradigms, theories, and research methods needed an acquiring knowledge continuum rather than two polarised ontological perspectives such

as positivism and interpretivism (Kaushik and Walsh 2019: 6). Pragmatism is the practical solution to the paradigm war as it engages somewhere in the centre of the paradigm continuum. Pragmatism embraces objectivity and subjectivity within the context of ontologies. It offers an adaptable, reflexive, and logical approach to a research problem. Moreover, ontologically, epistemologically, methodologically, and axiologically, pragmatism positions itself at the centre of the continuum in terms of paradigms. Thus, the researcher, taking all this into consideration, positioned the research problem under the umbrella of pragmatism.

4.3 General research approach

Research in the social sciences can deploy quantitative, qualitative, or mixed method approaches. The selection of the research approach depends on the nature, purpose, aim and objectives of the study. Creswell (2014: 247) posits that the research approach is the scientific procedure that includes broad assumptions and detailed methods. These broad assumptions and detailed methods are inclusive of data collection, data analysis and interpretation. Research approaches can also be perceived as the interlocking of philosophical assumptions, research design and data collection methods. The section below discusses quantitative, qualitative, and mixed-methods research approaches.

4.3.1 Quantitative and qualitative research approaches

Quantitative and qualitative approaches in research arecategorised into two primary categories (Mishra and Alok 2022). Research paradigms are recognised as one of the categories. The other is the research methodology adopted during the data collection process. In terms of research paradigms, quantitative and qualitative approaches are linked to epistemology (Abu-Alhajja 2019: 122-128). Epistemology is the distinction of knowledge in relation to the nature, origin, scope, and methods adopted in research (Goldman 2019: 10-20). Furthermore, quantitative, and qualitative approaches are epistemologically positioned during the research process to understand how the world works (Mertens 2019). The aim is to be crystal clear as to the primary goal within the quantitative and qualitative settings. The primary goal is to reveal how knowledge can come into existence when addressing the research problem.

Quantitative and qualitative research approaches also connect to the methodology in the research process (Assalahi 2015: 312-317). This refers to the scientific procedures adopted when collecting,

analysing and interpreting data in relation to a particular study. This is important since scientific procedures create opportunities for a clearer understanding of a research problem (Smith 2019). The purpose in exploring and probing a topic through scientific data collection methods is to bridge the gap in a particular field. It also provides clarity, guidance and in many instances solutions to a research problem within a specific discipline (Burkholder *et al*. 2019). Thus, the value that quantitative and qualitative approaches provide in data collection is a key piece of the puzzle during the research process.

A key difference between the quantitative and qualitative approaches is the nature of their ontological and epistemological backgrounds (Baskarada and Koronios 2018: 2-21). This means that the ontological social reality and epistemological knowledge in terms of these two approaches are reflected in using polarized paradigms during the data collection processes. When the researcher unpacked quantitative approaches, the following was discovered:

- a social research problem is addressed using an objective meaning with a single reality;
- logical and systematic methods to test the hypothesis and measure variables that emerge from the data collection process to express the magnitude of the facts in a study; and
- data is empirically analysed using research designs such as descriptive, correlational, experimental and qausi- experimental when using this approach.

Thereafter, the researcher navigated the qualitative approaches. The following was discovered:

- a social research problem is addressed using subjective meaning and has multiple realities;
- the research process directly involves the researcher who addresses the phenomenon to capture the experiences of the participants during data collection procedures; and
- data is rich and needs to be transcribed by the researcher in the form of words, then into themes and categories. Therefore, this process is deemed subjective.

The literature was examined further, and the researcher presents the philosophical underpinnings and characteristics of quantitative and qualitative approaches in Figure 4.3.

Table 4.1: Quantitative vs Qualitative Approaches (Creswell, 2020)

Attributes	***Quantitative research***	***Qualitative research***
Philosophy and ontology	Positivism and empiricism – objective single reality	Interpretivism – subjective multiple realities
Epistemology	Empirical and statistical methods excluded from the data collection process	Fieldwork and included in the data collection process
Methodology	Test and measure a single hypothesis using a logical and systematic process to provide a nomothetic reality	Discover, probe, and understand the hypothesis that may change during the research process to provide an ideographic perspective
Research methods and data collection instruments	Descriptive and inferential methods Survey, questionnaires, and polls	Transcribed and thematic methods Interviews, focus groups and document analysis
Analysis of findings	Deductive reasoning using empirical data to logically make inferential conclusions	Inductive reasoning using specific observations such as interviews to make broad generalisations
Objective of research	Test a phenomenon through a hypothesis or research problem using analytical data	Explore a phenomenon through participants lived experiences and shared meanings

At this stage in delving into research approaches from a quantitative and qualitative position, the researcher used Table 4.1 to construct and discuss the differences in methodologies and data collection methods. Table 4.1 elicits a stimulating discussion related to the methodologies in the quantitative and qualitative approaches. Quantitative approaches are generally nomothetic in nature (Mathotaarachchi and Thilakarathna 2021: 947). This means that quantitative research is concerned with applying a common law to solve the research problem through predictive data analysis (Rahman 2017: 102-112). On the other hand, qualitative approaches are described as being idiographic (Cassell, Cunliffe and Grandy 2018). Qualitative approaches zoom into the individual traits of a person through lived experiences and shared meaning. It does not emphasise the common law derived through empirical methods that may impact a group of people. Teddlie and Tashakkori (2009: 42) state that in terms of ideography, it '*consists of the representation of an individual event including a temporally limited reality as completely as possible with the objective of recording and comprehending it in factuality*'. This is directed and determined through

the researcher attempting to understand an individual's perceptions about a research problem. Table 4.1 places nomothetic and idiography as opposing views as these are identified as extremes of the paradigm continuum. However, according to Gelo, Braakmann and Benetka (2008: 271), nomothetic and ideography can also be used in a close interplay when needed during the research process.

Research methods used in the quantitative and qualitative approaches also differ as illustrated in Table 4.1. Although both quantitative and qualitative approaches sample the population, there are variations. Quantitative approaches may sample a population using individuals that are a representation and reflection of a specific community. An example of this would be academic librarians who teach library instruction at UoTs in South Africa. This is done through empirical means to derive results that are nomothetic and general in relation to the sampled population. Moreover, according to Gelo, Braakmann and Benetka (2008: 275), qualitative approaches may use purposive sampling to understand a research problem. Purposive sampling is subjective in nature as researchers are dependent on their own perceptions when transcribing and understanding the data collected (Campbell *et al.* 2020: 652-661).

Another key difference as explicated in Table 4.1 lies in how the data is collected and positioned to represent the methodology in the quantitative approach. The methodology is centered on collecting data using instruments such as surveys and questionnaires to test a hypothesis. In the qualitative approach. the researcher intends to probe the hypothesis through instruments such as interviews and focus groups to formulate an in-depth understanding of the lived experiences of participants in relation to the research problem. Moreover, as shown in Table 4.1, the quantitative approach uses deductive reasoning that emanates from the data collected. Thereafter, descriptive, and inferential statistical analyses are used to illustrate the findings, results, and interpretations of a study. However, in qualitative approaches, the data collected is first transcribed through interpretations. It is then channeled through a process of thematic analysis and inductively inferred to make broad generalisations in terms of a research inquiry.

Mixed methods research (MMR) is a type of methodology that combines the quantitative and qualitative approaches (Giara 2020: 14). It has been recognised as an important research method in social sciences and is well founded in the LIS literature (Hayman and Smith 2020: 106-125). Mixed method research affords individual the opportunity to strengthen their methodology using

a variety of data collection methods, findings, interpretations, and analyses. Furthermore, Gorard (2004: 7) elaborates that mixed method research *'requires a greater level of skill, can lead to less waste of potentially useful information and creates researchers with ability to make criticisms of all types of research*'. The next section discusses the MMR approach.

4.3.2 Mixed methods research approach and design

Creswell and Plano Clark (2018) define MMR as a methodology and a method. Mixed method research is described as a methodology because it has the ingenuity to combine two differing approaches in the form of quantitative and qualitative techniques during the research process. It also frames the method used to collect and analyse data when designing data procedures. This enables the results from both quantitative and qualitative methods to be fused in the research. Therefore, the strength of MMR is recognisable in its scientific sequence to mix quantitative and qualitative approaches in a single or series of studies to provide a cohesive understanding of a research problem. Furthermore, Tashakkori and Teddlie (2021) expound on this by adding that MMR has the elasticity to integrate findings and combine inferences from quantitative and qualitative approaches and methods. This is dynamic as MMR can determine and then establish an in-depth understanding in a single or series of studies using varying paradigms and methodological approaches. Johnson, Onwuegbuzie and Turner (2007: 13) affirm that MMR is an approach in research that '*combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration'*.

Mixed method research is used as a methodology and a method in social sciences when a single approach cannot provide accurate conclusions for exploring the research problem because the research problem may have complexities, such as in the case of digital pedagogies and academic librarians at UoTs in South Africa. Although this study is a single approach, it requires exploring the pedagogies and digital skills of academic librarians related to online teaching. The term 'digital pedagogies' is a combination of digital skills and pedagogical knowledge in relation to this study. It is complex and multi-faceted. Therefore, as explained through this study, MMR allows the researcher to examine a phenomenon more comprehensively than a single methodological approach (Hall 2013: 71-78). It permeates through the complexities and multifaceted nature of a phenomenon, resulting in diverse research findings. Furthermore, MMR uses different research

methods that enable flexibility in the research design (Greene 2007). The combination of research methods such as an online survey and semi-structured interview creates insightful possibilities which a single approach cannot produce when exploring a phenomenon. Fidel (2008: 265) agrees that weaknesses, biases, and limitations in a study can be counterbalanced when using MMR to probe a particular phenomenon in social science through the research design.

Leech and Onwuegbuzie (2009: 265) assert that there is a plethora of mixed method designs developed for the MMR approach. This provides researchers with the opportunity to intensely examine and select the most optimal design when using MMR for a study. However, having so many MMR design options can also become complicated and pose challenges for the researcher. The researcher must be decisive in selecting the most germane MMR design to unpack the research problem during the data procedures. The design must be in sync with data collection processes, analysis, results, and interpretation. Ultimately, the design must be positioned against the backdrop of the MMR approach (Ghiara 2020: 11-25).

Teddlie and Tashakorri (2006: 12-28) afford researchers the opportunity to delve into the design of MMR using the Methods-Strands-Matrix developed for the social sciences. The purpose of the Methods-Strands-Matrix is to ensure that researchers reflect before selecting the design that is most suitable for a study. 'Methods' in the phrase Methods-Strands-Matrix refers to the number of research strands used in a study. This refers to the *methods* strand either being single or multiple, whilst *strand matrix* represents several methods employed when collecting and analysing the data. The Methods-Strands-Matrix presents four families of MMR design, namely sequential, concurrent, conversion and fully integrated. Furthermore, the matrix presents a flexible design where several dimensions and categories can be shaped and modified.

This adaptability of the Methods-Strands-Matrix is dependent on the critical research questions in the study. The key areas in Methods-Strands-Matrix include:

- the number of methodological approaches executed;
- the number of strands in the design of the research;
- type of implementation process; and
- the overlapping of integration (when integration occurs in more than one stage).

Moreover, Creswell (2009: 59-76) describes three MMR designs that provide insights into advanced strategies. These can be embedded into quantitative, qualitative and the MMR approach. These MMR designs include:

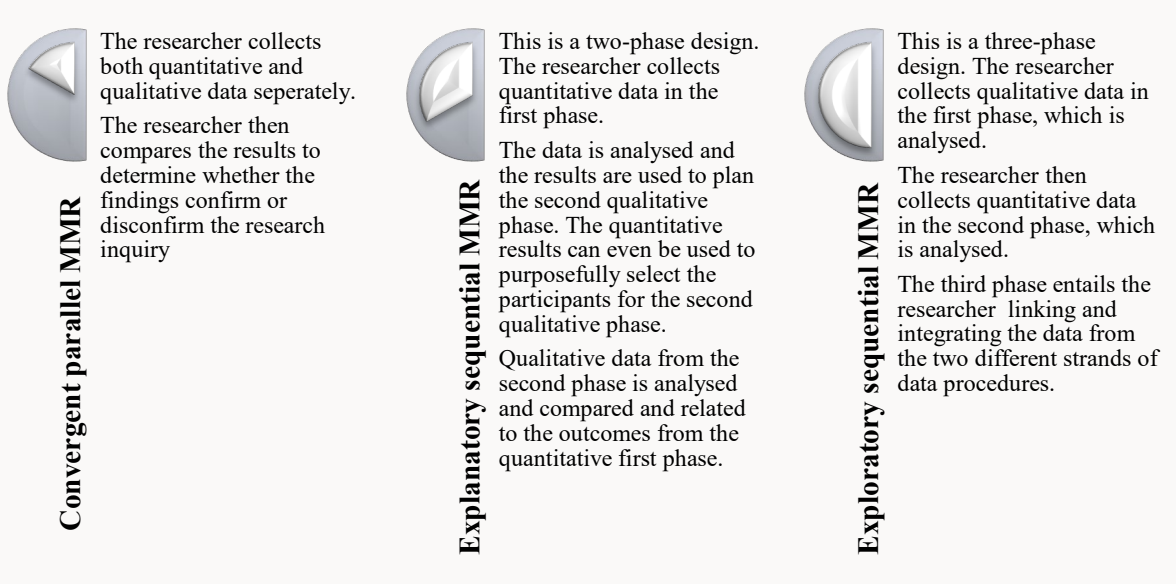


Figure 4.3: Mixed Method Research Designs with advanced insights and strategies (Creswell, 2014)

In addition, according to Creswell (2014: 227-228), there are three advanced MMR methods in the form of designs that include key elements of the convergent, explanatory and exploratory sequential designs. Figure 4.4 provides an illustrative representation of the different advanced MMR design methods.

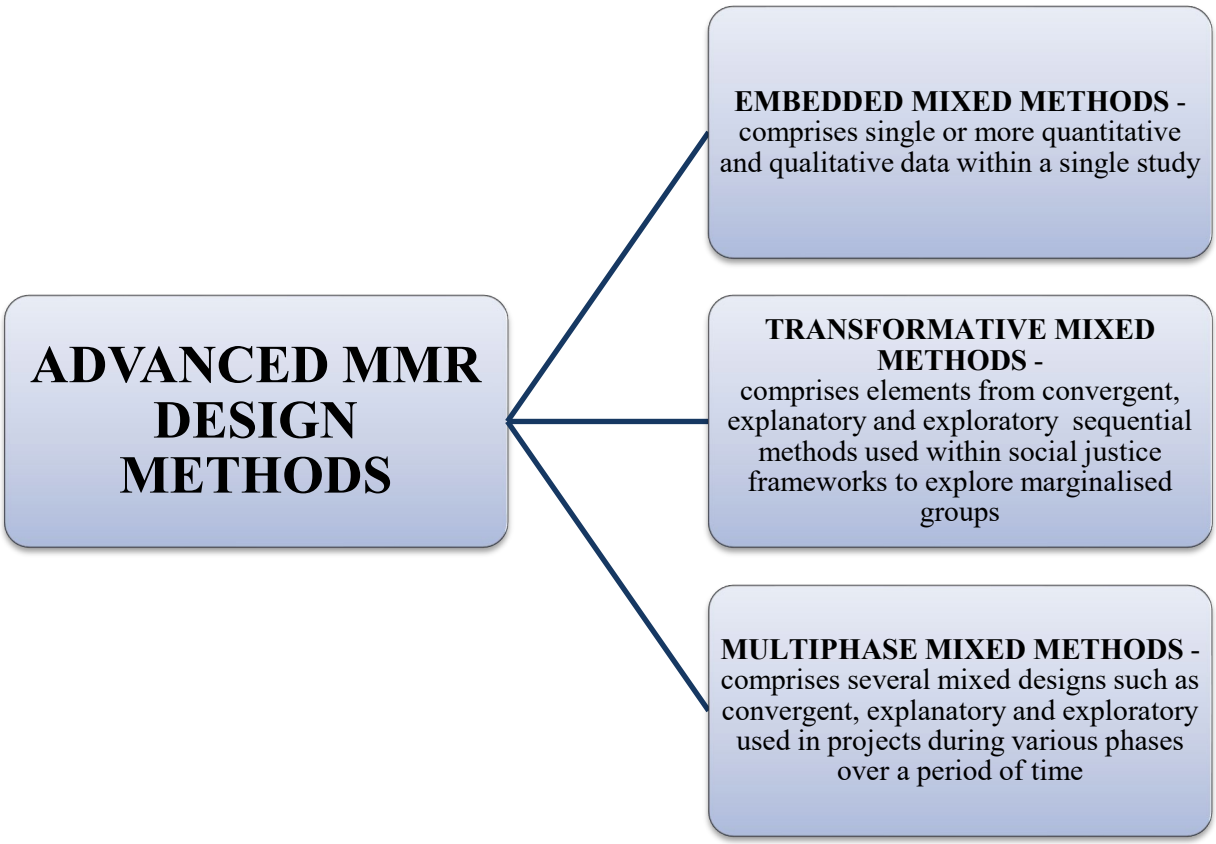


Figure 4.4: Advanced MMR Design Methods with advanced acuities and strategies (Creswell, 2014)

The versatility of MMR is evident in a mixed research design and the advanced strategies as shown in Figure 4.3 and Figure 4.4 respectively. The mixed method design and advanced methods can also support varying methodological approaches such as quantititative and qualitative in a single study, as described in Figure 4.3. Furthermore, Leech and Omwuegbuzie (2009: 267) posit that mixed methods is flexible as it provides allowances for the researcher to faciliate a partial or fully MMR design. A research design that is completely framed used mixed methods provides a holistic picture of the research approach and data collection procedures (Greene and Valerie 1997). The difference with the fully and partial mixed method design is the overlapping of the quantitative and qualitative approaches (Greene, Caracelli and Graham 1989). In terms of using a complete design, the quantitative and qualitative phases are completed mixed within or across one or more stages of the research process. In the, partially mixed method design, the quantitative and

qualitative phases are conducted either concurrently or sequentially. Furthermore, in the partial mixed method design, the quantitative and qualitative stages are not mixed across stages until the data interpretation stage.

Leech and Onwuegbuzie (2009: 265-275) present a three-dimensional typology of the mixed method design that is critical to this study. This typology is centered on the folowing:

- level of mixing (partially versus fully mixed) – refers to whether mixing occurs at more than one stage or across stages, distinguishing the degree of integration in the design;
- time orientation (concurrent versus sequential design) – refers to whether the quantitative and qualitative phases occur at the same time (concurrent) or one after the other (sequence); and
- emphasis of design (equal design status vs dominant design status) – refers to whether the quantitative or qualitative components have the same degree of importance to address the research question (equal), or the one approach has a higher priority (dominant).

In terms of the three-dimensional typology, one can derive eight types of mixed method design as Leech and Onwuegbuzie (2009: 268) suggest:

Table 4.2: Eight types of mixed method design (Leech and Onwuegbuzie 2009)

Type of Mixed Method Design	Level of mixing	Time of orientation	Emphasis of design
Partially mixed concurrent equal	Mixing not at all stages	Same time	Quantitative and qualitative equal weight
Partially mixed concurrent dominant	Mixing not at all stages	Same time	Quantitative phase or qualitative phase may dominate design
Partially mixed sequential equal	Mixing not at all stages	Two phases	Quantitative or qualitative both have equal weight
Partially mixed sequential dominant	Mixing not at all stages	Two phases	Quantitative or qualitative phase may dominate design
Fully mixed concurrent equal	Mixing at more than one/across stages	Same time	Quantitative and qualitative equal weight
Fully mixed concurrent dominant	Mixing at more than one/across stages	Same time	Quantitative phase or qualitative phase may dominate design
Fully mixed sequential equal	Mixing at more than one/across stages	Two phases	Quantitative or qualitative both have equal weight
Fully mixed sequential dominant	Mixing at more than one/across stages	Two phases	Quantitative phase or qualitative phase may dominate design

The researcher explored, scrutinised and reflected on the three-dimensional typology as illustrated in Table 4.2. This guided the researcher as to which factors to consider when selecting the most appropriate mixed method design. Creswell (2014: 218) also agrees that the type of mixed method design and the rationale for selecting it should be justified in a research study. Hence, the next section discusses the selection of the most appropriate and relevant mixed method design for this study.

4.3.2.1 Mixed methods design selected for the study

In terms of selecting a mixed method design after considering the factors as illustrated in Table 4.2, the researcher used seven generic criteria. Traditionally, these generic criteria are synonymous with research experts in the field of methodology when creating typologies for mixed method designs (Creswell, Plano-Clark and Gutmann, 2003; John and Onwuegbuzie, 2004; Morse, 1991). These generic criteria include:

- number of methodological approaches used;
- number of strands or phases;
- type of implementation of process;
- stage of integration of approaches;
- priority of methodological approach;
- function of the research study; and
- theoretical perspective.

Teddlie and Tashakkori (2006: 25) used these generic criteria as an impetus to further develop a seven-step process for selecting the best mixed method design for a research study and typology. This process requires researchers to consider the following:

i. The researcher must at the onset first establish whether the research question requires a mono-method or mixed method design;
ii. The researcher should be aware of and able to access several typologies and mixed method designs when exploring the most suitable for a study;
iii. The researcher feels gratified to select the most relevant mixed method design for the study. The researcher also assumes that any of the published typologies in the literature will be most appropriate for the study;

iv. The researcher must know that there are differences in typologies with distinct criteria. The researcher must be able to identify the differences in the criteria and how these typologies vary in the research design;
v. The researcher should list, identify and select the most important criteria. This will allow the researcher to design the mixed method relevant to the study;
vi. The researcher should then apply the selected criteria to a potential design. This will ensure that the researcher finds the most applicable design for the study; and
vii. In some cases, a new mixed method design may need to be developed if a suitable design does not exist in the literature for the study.

Therefore, the researcher considered the following when selecting the most appropriate mixed method design for this study:

- various mixed method designs as illustrated in Table 4.2;
- generic criteria as described in the mix methodology literature; and
- a seven-step process as explained to select the most appropriate design for his study.

The mixed method design, generic criteria and seven-step process were unequivocally important for the researcher in selecting the most appropriate and relevant mixed method design within the context of this study. The MMR used in this study is '*explanatory sequential mixed method*' research. This study involved a two-phase process in which the researcher collected quantitative data using a 5-point Likert scale through an online web questionnaire for the first phase. Initially, the results from the quantitative data were analyzed and statistically represented. Thereafter, inferential statistics in the form of correlations and multiple regressions were computed on the dimensions using Pearson Product Moment Correlations with the quantitative data. The quantitative results were analysed further using descriptive and inferential statistics, including regression tables. The empirical data gathered through the online web questionnaire, literature and theoretical frameworks guided the researcher in the type of questions to ask academic librarians for the semi-structured online interviews during the second qualitative phase of this research.

Data from various sources such as the literature, online web questionnaire and semi-structured online interviews with academic librarians were integrated in this study during the analysis and interpretation stages. Equal priority was given to both phases of this study as the researcher wanted

to explore, probe, and ascertain the pedagogical and digital skills of academic librarians at UoTs in the first (quantitative) phase. In the second (qualitative) phase, the researcher wanted to directly engage with academic librarians to deeply understand their lived experiences and shared meanings as online teachers. Moreover, the equal importance of both quantitative and qualitative approaches is key in designing a training model to suit the pedagogical and technological needs of academic librarians. At this point, the researcher re-visited why pragmatism was chosen as the philosophical foundation for this study. Pragmatism supports both objectivism and subjectivism. However, it is an action-oriented approach. It uses research procedures that are practical, merges data methods and is unbiased. Thus, this study chose pragmatism as the epistemological lens to frame this study based on the research objectives, questions, and context.

The mixed method design chosen for this study was '*fully mixed sequential equal'*. According to Leech and Onwuegbuzie (2009: 268), this design involves mixing quantitative and qualitative research across one or more stages of the research process. In this study, the quantitative phase occurred first as a sequence using the online web questionnaire, followed by the qualitative phase through semi-structured online interviews. The quantitative and qualitative phases as described in Table 4.2 were mixed, with both phases having equal weight as a mixed method design. Moreover, the data was mixed across the analysis and interpretation stages to determine the digital pedagogies of academic librarians at UoTs in South Africa.

The current study explored the multifaceted nature of digital pedagogies and academic librarians at UoTs in South Africa. The quantitative research approach enabled the researcher to analyse the data; create descriptive statistical illustrations, correlations, multiple regressions; and establish relationships amongst variables, including inferences. However, the empirical methods implemented could not explain and elaborate on the reasons for these relationships in the quantitative approach. Therefore, the evidence from the empirical methods created a window for the researcher to further probe the research problem. Hence, the qualitative approach was used to elucidate the broad relationships evident from the variables in the quantitative phase to ascertain the digital pedagogies of academic librarians at UoTs in South Africa. Therefore, both approaches empirically and phenomenologically have equal methodological weight in the mixed method research design for this study.

4.3.3 Delphi methods

The Delphi method is a systematic and interactive procedure used in research (Drumm, Bradley and Moriarty 2022). It is systematic as it is congruent with quantitative, qualitative, and mixed method approaches (Padilla-Rivera *et al*. 2021); and Interactive because a panel of independent experts within a specific field provide feedback to the researcher. This helps the researcher identify possible solutions to a research problem. The Delphi method also guides researchers to endorse research findings from the quantitative, qualitative, and mixed methods results in a study. Therefore, it provides transparency, validity, and direction in a research study.

The Delphi method can also be useful when creating training models and frameworks (Chowdhury, Katsikas and Gkioulos 2022). The insightful feedback that seasoned experts in a particular field provide when using the Delphi method affords the researcher credible data to develop a training model or framework. Moreover, feedback provided from experts is a cyclic process when using Delphi methods (Riemens *et al*. 2021). This means that the Delphi method is repeated until consensus is achieved to address a research problem.

During this process, a succinct questionnaire can be prepared and sent to selected participants who are recognised as experts in a field. The anonymity of participants is ensured during the process. Moreover, the responses are analysed, and feedback provided to participants. The Delphi methods is repeated if experts cannot agree on addressing the research problem. Figure 4.5 is a visual illustration of how the researcher contextualised the Delphi method for the suitability of this study. It illustrates the systematic steps the researcher would use to engage experts in deciphering how the training model should be developed to support academic librarians at UoTs in South Africa.

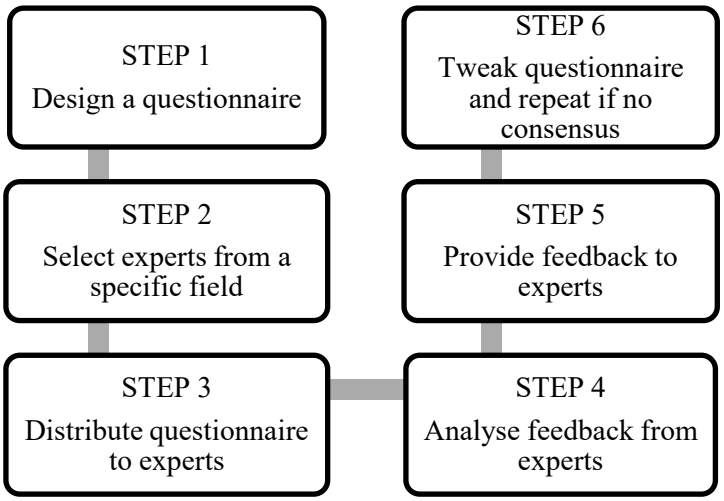


Figure 4.5: DELPHI method in research (Drumm, Bradley and Moriarty 2022)

In terms of this study, the researcher decided that the Delphi method would be useful when developing the training model for academic librarians at UoTs in South Africa. The use of this method creates a window of opportunity to engage with seasoned academic librarians with teaching experience from UoTs in South Africa. Their expertise combined with analysed data from both research instruments allowed the researcher to view a training model for academic librarians at UoTs in South Africa through a microscopic lens. Thus, the Delphi method ensured that there was detailed and critical introspection when developing the training model on digital pedagogies for academic librarians at UoTs in South Africa.

4.4 The research context

The previous sections on paradigms and research approaches outlined the path created to navigate during the research process, as illustrated in Figure 4.1. This section also follows the roadmap in Figure 4.1 to elaborate on the research procedures implemented as a subsidiary to the research strategy. Research procedures are techniques that produce evidence acquired through a scientific process (Mcdouglae *et al*. 2020: 408). Research procedures also generate research evidence through sampling of the population, data collection instruments and statistical techniques (Remler and Ryzin 2022: 4). Furthermore, according to Strait and Singleton (2018: 3), the research procedure must be steered through a scientific and logical path. This should be identifiable in the clear understanding and judgement when gathering and consuming research evidence in a study.

4.4.1 Research setting

The study involved the seven Universities of Technology in South Africa that support teaching, learning and research. These UoTs share many commonalities such as: emanating from previous disadvantaged communities, similar student populations, types of location, curricula, libraries, physical and digital infrastructure. While the reality is that these may have differing expertise in either teaching, learning and research, the social, economic, and political make-up are very similar. Therefore, the rationale for selecting the academic librarians from UoTs only is because their patterns of transformation and development in South Africa are comparable. These UoTs include the following institutions:

- Central University of Technology;
- Cape Peninsula University of Technology;
- Durban University of Technology;
- Mangosuthu University of Technology;;
- Tshwane University of Technology
- Vaal University of Technology; and
- Walter Sisulu University of Technology.

4.4.2 Population

Punch (2014:244) defines a population as '*the total target group, who would, in the ideal world, be the subject of the research, and about whom the researcher is trying to say something*'. The term population also refers to individuals that are categorised into different groups, organisations, events, and human products (Welman, Kruger and Mitchell 2005: 52). The distinguishable characteristic in any population, irrespective of the groupings, is the conditions that people are exposed to. Furthermore, according to Schofield (2006: 52), the population includes all units of analysis that the researcher intends surveying, including every element for a research study. This allows the researcher to draw specific conclusions about a study.

In certain instances, when the population size is small, the researcher can choose to survey the entire population, including all the elements. The term used to survey an entire population and all its elements is 'census' (Logan 2018: 543). According to Babbie (2021), a census can be defined as a count of all the elements in a population. Furthermore, Schofield (2006: 52) posits that a

census can determine the characteristics of a population based on the information gathered from the elements. Censuses are usually planned and implemented in a survey format.

Surveys are conducted to obtain information about a selected population. According to Fricker (2008: 195-216), a census is used as a survey when the researcher anticipates collecting data from every element of the entire population. In this study, the researcher targeted the entire population of academic librarians with a teaching identity, such as faculty librarians, information specialists, subject librarians, research librarians and postgraduate librarians at UoTs in South Africa. The first phase of the explanatory sequential mixed method approach included these types of academic librarians using a census through a web-based survey from the seven UoTs identified that support teaching, learning and research.

The researcher contacted the UoTs in South Africa via email and telephonically to confirm the number of academic librarians involved in teaching and research. The total number of academic librarians involved in teaching and research at UoTs in South Africa at the time of contact was seventy-seven. The link to the online web survey was only distributed via email to the academic librarians once the ethical clearance letter, gatekeepers' permission and necessary documentation were completed by the researcher and authorised by each host institution. The survey was administered from the 07th of October 2021 until the 31st of May 2022. The researcher had no influence on the participants since the link to the survey sent via e-mail directed participants to the web-based survey. Thus, responses remained in anonymity throughout the administration of the survey.

However, the researcher was privy to the number of participants that were responding to the web-based survey. Regular reminders were sent out to participants to complete the survey. Initially, this was communicated monthly; thereafter, fortnightly, and finally, weekly in certain instances, gently requesting participants to complete the survey. The researcher was optimistic that all academic librarians involved in online teaching would rise to the occasion to complete the survey. Despite numerous attempts to convince the academic librarians at UoTs in South Africa, six participants did not complete the survey. Hence, the final total participants for the first phase of the study included 72 academic librarians from the seven UoTs in South Africa involved in online teaching.

After the survey was analysed, the researcher drafted and sent emails to participants requesting those that contributed to the survey to inform the researcher should they be interested in being interviewed for the second phase. A total of eleven participants responded and indicated that they participated in the survey. They further indicated that they were prepared to be interviewed for the second phase of this study. These eleven participants belonging to various UoTs in South Africa were keen to contribute to the study by sharing their lived experiences and meanings in online teaching. Thus, semi-structured interviews were conducted with 11 academic librarians from UoTs in South Africa. The researcher used the analysed data from the first phase of the explanatory sequential approach in the form of the survey instrument (online questionnaire) and the literature reviewed to design the instrument (semi-structured interview questions) for the second phase of this study.

4.4.3 Sampling

One of the key areas in research procedures is sampling. It provides insight into the quality of the inferences made by the researcher after analysing the findings. Sampling strategies can be complex when combining the quantitative and qualitative approaches. However, according to Taguchi (2018: 27-30), although sampling strategies can be difficult, mixed methods designs such as concurrent and sequential help researchers achieve a thorough understanding of the phenomenon in a study. Therefore, the sampling and mixed method design must be cohesive in the research procedure. Furthermore, the selection of the sampling method represents the mixed method design during the research process. Headley and Plano Clark (2020: 146-147) agree that the sampling design exemplifies the type of mixed method approach and the intended path the researcher chooses in the study. Hence, the sampling size, schema and characteristics must be made explicit by the researcher (Vasileiou *et al*. 2018: 2-4).

Sampling strategies used in quantitative research deliberately select specific units of the population to analyse. The analysis leads to the researcher inferring that the results can be generalized as the representation of the entire population in quantitative research. This is termed external validity in research. According to Findley, Kikuta and Denly (2021: 368-369), external validity is when inferences are drawn from a study through a process of capturing and analysing the data. The results are interpreted and inferred to a broader population in that field. External validity is achieved through probability sampling. Mishra and Alok (2022) explains that probability sampling

is when every member of a population has the same chance to be selected in the sample. Furthermore, Mishra and Alok (2022) explain that there are various probability sampling strategies such as simple random, stratified random, cluster and systematic sampling.

Qualitative research, on the other hand, uses non-probability sampling methods to understand a phenomenon in a study. In non-probability sampling, the researcher cannot guarantee that every single element is represented in the sample population. Non-probability sampling is also subjected to the researcher's judgement instead of using any type of random sampling technique (Elfil and Negida 2017: 1-3). Common forms of non-probability sampling methods include purposive, quota, convenience, and snowball sampling (Berndt 2020: 224-226). Additionally, when selecting a non-probability sampling method, the researcher needs to consider many factors such as research questions, methodology, size of the population and knowledge about the population of interest (Shorten and Moorley 2014: 32-33).

Purposive sampling is a form of non-probability sampling method wherein the researcher intentionally selects participants who have a lived experience related to the phenomenon being explored in a study (Creswell and Plano Clark 2007: 415). The decision to select participants with lived experiences enables the researcher to probe information-rich cases related to the phenomenon. This opens a window for the researcher to engage selected participants about the phenomenon and review their shared meanings through their rich experiences. The other forms of non-probability sampling methods include convenience sampling, which is a sub-population drawn for a study that is easily accessible to the researcher; homogeneous sampling, which is selecting a small sub-population for in-depth examination; and snowball sampling, which is a recruitment technique in which participants in a study assist the researcher by identifying other potential subjects during the sampling process (Berndt 2020: 224-226). In this study, a purposive sample was selected for the second phase after analysing the data and designing the interview schedule. The researcher purposively selected academic librarians with a teaching identity at UoTs because they were best prepared to share their lived experiences on the phenomenon.

Singh and Masuku (2014: 10-11) state that when the size of the population is smaller than two hundred, then the entire group should be sampled to achieve a desirable level of precision in the outcomes for the study. Leedy and Ormrod (2010: 213) agree that when the population is small, the entire population should be surveyed. The population for the first phase of this study was 72

academic librarians who participated in the online survey. Since the population was not large, a census was conducted with 72 academic librarians who participated in this study. Initially, there were 77 participants in total as enumerated after contacting the UoTs telephonically and through email prior to the data collection. However, six participants did not contribute to the online web survey. The researcher assumes that the enumerated total could have been a smaller deficit than the original total of 77 provided by the UoTs. Therefore, the final number of participants accounted for 72 academic librarians in the first phase using an online web survey through a census. Thus, no sampling was required for the first phase of this study since a census was used to collect the data. Furthermore, the benefit of using a census is that it alleviates sampling error (Hu 2021: 245).

The institutions and selected participants were drawn for the semi-structured interviews from the online survey in the first phase of this study. The semi-structured online interviews included academic librarians from UoTs who indicated having above-average pedagogical knowledge and digital skills in online teaching. This was ascertained after the results of the data from the online survey went through a process of statistical analysis, leading to inferences, regressions, cross-tabulations and correlations. Although the participants remained anonymous as per the ethical objectivity of this study, the analysis from the online survey indicated the institutions with which participants with above-average pedagogical knowledge were affiliated. Thereafter, the researcher using the same mailing list provided by the UoTs during the first phase and contacted participants from UoTs as per the results, analysis, and findings from the first phase of this study. Hence, the results and the analysis from the online survey directed the researcher as to which UoTs to target for the second phase of this study when conducting the semi-structured interviews.

4.4.4 Research methods used for data collection

The previous section was a build up from the research context to the setting. This section, as illustrated in Figure 4.1 on the roadmap, is where the chosen research methods shaped the data collection procedures used in the quantitative and qualitative approaches. Morgan (2018: 270) agrees that the quantitative and qualitative strands in MMR can be distinguished through research methods. The distinction of these strands becomes transparent as the data is generated and analysed in a study.

In Figure 4.6, the researcher constructed how these data collection instruments are associated with either the quantitative or qualitative approach in MMR design, from the literature reviewed.

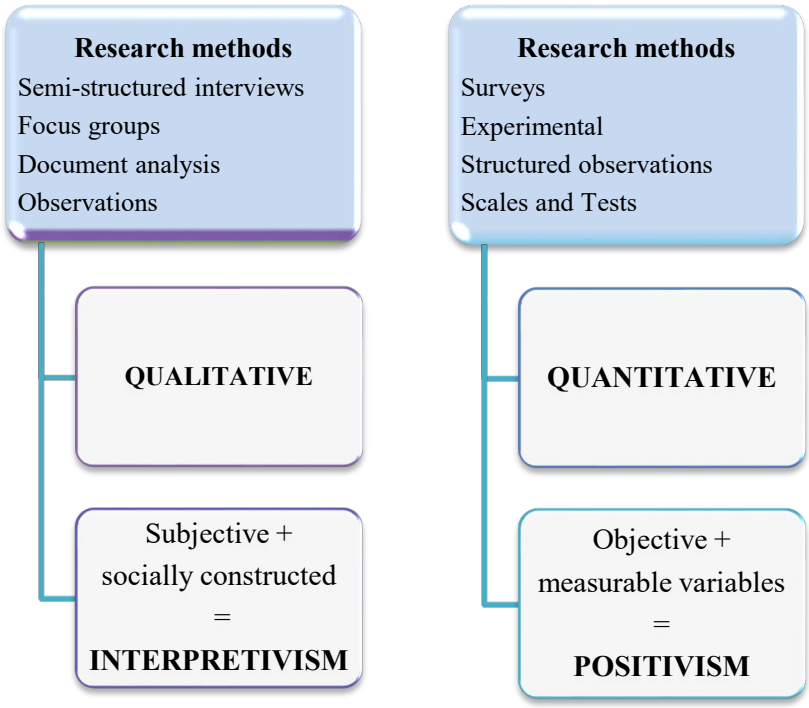


Figure 4.6: Research methods and quantitative and qualitative associations

Research methods are associated with quantitative or qualitative approaches (Creswell and Plano Clark 2018). The objectivity found in quantitative research methods signifies the importance of using empirical methods in the data collection procedure. In contrast, the subjectivity that exists in qualitative methods reconciles using social constructs in real-life settings for data collection processes. Sandelowski (2014: 3-8) affirms this logic and further states that subjectivity and objectivity express themselves in the research process during the data collection process. This is manifested in Figure 4.6 with the associations and the type of instruments used in the data collection procedures for this study.

This study used two instruments in the data collection process. Data was collected using an online web survey and semi-structured interviews. The research methods chosen are on opposing sides of the paradigm war, as shown in Figure 4.6. However, the mixed method design selected in this study allowed the quantitative and qualitative strands to work together in cohesion, as shown in Figure 4.3, while exploring the phenomenon. This created the opportunity for the researcher to

delve into the research problem using two different research approaches in unison. Therefore, this section discusses the research methods used in the data collection process.

4.4.4.1 Online web survey

A survey questionnaire is an instrument used to gather data from a population objectively and empirically (Nirmalan 2021: 139:141). This data is statistically analysed using inferences, correlations, tabulations, and regressions with no influence of the researcher during the data collection procedures. Furthermore, survey questionnaires are one of the instruments that manifest within the positivistic paradigm because it meets the ontological, epistemological, and methodological requirements as illustrated in Figure 4.2 of this study. Neuman and Robson (2014) agrees that the survey questionnaire is linked to positivism since it meets the conditions as an instrument.

Teddlie and Tashakorri (2021) define survey research as a design in which information is gathered via questionnaires using methods such as paper, telephone, and web-based surveys. Web-based surveys are synonymous with using the internet. The purpose of using a web-based survey is the same as using traditional survey methods. The purpose is to predict the attitude and behaviour of a particular population when exploring a phenomenon within a specific field. This provides the researcher with the data to make generalisations without influencing the participants, and therefore ensures external validity (Rajkoomar 2015: 85-86).

Nayak and Narayan (2019: 32) posits that the use of web-based surveys is new and evolving. During the Covid-19 pandemic, the use of web-based surveys became more of a reality since postgraduate students and researchers had to explore this option for gathering data. The pandemic accelerated researchers towards embracing a so-called *new reality* (Singh and Sagar 2021: 1-3). Researchers began deeply interrogating the use of online web survey as a primary option in collecting data. The main reason amongst researchers for adopting this form of data collection method over traditional techniques such as face-to face was due to travel restrictions, including distancing guidelines. Thus, online surveys have become an important data collection method compared to traditional procedures.

Online surveys in the form of questionnaires provide the researcher with the following benefits:

- eliminates the researcher needing to physically visit participants of a particular population for them to complete the questionnaire;
- reduces cost factors such as travelling and increases opportunities to reach a wider audience faster using the online questionnaire;
- traditional surveys such as paper-based surveys have cost factors such as design and printing, whereas online surveys provide a range of templates to design questionnaires depending on the purpose e.g., education, marketing, research etc.;
- researchers can send participants a URL link to the questionnaire via various platforms such as email, social media platforms and instant messaging;
- researchers can design the online questionnaire, ensuring that responses remain anonymous. This ensures that participants can feel safe when answering the questionnaires, with no connection to them in anyway;
- participants can complete the questionnaire in their own time and space;
- participants have an increased sense of privacy in sharing their personal views on the phenomenon. This increases the objectivity and reliability of the responses from participants; and
- researchers can analyse participants' responses in real-time, unlike a paper-based method wherein all questionnaires need to be collected before the data analysis can take place.

However, with benefits in using online surveys, challenges are also common in any data collection procedure. Online web surveys also have challenges, namely:

- most online web surveys require secure and strong internet access for participants to complete the survey. This can compromise participants' responses to an online questionnaire;
- researchers need to consider whether the sample population of the study have access to mobile devices, data and portable devices to use, including accessing the online questionnaire;
- researchers need to be efficient with the components of the online web survey platform chosen to study the phenomenon. This will ensure that the researcher has the skills to design, collect and analyse the data effectively; and

- researchers should consider the technological abilities of the sample population as participants may be digital immigrants and may face challenges when answering online questionnaires.

The online web survey in the form of a questionnaire was the preferred method to collect data for the first phase of this study. The main reason that the researcher used this form of data collection is because the target population had access to the internet and portable devices such as laptops. The use of portable devices and stable internet connections is part of the work requirements for academic librarians at UoTs in South Africa. QuestionPro, an online survey software tool that is accessible to staff and postgraduate students at the Durban University of Technology, was used to design and collect the data for this study. The QuestionPro interface is user-friendly and has radio buttons to make the selection of answers visually easy for participants when answering a questionnaire. The radio buttons have a series of active options available on screen in the form of open circles next to each question which may be selected by the participant. QuestionPro also offers various types of survey question options such as multiple choice, graphical rating, ordering and static content. These multiple options are seamlessly accessible to design the questionnaire for the researcher from design template options when using the software. Online delivery of the questionnaire using QuestionPro eliminated travel, telephonic interview, questionnaire design and printing costs and time for the study. The researcher sent friendly reminders to participants via email at regular intervals to improve the response rate. The responses were stored in QuestionPro once completed.

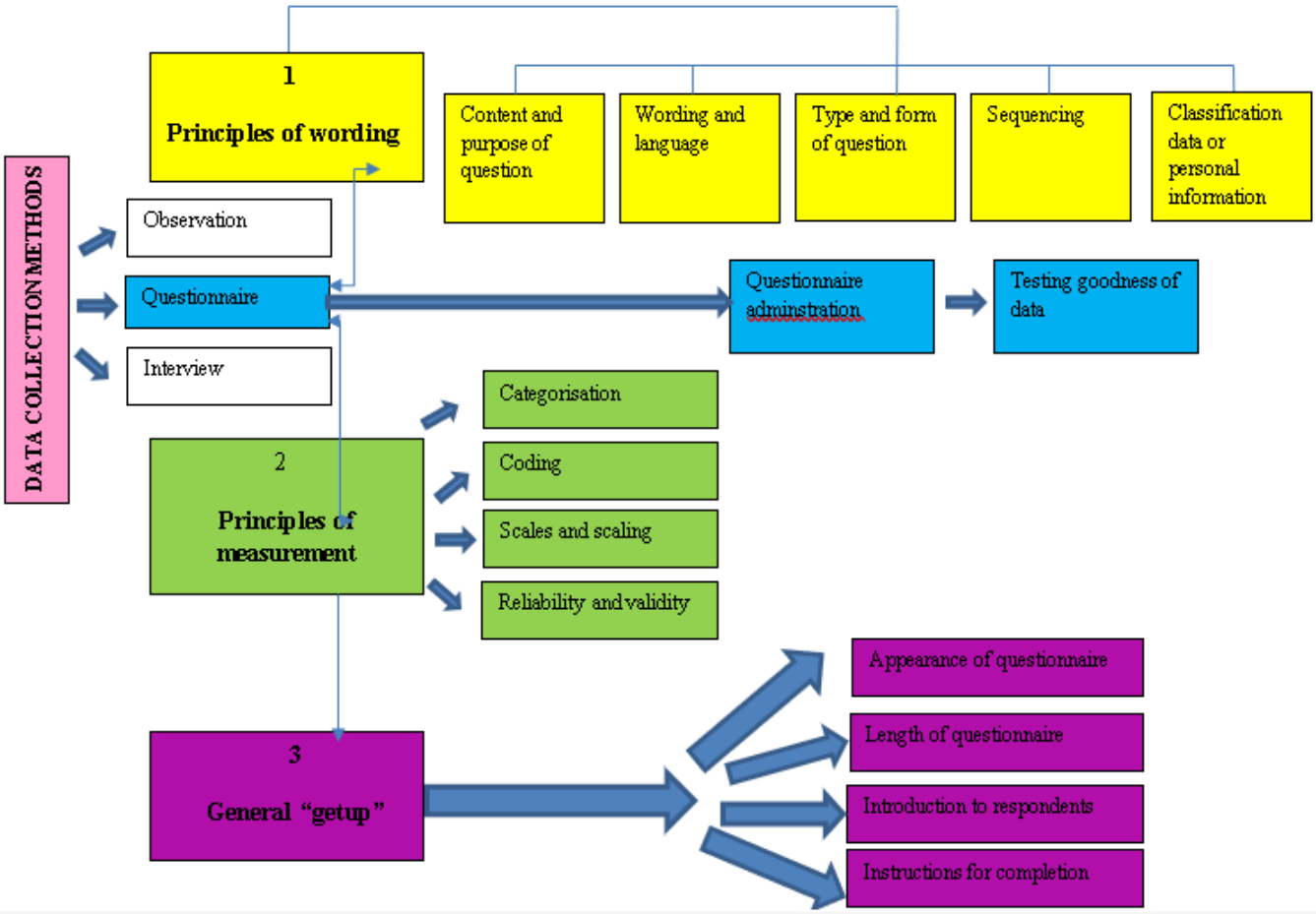
Dillman *et al.* (2014: 301-320) provide guidelines on how to design web-based surveys such as questionnaires. The critical areas discussed in the guidelines include technical features, user-friendliness, and support for trouble-shooting errors. The guidelines to develop online web questionnaires are described in Table 4.3:

Table 4.3: Guidelines to develop online web-based questionnaires (Dillman et al. 2014)

Technical features	User-friendly	Troubleshooting and support
Consider the configurations and capabilities of participants portable devices in accessing the questionnaire	Start the online web questionnaire with an interesting welcome screen	The researcher must provide a help button with further explanations as a feature for participants experiencing any issue when answering the questionnaire.
Maintain consistency in the layout of the questionnaire across different browsers for participants	Provide clear instructions on how to complete the questionnaire and keep specific instruction for certain questions where the action is needed	The contact details of the researcher must be provided for participants experiencing any issues when answering the questionnaire.
Ensure that the online software selected to gather data can be accessed and completed using a range of devices	Refer participants to the check box for informed consent before starting the questionnaire	Wherever possible provide a floating window for each question to provide clarity or further instruction whenever necessary
The researcher must ensure that participants only access the questionnaire via the internet protocol address once	Ensure that participants can scroll easily between questions	Wherever possible provide a dedicated support webpage to answer queries pertaining to the questionnaire from participants
The software must be able to identify participants who have incomplete questionnaires to continue from wherever they may have stopped. This feature is activated and monitored via the internet protocol address wherein participants can save their survey and continue at a later stage	Avoid setting up the questionnaire such that participants are forced to response to each question before moving onto the next	The software must be able to prompt participants to complete missed, skipped questions or to correct errors e.g., two ticks for a single item in a rating scale

Sekaran and Bougie (2016: 145) also present guidelines to design a questionnaire. The guidelines focus on three main areas when designing a questionnaire, namely principles of wording, principles of measurement and "general getup". Figure 4.6 schematically categorises each principle and the aspects that are relevant to data collection methods.

Table 4.4: Questionnaire design guidelines (Sekaran and Bougie 2016:145)



In Table 4.4, the principles caution the researcher to be cognisant of the research aim; suitability of the language for the target population; type of questions (whether open- or closed-ended, or a mix of both), including the appropriateness to the objectives in the study, when designing the questionnaire. The sequence of questions must be structured such that questions move from simple to focused, and the organisation of data within categories such as personal information must remain private and protected. Neuman (2011: 316) agrees that when applying questionnaire guidelines, the researcher must avoid double – barrelled, ambiguous, leading and loading questions. It is

preferable to design a questionnaire using simple and short questions linked to the research problem of the study. Sekaran and Bougie (2010: 203) expound that when a researcher designs the questionnaire, the order in which the questions are structured must be from general to specific, and from easy to answer questions to the more difficult or challenging. Furthermore, in Table 4.4, Sekaran and Bougie (2016: 145-154) emphasise that a clear and transparent introduction including a visually simple alignment of questions will encourage participants to answer the questionnaire. Therefore, the appearance and length are also important when designing the questionnaire for a study.

4.4.4.2 Structure and selection of the online web questionnaire

The design of the online questionnaire for this study went through several drafts. The supervisors and statistician guided the researcher. These individuals ensured that the questions were aligned to the research objectives, critical questions, and theoretical frameworks of this study. The aim was to seamlessly address the research problem. Therefore, the questionnaire was verified multiple times, removing doubled barrelled and ambiguous questions. The researcher was also cautious and avoided leading and loading questions. Furthermore, the questionnaire included an introduction that clearly outlined and explained the topic. It also described the purpose of this study.

The sequence of the questions was from general to specific. The online questionnaire consisted of closed-ended questions. The online survey questionnaire was also controlled as participants could not access the QuestionPro survey software tool without the internet protocol address being monitored and tracked. This allowed returning participants to complete the questionnaire in anonymity wherever they may have stopped. It also eliminated any form of duplication and avoided a participant answering the questionnaire more than once. The link to the survey questionnaire was delivered using the email addresses of the participants from all the UoTs. This information was made available from the management of the UoTs' libraries once gatekeepers' permission was approved. An email was prepared, introducing the researcher, topic, active link to the survey and necessary documentation such as the gatekeepers' permission letter.

The theoretical framework shaped the questions posed to the academic librarians. This included questions that covered technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge and pedagogical content

knowledge. The online questionnaire also explored academic librarians at UoTs in South Africa in terms of teaching, social and cognitive presence in a digital environment. An online questionnaire in the form of a 5-point Likert scale was created and used to collect the data from academic librarians at UoTs in South Africa. The aim of using a Likert scale as the quantitative first phase in the mixed method design of this study was to ascertain the digital pedagogies of academic librarians at UoTs in South Africa for online teaching. Maree (2016: 186) affirm the researcher's sentiments that a Likert scale is widely used in research to determine how participants feel about a specific issue within a particular field. Story and Tait (2019: 193) also posit that some surveys are simply used to measure knowledge, whereas others determine constructs, practices and behaviours using Likert scales. Therefore, the Likert scale is a good tool to measure constructs and explore the strength of feeling of participants in a study.

Likert scales use a series of questions and provide participants with nominal, ordinal or numerical response options (Story and Tait 2019: 196). An example of a nominal scale option can be (male/female,), while an ordinal scale can be a participant being either 'very happy' or 'very sad'. The examples of a numerical response option can include age, height, and weight. Likert scales usually have a series of three, five, six and seven responses. The literature points to the five-point Likert scale as being the most popular option in research (Van der Lee *et al.* 2019: 357). The type of questions and scales used depends on the objectives of the study. In this study, the researcher aimed to explore the pedagogical and digital skills of academic librarians at UoTs in South Africa for teaching in an online environment. Therefore, the researcher used an explanatory sequential MMR design. The quantitative first phase was facilitated using the online questionnaire. The researcher decided to select the five-point Likert scale using an online closed-ended questionnaire to explore the digital pedagogies of academic librarians for online teaching as it provided the following advantages:

- UoTs are geographically located in different parts of South Africa. The online questionnaire saved time and travel costs for the researcher. Although telephone interviews are an option, this posed a challenge since staff at UoTs were working remotely because of the Covid-19 pandemic.

- Online questionnaires are easily accessible to the academic librarians at UoTs since they have access to the internet and portable devices. This meant that academics could access the online questionnaire from any location, even if they worked remotely.
- Results from participants could be objectively measure and analysed,
- The researcher could compare, tabulate, and correlate the data using various statistical models.
- The online questionnaire using the five-point Likert Scale and multiple-choice questions helps participants in responding to the questions efficiently.

Closed-ended question in an online survey format using a five-point Likert scale have limitations, as with many other collection methods. This includes:

- Participants can only be encouraged to participate through gentle e-mail reminders;
- Questions are designed in a format that does not present opportunities to probe further and gather additional information through the data collection procedure;
- Researchers cannot ascertain the mind-set of participants when responding to the online questionnaire; and
- Participants cannot be guided at any point if they are unsure about a question.

However, one the greatest hurdles of using closed-ended questions as per the literature is participants being unable to discuss their feeling, attitudes, and behaviours about a phenomenon. The researcher considered this but decided to continue with the online questionnaire since the second phase of the explanatory sequential MMR design probed the participants' understanding of the phenomenon. Additionally, the interview schedule for the qualitative second phase was drawn from the results and analyses of the quantitative stage. Thus, the five-point Likert scale using an online questionnaire was relevant and appropriate for the purposes of this study.

4.4.4.3 Interviews

One of the most common data collection methods in qualitative research is interviews. Babbie (2008: 291) states that interviews are a process in which the researcher directs questions at participants to which there is a response. Interviews are an important method used to gather data

from participants. Interviews present participants' personal experiences and attitudes in terms of a phenomenon. Punch (2014: 144) agrees that interviews are an excellent tool to use to unearth a community's perceptions, ideas and thoughts related to a problem. According to Peräkylä and Ruusuvuori (2008: 529), interviews allow the researcher access to participants' interpretation of a phenomenon through their responses to questions, which otherwise would remain confidential. It also provides insight into a research problem as conceptualised through the intrinsic inner eye of participants. Naturally, interviews align with the interpretivist paradigm as illustrated in Figure 4.2 of this chapter.

Traditionally, interviews were conducted either through face-to-face interactions or telephonic conversations with participants (McCoyd and Kerson 2006: 389-406). According to Lofland (1995: 60-67), in-person interviews are the '*gold standard'* because it allows the researcher to probe the verbal and non-verbal behaviour of participants. However, in-person interviews may not be possible all the times because of distance (geographical location) and recently, because of the Covid-19 pandemic, including social distancing regulations (Thunberg and Arnell 2021:2). Telephonic interviews seem to be the alternate form of the researcher engaging with participants as it eliminates geographical limitations. Novick (2008: 391-398) agrees with telephonic interviews being the alternate and mentions that it cannot be the replacement for in-person interviews as the researcher still cannot determine the non-verbal behaviour of the participants, such as body language.

During the latter part of the 1990s, the internet gained popularity. Researchers involved in qualitative studies explored the option of using email and chat forums to interview participants. This also presented the same challenges as telephonic conversations wherein non-verbal behaviour, of participants could not be considered as part of the data collection method. However, Novick (2008: 391-398) argues that the researcher cannot place non-verbal behaviour as a weakness in the data collection methods for telephonic or online interviews. It may just be a reason for greater discussions between the researcher and participants, leading to richer data on the phenomenon. The reason cited is that participants may feel more comfortable in their own spaces. Therefore, participants may engage with confidence and freedom of expression whilst engaging with the researcher, rather than in a face-to-face environment.

Interviews are distinguished by the levels of structure in qualitative research. These levels include structured, semi-structured and unstructured interview designs. The aim and purpose of these levels are the same, that is to ascertain the participants' lived experience and shared meaning when exploring a phenomenon. However, each of these structures have unique characteristics in qualitative research. The researcher felt that it was important to briefly examine the three levels of structure for the qualitative approach in this study. This guided the researcher in making an informed selection of which structure would be relevant in further probing digital pedagogies and academic librarians at UoTs in South Africa. Table 4.5 provides a comparison of the three interview structures.

Table 4.5: Three interview structures (Babbie, 2021)

Structured interviews	Semi-structured interviews	Unstructured interviews
Predetermined questions in a set order	Questions include structured and unstructured elements	Questions are not set in any order
Both open and closed ended questions, however, closed ended questions such as (yes/no) are common	Questions are often open-ended to allow for flexibility and follow a thematic framework to maintain order including the research guidelines	Questions are open ended and allow absolute flexibility making the interview process challenging for the researcher as order can be compromised
Questions asked in an orderly manner allows the researcher to compare responses between participants eliminating bias and creating the opportunity for high reliability and validity	Questions can differ between participants depending on how they are responding, and this can be a challenge for the researcher to identify thematic patterns, however, reliable data can be collected	Discussions must not prompt leading questions as bias response can result in a lower reliability and possibly invalidate the results

4.4.4.4 Selection of semi-structured online interviews

Globally, human interaction and communication has been rapidly changing over the past decade (de Villiers, Farooq and Molinari 2021: 1-19). Recently, at the onset of Covid-19, there was panic in businesses, education and social circles as the pandemic limited physical interaction. However, during the pandemic, society gradually embraced the 'new norm', which was using virtual spaces for business, education, and social interactions (Parker 2020: 1943-1967). This resulted in many organisations reflecting and adjusting business and educational practices as they enter the endemic

phase of Covid-19. Although face-to-face engagements are important, this type of interaction is becoming less prevalent following the pandemic.

Researchers involved in quantitative and qualitative data collection methods have also re-positioned themselves. Qualitative researchers have embraced data collection processes such as engaging with interviewees using virtual platforms like MS Teams, Zoom and Skype (Keen, Lorneli-Rodriguez and Joffe 2021: 1-19). These platforms have provided an alternative to face-to-face or telephonic interviews (Chen and Neo 2019: 1-10). Therefore, online interviews can be an option for researchers conducting an explanatory sequential MMR study (Archibald et al. 2019:1-8). The researcher can design an interview schedule to explain and elaborate on the quantitative first phase by using a virtual platform to conduct interviews with participants (Noor, Isa and Mazhar 2020: 169-184). This will save the researcher time and cost and limit physical interactions with participants. Furthermore, qualitative researchers need to be cautious of physical interactions in the endemic era as society holds varying opinions in terms of social spaces and health issues post Covid-19.

The researcher considered technological barriers, health and travel costs and decided to utilize the virtual platform to facilitate the interviews for this study. The researcher was comfortable in using these virtual platforms to set up interviews (meetings), text transcriptions, engage, record and download the data for content and thematic analysis. At the same time, the researcher was aware of the technological barriers that may occur due to factor such as *university internet downtime* or even *loadshedding* without due notification in South Africa. However, the researcher decided to persevere with the interviews on the virtual platform as interviews could be re-scheduled if these circumstances did arise at any stage. This was also a better option compared to the travel costs to all the UoTs in South Africa and the availability of participants for face-to-face interviews as society exits the endemic phase of Covid-19.

In terms of structure, the researcher selected a semi-structured interview design for the qualitative phase of this study. The researcher had previous exposure to this type of interview structure through previous postgraduate studies and was experienced in facilitating this kind of meeting. Semi-structured interviews were also an effective data collection method for the researcher as the

aim was to probe academic librarians' lived experiences, attitudes and beliefs related to digital pedagogies in an online environment. It provided the researcher with the flexibility to delve deeper into the phenomenon after designing the semi-structured interview schedule from the analysis of the quantitative first phase of this study. The interview schedule also contained open-ended questions, which allowed the researcher to maintain flexibility and probe new topics as needed within the frame of the interview schedule whilst scientifically inquiring from academic librarians at UoTs about the phenomenon.

The aim of the second qualitative strand was to further probe the pedagogical and digital skills of academic librarian arising from the results and analysis from the first quantitative stage. The empirical evidence in the form of descriptive statistics, correlations and regression analysis was drawn from the quantitative first phase and framed the semi-structured interview schedule for the qualitative second phase. Moreover, the influence of variables on each other in the quantitative phase guided the researcher to include pertinent questions related to digital pedagogies and academic librarians at UoTs in South Africa when designing the semi-structured interview schedule for the second phase of this study. Thus, semi-structured interviews were conducted with selected academic librarians from UoTs in South Africa using the virtual online environment with the direction of the findings from the quantitative first phase of this study, as described in the roadmap in Figure 4.1 of this chapter.

4.4.5 Pre-testing of instruments and pilot study

The process of pre-testing the data gathering instruments is accepted as indispensable in research literature (Ikart 2019: 1-2). According to Sekaran and Bougie (2016: 155-170), it is important to pre-test the instruments to reduce any form of ambiguity; ensure that participants understand the questions; identify issues with the wording; and correct possible measurement errors. Pre-testing is critical as it strengthens the instruments through rectifying the inadequacies pointed out during the preliminary distribution of the instruments (Howard 2018: 1-11). Therefore, pre-testing prior to distributing the instrument also reduces bias and presents an objective perspective to the participants.

Pilot studies are commonly used within quantitative studies to pre-test instruments such as questionnaires (Malmqvist *et al*. 2019: 2). Van Teijlingen and Hundley (2001:33-36) expand that

the main reasons for facilitating pilot studies in social science research is either to determine whether it would be feasible for smaller versions of studies, or to pre-test a research instrument. Additionally, Leedy and Ormod (2009: 110) describe a pilot study as a brief exploratory investigation. In this brief exploratory investigation, the researcher uses a small group of participants to experiment with the research instrument. The purpose thereof is to test the durability through practical procedures such as methods of analysis to determine the feasibility in using the instrument. For this study, the researcher pre-tested the online web-survey questionnaire.

In terms of qualitative data collection methods, the literature is very limited in describing pilot studies for qualitative studies (Malmqvist *et al*. 2019: 4). However, pilot studies for qualitative research can also be useful to understand the social and cultural norms of a population. Pilot studies in qualitative research also provide the researcher with an insightful background to the sample population through processes such as peer evaluation of the interview schedule (Poggenpoel and Myburg 2003: 418-423). This can assist in counteracting threats such as trustworthiness and bias in an interview schedule. The researcher considered this and therefore decided to distribute the semi-structured interview schedules to a few colleagues who had vast experience in qualitative research. The aim was for these colleagues to provide critical feedback on the interview schedule to the researcher to make changes if necessary.

In the context of this study, the online exploratory web-based questionnaire was piloted to pre-test the instrument for the quantitative data collection approach. The aim was to improve understanding, remove ambiguity in wording and possible measurement errors before distributing it to the academic librarians at UoTs in South Africa. On the 10th of May 2021, the researcher emailed five academic librarians from the Durban University of Technology, requesting them to participate in the pre-test of the online survey questionnaire. The academic librarians agreed to participate in the pilot study to pre-test the instrument. Web-based software, QuestionPro, was used to design and distribute the questionnaires. In this study, the respondents were asked to:

- make comments, suggestions and recommendations on the feasibility of the study;
- Pinpoint questions and instructions that needed more clarity;
- identify irrelevant questions and omissions and duplications of the questions;
- record the time spent in completing the questionnaire;

- identify unsettling or offensive questions;
- detect ambiguous questions; and
- review the language and grammar used.

Table 4.6 reflects the distribution and response rate for the pre-testing of the web-based questionnaire.

Table 4.6: Distribution and response rate for pre-testing the web-based questionnaire

Pre-test web-based questionnaire			
Respondent	Number of questionnaire	Number of questionnaires returned	Time taken to complete questionnaire (minutes)
Participant 1	1	100%	13
Participant 2	1	100%	16
Participant 3	1	100%	21
Participant 4	1	100%	20
Participant 5	1	100%	14
Total	5		

Respondents agreed that the questions and instructions of the forwarded web questionnaire were clear and concise without ambiguity. Respondents felt that all questions were relevant and that there were no omission questions. Respondents also thought that the questions were not unsettling or offensive. No issues were reported on the language and grammar used in the questionnaire. Respondents also indicated that it was easy to navigate through the web-based questionnaire.

However, several minor changes were identified by the respondents in the web questionnaire. These changes included the duplication of the word “Studies” and “Science” in Question Six, referring to Library and Information Studies or Library and Information Science qualifications.

The phrase and option “Library and Information Studies” was removed. Question 11 should have a follow-up question exploring if there are other topics that academic librarians teach, not listed as an option. Therefore, Question 12 was included in the form of an open-ended question asking academic librarians to list topics they teach that were excluded in Question 11. The other changes to questions were technical changes. These technical changes either referred to changing the answer boxes to “select one” or select many” from the options provided in the online survey questionnaire.

All participants answered using a desktop/laptop device for the web survey. The time taken was within the allocated 25 minutes for the online survey questionnaire for the research. Reflecting on this, there was no need to change the time allocated for respondents to answer the online survey questionnaire. All the questionnaires were completed and returned on the 31st of May 2022. In terms of the semi-structure interview schedule, this was distributed to colleagues with experience in qualitative research to provide expert opinions in terms of the structure, type of questioning, relevance to the study, language, and depth in probing the phenomenon. The feedback from piloting the interview schedule allowed the researcher to make a few minor changes such as including a few leading questions that would delve deeper into the phenomenon.

4.4.6 Administering of instruments and data collection

An important section of data collection is outlining how the procedures unfolded in distributing the instruments for the research study. This section discusses how the online web-based questionnaire and online semi-structured interviews were facilitated by the researcher.

This study was registered with the Durban University of Technology, Faculty of Accounting and Informatics. The research proposal for this study went through Faculty Research Committee, a division of the Faculty Accounting and Informatics. The Faculty Research Committee approved, registered and ethically cleared the proposal before the researcher was allowed to continue with the study (refer to Annexure F). The researcher was then advised by his supervisors to contact the 7 UoTs in South Africa for permission to conduct research at these institutions.

The researcher contacted the research offices of the UoTs in South Africa telephonically and through email. The research officers at the UoTs explained the procedures, including the necessary

documentation they would require for the researcher me to continue with the data collection procedures at their institutions. Each UoT had varying requirements, but common to all was the permission from DUT for the researcher to conduct the research (refer to Annexure F), a sample consent form for participants (refer to Annexure C) and the research proposal. The process for approval in the form of gatekeepers' permission can be challenging as these research committees meet at different intervals during the academic year. Some of the other challenges included further documentation required and the unavailability of senior committee members at these UoTs. The researcher assumes that reasons such as the Covid-19 pandemic and student unrest can delay processes at UoTs.

Once the researcher started getting gatekeeper permission letters (refer to Annexure D), the heads of departments from the libraries were contacted, seeking permission to conduct the research. Although institutionally the UoTs provided gatekeepers' permission, the researcher felt that it would make ethical sense to contact the heads of departments at the academic libraries to inform them of the researcher's intent and study. Most heads of departments at the academic libraries were helpful and furnished the contact details of academic librarians who were involved in online teaching of library instruction either personally or via the secretaries. However, there was a challenge with two heads of departments even though the researcher had ethical clearance from the host institutions. The researcher sent numerous electronic mails and made telephonic enquiries to these heads of departments to provide the contact information of academic librarians with a teaching portfolio. There was no response either via telephone or electronic mail from the heads of departments from these UoT libraries. Eventually, the researcher used the UoTs' library website to access the contact information of academic librarians with a teaching profile.

The population for the first phase of this study was 77 academic librarians from UoTs in South Africa. The instrument used was an exploratory web-based survey in the form of a questionnaire. A total of seven group-listed emails was initially sent out to academic librarians at UoTs in South Africa. The emails included an introduction to the research, purpose of the study and the live link to the online questionnaire. The emails also included consent forms for participants (refer to Annexure C), gatekeepers' permission letters for their institution (refer to Annexure D) and permission from DUT for the researcher to conduct the research (refer to Annexure F). The online questionnaire was administered to 77 academic librarians between the 07$^{th\ of}$ October 2021 and 31st

May 2022 and 72 (94%) participated in the study. The results from the online questionnaire were downloaded in the Statistical Package for the Social Sciences (SPSS) format. The QuestionPro software used by the researcher has an option to convert results into SPSS and download it onto an Excel spreadsheet. The results from the quantitative phase were analysed with the help of a statistician. The statistician provided descriptive analyses, inferences, and regression models for the quantitative phase of this study. The results from the exploratory web-based survey firmly positioned the study as the results and analysis provided direction to the researcher for the second qualitative phase in terms of the type of questions to ask participants for the semi-structured interviews.

The second phase of the study included semi-structured online interviews with academic librarians from UoTs in South Africa. A semi-structured interview schedule was used (refer to Annexure I) as a guide for the researcher during the online meetings with the participants. Each academic librarian was contacted via electronic mail to introduce the researcher and invite them for an online interview. The electronic mail included an attachment with a sample consent form for participants, referring them to the section on the confidentiality (refer to Annexure C) of the data to be collected in the online interview. Furthermore, the researcher discussed, via electronic mail, preferred dates and times that suited the participants' schedules.

The interviews were arranged as academic librarians at UoTs found the space and time to engage with the researcher. The online interviews were conducted on Microsoft Teams (MS Teams) as all academic librarians at UoTs were using this virtual platform. Once a suitable date and time was agreed upon, participants were sent invites via electronic mail. This electronic mail was in the form of an invite to the MS Teams platform that, once participants accepted automatically, saved onto their Microsoft calendars (MS Team and MS Outlook). Microsoft Teams and Outlook as an application sends regular reminders to their clients on this platform. Therefore, the researcher did not have to send follow-up reminders to participants for the interviews scheduled. Before the commencement of each online interview, participants were once again taken through the extent of confidentiality and the researcher sought their permission to record the interview. The researcher also assured each participant that the recording would be secured with anonymity and not made public to anyone.

4.4.7 Validity and reliability

The process of data collection in social sciences is outlined in the researcher's purpose to understand participants' attitudes, perceptions, emotions, and opinions related to the phenomenon. These type of behaviour patterns in the social sciences can be ascertained using instruments such as Likert scales. However, when measuring behaviour patterns, it is important for the researcher to determine the strength of these type of instruments before the data collection process. Therefore, as part of the research process, measuring the validity and reliability of data collection instruments is important. Validity can be defined as the ability of the measuring instrument to assess the behaviour and quality of what it is intended to measure (Leedy and Ormrod 2005: 28). On the other hand, Cohen, Manion and Morrison (2018) describe reliability as '*the consistency with which the measuring instrument yield a certain result when the entity being measured has not changed*'.

Mohajan (2017: 58-82) mentions that validity is also how well the measuring instrument performs its function. Furthermore, Clifton (2020: 259-270) posits that validity and reliability increase transparency and decrease the gap for research bias in the data collection process. According to Adeniran (2019: 1-2), reliability also contains two types of consistencies. The one consistency is when the instrument is repeatedly measured while exploring the same phenomenon and reliability can be seen in the results. The other consistency is prevalent internally in all the items that are being measured and expresses the same attribute.

Cronbach's alpha coefficient is used to measure the internal consistencies of a scale (Bujang, Omar and Baharum 2018: 85-89). It guides researchers to statistically measure how closely related a set of items can be attributed to each other as a group in terms of quantitative instruments such as Likert scales. The values of Cronbach's alpha range from the number zero to one. According to Cronbach (1951: 297-224), the higher or closer the coefficient is to the value one, the items in the instrument are measuring the same elements and dimensions with consistency. This makes the instrument reliable because of its consistency when measured using Cronbach's alpha coefficient. In determining the reliability of the web-based online questionnaire for this study, the researcher used Cronbach's alpha coefficient.

The researcher must also maintain an objective and critical mindset throughout the research process. This assists in removing bias and preconceived ideas of outcomes in the results, analysis, findings, and interpretations of the research. Therefore, objectivity is a precondition in attaining validity in the research process. According to Rajkoomar (2015: 105), objectivity needs be followed at every step of the research process. A researcher with an objective mindset is cautious whilst engaged in scientific research. The researcher avoids taking decisions and making judgements that will lead to biased outcomes and errors in the data collection procedures. Mouton (2017: 112) identifies some of these threats to objectivity and validity in the data collection procedures, namely vague research questions, biased instruments and sampling that is not evidence-based in the research process.

In this study, the researcher ensured that validity, reliability, and objectivity was maintained for both the instruments administered to participants with rigour. The researcher made certain that the research questions for the online web-based questionnaire and design of the Likert scale were clear. Initially, the online questionnaire was piloted as a pre-test. The pre-tested online web questionnaire was sent to the statistician to measure the reliability of the online questionnaire. The Cronbach alpha efficiency was calculated using *SPSS version 27.0* software. The coefficient presented an overall average value closer to one (0.967), indicative of a high reliability for all the constructs in the Likert scales. The reliability checks were conducted separately at different intervals for each construct. This is discussed in the next chapter. According to Sürücü and Maslakci (2020: 2694-2726), a coefficient that features closer to one is indicative of high reliability and is considered appropriate for a study. The pilot study for the online questionnaire and semi-structured interviews also provided valuable feedback from participants, thus removing ambiguity, language, grammar, duplication of questions and bias, making the instruments valid and reliable.

Moreover, the researcher further probed the reliability and validity of the interview schedule before the data collection procedures. The researcher scanned the literature wherein validity was presented differently in terms of qualitative research methods. Creswell (2014: 201) suggests that in qualitative methods, terms such as trustworthiness, credibility, plausibility, and dependability are much more significant when determining the validity of an instrument for collecting data. Onwuegbuzie and Johnson (2006: 51-55) agrees that qualitative research methods are better

described using the term ‘trustworthiness’ than reliability. The researcher applied these qualitative terms that were suggested when receiving feedback for the semi-structured interview schedule piloted with colleagues. The researcher used these terms to reflect upon the feedback received from the semi-structured interview schedule. This provided the researcher with the insight to revise, adjust and modify the semi-structured interview schedule to suit the purpose of the study. Therefore, to inspect, correct and measure the instruments in the data collection procedures increases reliability and validity, thereby assisting in increasing the accuracy of the findings (Creswell 2014:201). It also removes bias, preconceived ideas and improves the objectivity of the study.

An important aspect to consider when addressing reliability and validity in research is triangulation (Quintão, Andrade and Almeida 2020: 264-275). Triangulation can be defined as using two or more methods to validate the results and increase the reliability of a scientific research study through repeatedly testing the same phenomenon (Denzin 1978: 304). Furthermore, Flick (2004: 178-193) posits that triangulation is the combination of research approaches including the systematic selection of methods used to increase the length and breadth of a project. Cohen, Manion and Morrison (2018) agree that the length, breadth, and quality of a research project is improved when several methods are used to explore the same phenomenon. The common thread in triangulation through methodology, theoretical perspectives and multiple data collection methods is that the process must be treated and applied in an equal consequent way to promote quality in research (Flick 2018: 23). Therefore, critical in the process of triangulation is that these combinations must complement each other to ensure reliability and validity. In terms of this study, a combination of both quantitative and qualitative approaches was used to complement each other whilst exploring, probing, and ascertaining the digital pedagogies of academic librarians at UoTs in South Africa.

According to Quintão, Andrade and Almeida (2020: 269), validity is divided into internal and external validity. Internal validity is relevant to an explanatory mixed method research design. This is because internal validity can be used to demonstrate relationships, behaviour patterns and perspectives including causes and effects between elements. In this research, internal validity was promoted as the outcomes from the web-based questionnaire to frame the design of the semi-

structured interviews with academic librarians at UoTs in South Africa. Furthermore, this alleviated pitfalls and threats such as a lack of reliability in the instrument.

Leedy and Ormrod (2009: 94), when referring to threats and pitfalls in measuring reliability, include the following:

- instruments that describe items ambiguously and erroneously, resulting in misinterpreted data;
- a lack of clarity in the instructions;
- a lack of pilot studies and pre-testing of instruments;
- questions are not sequential or ordered from general to specific;
- the questionnaire is complex and the interviews are long;
- abstract concepts are measured unequally; and
- the administration of the data collection process is uneven.

In this study, threats and pitfalls were lessened with the pre-testing and piloting of the data collection instruments. The web-based questionnaire was succinct. The researcher designed the instrument such that a Likert scale with radio buttons was used to click on options. This made it seamless for participants to navigate and select options to complete the web-based questionnaire in 20-25 minutes. This was indicated in the pre-test of the web-based questionnaire through feedback from participants. In terms of the semi-structured online interviews, the researcher was consciousness of the time limit and kept the data collection procedure between 45-60 minutes. At every juncture of the data collection procedure of this study, the researcher strove towards maintaining reliability and validity. In addition to ensuring reliability and validity in the data collection procedures, it is equally important to address how the data was collected and presented. The next section focuses on the data analysis presentation for this study.

4.5 Data analysis and presentation

Research is a systematic process that is cohesive. The aim of doing research is to explore, probe and gain a clearer understanding of a phenomenon. In research, if methodology is described as a roadmap that charts the path as in Figure 4.1, then data analysis is that stage in which the study examines whether the researcher navigated the roadmap within correct measures. This is

ascertained from the results generated using appropriate scientific procedures to address the objectives of the study. Hence, data analysis is the outcome of the researcher using the roadmap as a guide to scientifically direct data collection procedures.

Data analysis begins with the reduction of large amounts of data. In the data reduction process, three strategies can be applied in research. These three data analysis strategies are deductive, inductive, and abductive reasoning (Maree 2016). The purpose of using these three strategies in analysis is to reflect the multiple sources of data used in a study. Furthermore, it explicitly illustrates the philosophical underpinnings of these data analysis strategies. Figure 4.8 succinctly points to the three data analysis strategies and their underpinnings.

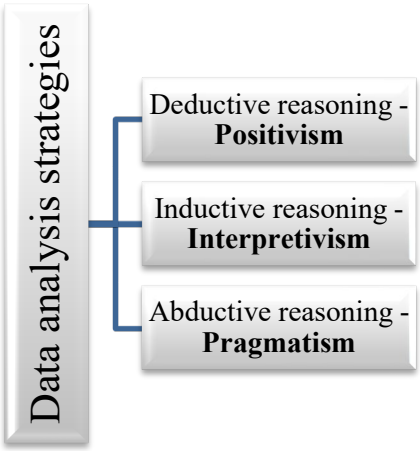


Figure 4.8: Data analysis strategies and philosophical underpinnings (Maree 2016)

Data analysis is achieved through checking the consistency and information in large amounts of raw data before the in-depth examination of the results (Bryman 2016). At this stage, errors such as missing or miscoding in the data is detected. The researcher then begins to verify the data before analysis. According to Scharp and Sanders (2019: 117-121), verification is an important process as it allows the researcher to make interpretations and draw meanings from the data. This leads the researcher to identify numerical patterns and thematic relationships when examining the data. The researcher is then able to build on this analysis through inferences, tabulations, correlations, and interpretations of meaning. Babbie (2008: 122) agrees that the purpose of data analysis is to understand the relationships that exist between the elements through processes such as inferences

and meanings. This is achieved using quantitative and qualitative data analysis procedures. Ultimately, the outcome is that the researcher can present the data in a meaningful way for interpretation.

The first phase of this study involved analysing the quantitative data collected through the web-based questionnaire, which was administered to 77 academic librarians at UoTs in South Africa, 72 (94%) of which participated in this study. The raw data was downloaded in SPPS format from the QuestionPro web-based survey software to an Excel spreadsheet. The raw data was analysed using SPSS. The researcher began data reduction by checking, polishing, and fine-tuning the responses from participants. Thereafter, the statistician used SPSS to simplify the raw data through coding and analysing the web-based questionnaire. Furthermore, frequency tables with labels, values and percentages were generated using SPSS. The results were presented in the form of graphs, cross- tabulations, correlations, and regression tables. Descriptive and inferential statistics were used to illustrate the relationships between dependent and independent variables in the analysis of the quantitative data. Additionally, the researcher explored these relationships using correlations in the form of Pearson Product Moment and multiple regressions with the variables from the quantitative data. The findings from the first phase were then used to design the interview schedule for the second qualitative phase of this study.

In terms of the second qualitative phase, online semi-structured interviews were conducted on MS Teams with academic librarians who were purposively selected from the quantitative first phase. The researcher enabled the record and transcriptions settings for each interview on the MS Teams platform. Participants were made aware that the interview was being recorded and transcribed automatically as part of the data collection procedures. They were comfortable with this arrangement and gave the researcher permission to continue with the interview. The saved recordings and transcriptions were downloaded onto the personal laptop of the researcher. A folder was created with each participants recorded and transcribed interview given the same label (e.g., Participant 1). This ensured that the data was not mixed up by the researcher.

In the next stage of the qualitative phase, the researcher cleaned the raw data by creating a table format on Microsoft Word for each participant with their lived experiences aligned to each

question related to the phenomenon. The cleaned documents for each participant were also labelled and saved in a separate folder. Thereafter, NVivo software that complements qualitative and mixed methods research was used to interpret the data. A group was created in Nvivo under the cases option of NVivo. The researcher converted and then imported the cleaned Microsoft Word files (data) of each participant in pdf format into NVivo under the cases options, under the label '*person'*. This meant that all the cleaned data for all the participants were grouped together in NVivo.

The researcher then began analysing the data using content and thematic analysis. According to Neuendorf (2018: 211-223), content and thematic analysis is the examination for recurrent words, phrases and sentences of some kind in the data. Once the researcher identified such patterns or themes arising in the responses of participants, it was coded. This is critical since the coding of the data in this format allowed the researcher to classify the coded items into themes. Creswell (2014: 241) avers that the process of organising the coded data and labelling it helps the researcher to get a general sense of the patterns that exist in terms of the phenomenon being studied. Each theme was classified into nodes in NVivo. In NVivo, a node is a term used when referring to coded data through themes (Feng and Behar-Horenstein 2019: 563-572). Word frequencies were also created to validate the recurrence of the main themes in the qualitative data from the online semi-structured interviews.

This study used the '*fully mixed sequential equal status design'*. Therefore, in terms of this design both approaches have an equal weighting, but the sequential explanatory mixed method design guided the research procedure. Hence the quantitative data was analysed in the first instance. The closed questions (quantitative data) using a 5-point Likert Scale in the form of a web-based questionnaire was analysed using SPSS. This raw data was verified and empirically measured using descriptive and inferential statistics. The data was further explored through the dependent and independent variables from the empirical evidence (quantitative), resulting in correlations and regression tables. The results from the quantitative first phase was then used to plan the qualitative second stage using online semi-structured interviews. In this phase, the data was recorded, transcribed, downloaded, organised, and imported into NVivo for content and thematic analysis using the software. Furthermore, the mixed method analysis phases of the data included empirical

evidence from the quantitative analysis and the themes extracted from the qualitative method. The researcher also logically mixed the components from the frameworks, literature, and analysed data from the quantitative and qualitative methods, including the findings, to present the discussions related to this research. The next section outlines the ethical issues that grounded this research.

4.6 Ethical issues

Ethical issues are critical in securing scientific research. The researcher must follow protocols in gaining access to participants through procedures such as informed consent and gatekeeper permission. Another aspect that must be considered is respect for participants. Therefore, confidentiality must be maintained through the research process. According to Parameshwara (2019: 38-42), trust is key when planning data collection procedures wherein ethical principles such as beneficence, autonomy, justice, veracity, and privacy are developed between the researcher, participants, and institutions. Creswell (2014:92) also emphasises issues such as personal privacy and credibility, and disclosure agreements between participants and researchers must be applied to all the stages of the research process in quantitative, qualitative, and mixed methods research.

Research experts in the social sciences have discussed ethical issues in-depth within the literature. Moreover, Zhang and Liu (2018-505:508) explain that ethical issues have been divided into two main categories. The first category is a code of ethical and professional conduct that the researcher for this study has propounded on when discussing ethical principles. The other is the researcher's checklist with important ethical issues to consider prior, during and after the research process. This includes the following, which was taken into consideration for this research study:

- research must be done with the purpose of contributing to the body of knowledge in a particular field and not for personal gain or recognition;
- researchers must select a valid research design that will enable the scientific inquiry to be explored and probed with tenacity;
- the researcher must respect the confidentiality of participants and the data obtained from the collection procedures;
- researcher must value the data collected and the information by participants, ensuring that their confidentiality and privacy is secured and guarded;

- the purpose of the research must be clearly explained to all participants;
- the researcher must at no time misrepresent the nature of the study or views of the participants after the data collection process;
- participants must not be coaxed and forced to participate in the research as this de-values the research;
- participants who do not want to participate and have made their intentions clear to the researcher must be respected;
- the researcher must obtain informed consent from participants as this approves their legitimate involvement in the study;
- the researcher must ensure that there is no distortion in the data collection during the study either in the quantitative procedure such as surveys, or qualitative such as recorded interviews; and
- participants must be informed prior to quantitative and qualitative data collection procedures to be honest in their responses once they have agreed to participate in the study.

Additionally, Sekaran and Bougie (2010: 220) mention that besides participants having an obligation to be truthful, the researcher must ensure that no participants are subjected to physical, mental, and environmental harm in the study.

In terms of this study, the researcher adhered to the protocols, principles and checklist as discussed. Prior to commencing, the researcher obtained ethics clearance (Annexure F) from the Durban University of Technology, where this study is registered. Thereafter, the researcher sought official permission to conduct research from the seven UoTs (Annexure D) in South Africa. This was done through contacting the research offices (ethics) at these UoTs via electronic mail. Identifying the official channels at these UoTs to obtain permission to conduct research was easy. However, the response rates from some of the research offices (ethics) was poor, even after numerous follow-up communiques via electronic mail and telephone. The other factors that slowed ethics clearance was varying research processes at UoTs, such as different types of documents requested by research committees and quarterly meetings of research ethics committees at different times, resulting in delays in approval to proceed with the research. Ultimately, permission from the seven UoTs in South Africa was obtained via electronic mail (Annexure D).

Once the researcher received permission from a UoT, the head of libraries was contacted via email and informed. Although this is not a prerequisite in terms of ethical clearance, the researcher felt that it was a matter of courtesy to inform the head of the library at each UoT. The researcher forwarded the ethical clearance letter and gatekeepers' permission letters to the head of library (Annexure D and F). In all instances, this was well received and supported by the heads of UoT libraries. The support from the heads of the libraries was either provided directly or through their secretaries. The researcher was provided with the email addresses of academic librarians who were involved in the online teaching of library instruction at the UoTs.

The researcher contacted the academic librarians via email with the necessary ethics documentation. Most participants in the study voluntarily signed a letter of informed consent (refer to Annexure C). The confidentiality and privacy of all participants were always maintained. The researcher did not make any direct reference to the participants' personal details or the UoTs. Furthermore, the purpose of the research was clearly outlined in the covering letter (Annexure C). As mentioned in the ethics checklist, no participant was forced to respond to the survey or participate in the online semi-structured interviews. The researcher also outlined in the cover letter of the web-based questionnaire that confidentiality would be guaranteed. Participants would remain anonymous as the QuestionPro online survey software would automatically capture responses. The only individuals that would have access to the captured data would be the researcher and supervisors.

The research participants were treated with care, respect, dignity, fairness, and politeness. The researcher also ensured that research ethics principles and protocols were maintained when liaising with the participants. At no stage was any harm allowed to befall the participants.

The ethical principles, protocols and checklist discussed and implemented do not exhaust all the moral values in research. However, the researcher ensured that the main ethical principles were adhered to prior, during and after the data collection procedures. The researcher made every effort to cover the length and breadth of the main ethical principles and complied with these ethical principles by ensuring that the voluntary informed consent forms, disclosures, confidentiality, security, and protection of all participants was not compromised at any stage. To that extent, the

researcher also made participants aware and shared the proposed benefit of this research. The next section presents an evaluation and reflection of the research methodology of this study.

4.7 Evaluation of the research methodology

Research methodology is a fundamental piece of the puzzle in scientific inquiry. The purpose of research methodology is to determine the effectiveness of a study through the objectives (Cohen, Manion and Morrison 2007:38). In fact, Ngulube (2015:125) places such emphasis by stating that the success of scientific inquiry in scholarly research depends on the research methodology. Mixed method research was considered as being relevant for this study since digital pedagogies are a grey area in the literature (Volkova, Lizunova and Komarova 2021: 3-4). Furthermore, globally, there is a lack of contribution to the knowledge base in terms of digital pedagogies and online teaching for academic librarians (Omar Saib *et al.* 2022: 1- 13). Therefore, the researcher adopted a mixed -method design to address the critical questions. The mixed-method design provided a holistic picture of digital pedagogies and academic librarians at UoTs in South Africa by combining the quantitative and qualitative approaches. Hence, the MMR approach is underpinned by the '*action orientated*' paradigm of pragmatism that was selected in this study. The flexibility of pragmatism in this study allowed the researcher to epistemologically explore the phenomenon through the positivist and interpretivist lenses (Figure 4.1).

The justification for using an MMR approach in this study is that it allowed the researcher to glimpse the social world from two different lens. The researcher delved into the literature and saw the varying views in quantitative and qualitative approaches. The researcher realised that using one view would have limited the objectivity of the findings. Although both quantitative and qualitative approaches have strengths and weaknesses, combining both in answering the research question allowed the researcher to increase the reliability, validity, and overall confidence of the findings. Ngulube (2010: 255) agrees that the use of the MMR approach intensifies and presents an inclusive finding in a study. Furthermore, the strength of the MMR approach is vested in the design and triangulation of the data. According to Flick (2018: 527-544), triangulation is the foundation of the MMR design. The researcher identified with the MMR design and triangulation as the data was collected from multiple sources, such as web-based questionnaires and semi-structured interviews at different times, making triangulation possible. The researcher also extended the process of triangulation by delving into the literature and theoretical frameworks to

provide an unbiased view on the phenomenon. Thus, using the MMR approach enabled the researcher to provide a complete picture of digital pedagogies of academic librarians at UoTs in South Africa.

Sekaran and Bougie (2016) posit that scientific research that is underpinned with a good theoretical base and firm methodological design add rigour and credibility to the study. This study used two theoretical frameworks in the form of TPACK and COI to explore, probe then ascertain the situational context of the phenomenon for academic librarians at UoTs in South Africa. The researcher leaned on TPACK and COI, extracting key components from these frameworks when aligning to the MMR design. The design of the web-based questionnaire and semi-structured interview schedule was created within the premise of the theoretical frameworks.

The researcher also ensured that the data collection processes were adhered to by being thorough at every phase. The instruments were piloted before being distributed to participants in the quantitative first phase and the second qualitative phase of the study. The feedback from the pre-test and pilot study resulted in more accurate and comprehensive research instruments. Furthermore, the piloting of the semi-structured interview schedule helped the researcher to reduce interviewer bias. This allowed the researcher to establish the reliability and validity of the instruments prior to the data collection. Most importantly, it made the findings for this study trustworthy, credible, and ethically sound.

Sekaran and Bougie (2010: 22) mention that prior to the data collection methods, the intended sampling design must be scientifically and logically processed. Additionally, the procedures followed in the data collection process must be sequential and meticulous. In terms of this study, the researcher used a census for the first quantitative phase, followed by the qualitative phase. In the second quantitative phase, a sampling design was used (refer to section 4.4.4). The procedures followed in administering the data collection instrument and the process are thoroughly explained (refer to section 4.4.4). Therefore, the researcher feels confident in terms of the methodology of this study. The researcher believes that the generalisability of the findings provides a scope that is applicable to all UoTs (academic libraries) in South Africa. The methodology is also firmly supported using a scientific and logical design, including the data collection plan.

Nevertheless, Leedy and Ormrod (2015) state that research is vulnerable to challenges, imperfections and open to scrutiny. Therefore, when presenting the highlights and reflecting upon one's study in the evaluation of the methodology, it is also important to identify the mistakes, biases and problems experienced in the processes of data collection and analysis. This allows the researcher to develop a self-critical eye and grow in terms of research. To that extent, Chaterera (2017: 145) asserts that the lack of the researcher identifying or highlighting issues such as errors and problems in the research process creates a false sense of impression. It could even be assumed that there is a serious weakness in the data or the data collection procedures. The researcher considered this and highlights issues below:

- the administrative research processes at UoTs can be time-consuming, leading to the delayed gathering of data;
- the availability of participants can be an issue because of work commitments;
- cost factors rise in terms of statisticians for analysing data;
- the researcher sensed that some participants during the interviews were apprehensive, either because of being fearful of exposure or hiding critical information about their practices. However, once participants felt comfortable and trusted the researcher, the discussions became productive and led to the emergence of critical information in addressing the research problem; and
- the collection and analysis of data took the researcher thirteen months. This is clearly on of the biggest hurdles when conducting mixed method research as it is time-consuming.

4.8 Summary

This chapter outlined the research methodology by describing the philosophies, research approaches, mixed methods research designs and data collection methods and procedures. These key components of the research methodology were aligned to the present study. The researcher addressed philosophical foundations in terms of positivism, interpretivism and pragmatism. This chapter highlighted the stark differences in these philosophies, simultaneously presenting how they can co-exist in research. The researcher embraced both the objective nature of positivism and subjective reality of interpretivism. These two paradigms were integrated into the action-oriented pragmatic philosophy for this study. The objective nature of this study explored the digital pedagogies of academic librarians at UoTs in South Africa, whilst the subjective reality presented

the researcher with the opportunity to interpret the lived experiences of the participants related to the phenomenon.

Methodologically, this chapter highlighted the different research approaches applicable to scientific inquiry. The researcher explored scientific approaches to ascertain which one would be most suitable for this study. Consequently, the researcher did not discard but rather combined the quantitative and qualitative methods through a mixed method approach. Liu (2022: 1-2) agrees that paradigmatic duality cannot be reduced to mixing different scientific approaches, whereas compatibility can be established through the methodological process in research. Therefore, the researcher endorsed this logic and charted a scientific path to implement both these approaches in this study through the MMR approach and design as discussed in this chapter. Furthermore, the co-existence of both these approaches in MMR can lead to the development of their strengths as partners and reduce the weaknesses in a study. This chapter also highlighted the different MMR designs and the reasons for selecting the explanatory sequential design for this study.

Additionally, the researcher addressed the data collection instruments and procedures used in the study, such as the web-based questionnaire in the form of Likert scale and online semi-structured interviews and sampling. This was followed by the researcher focusing on reliability, validity and ethical issues pertaining to this study. The chapter concluded with a concise evaluation of the methodology used for this study. The next chapter delves into the findings of this study. It examines the results and validates the methodology by demonstrating how the findings supported the research process.

CHAPTER FIVE
PRESENTATION OF RESEARCH FINDINGS AND ANALYSIS OF RESULTS

5.1 Introduction

In Chapter Four, the researcher explored the paradigms, approaches, designs and data collection procedures. This provided the researcher with the context to make decisions best suited in framing the methodology for this study. Furthermore, the purpose, objectives and critical question for this study were fundamental in deciding the type of MMR design. The researcher selected the explanatory sequential design after delving into the literature on MMR. The explanatory sequential mixed method is a two-phase design (Figure 4.3). The first is the quantitative phase and the second is the qualitative phase. The MMR design chosen was underpinned using pragmatism. This paradigm allowed the researcher to equally combine objectivity and subjectivity using differing research approaches. Pragmatism also created the platform for the researcher to use a '*fully mixed sequential equal'* design to explore, probe and ascertain the digital pedagogies of academic librarians at UoTs in South Africa (Figure 4.2). The weighting of the' *fully mixed sequential equal'* from the instruments used are of a more or equal balance. This includes mixing the quantitative and qualitative data equally across one or more stages. The findings chapter of this study aims to illustrate this from the data analysed using the web-based survey and semi-structured interviews.

The sequence of the explanatory mixed method design is governed by the quantitative phase being the first stage of the data collection process. The researcher collected the quantitative data using a 5-point Likert scale through a web-based questionnaire. The results were analysed and used to inform the second qualitative phase for this study. This chapter presents the findings from the web-based survey (Annexure H) and semi-structured interviews (Annexure I) administered to academic librarians. The aim was to explore, probe and ascertain the pedagogical and digital skills of academic librarian whilst teaching in an online environment.

The web-based survey was administered to 77 academic librarians at UoTs in South Africa, 72 (94%) of which responded. The results of the web-based survey through descriptive, inferential, correlations and regression statistical methods were analysed. This informed the researcher as to which sampling method would be relevant for the second qualitative phase. The researcher chose

purposive sampling for the second qualitative phase in the form of semi-structured interviews. The researcher purposively selected academic librarians with a teaching identity at UoTs because they were best prepared to share their lived experience on the phenomenon. The results and analysis of the web-based survey also provided the researcher with insight as to the type of interview structure best suited for this study, and type of questions to ask participants.

This chapter begins with the order of priority by presenting the precision of the data instruments used for this study. The Cronbach alpha coefficient presents the measurements of the constructs and the overall average to determine reliability and internal consistency. The next section presents the overall analysis of the quantitative results through descriptive, inferential, correlations and regression statistical methods. This is preceded by the descriptive statistical results, including correlations that may exist between items within the constructs in the web-based questionnaire. The section that follows is the results from the thematic and content analysis of the semi-structured interview through a process of coding, resulting in the emergence of themes. The thematic patterns that emerged in the second qualitative phase and correlations from the quantitative phase are equally mixed to ascertain the digital pedagogies for academic librarians at UoTs in South Africa. Finally, the theoretical frameworks and literature reviewed are triangulated equally with the findings from both phases to present an analysis of the research problem.

5.2 Reliability and validity of the findings

Bardhoshi and Erford (2017: 256-263) state that the precision of the instruments is an exceedingly important step in the research process before the data can be collected. The precision in the instruments is established through reliability and validity. Reliability is determined through repeatedly measuring the constructs of the instrument with results remaining constant throughout this process. According to Leedy and Ormrod (2005: 28), validity is the ability of the measuring instrument to assess the behaviour and quality of what it is intended to measure. The researcher validated this study by using more than one instrument in the data collection process (refer to section 4.4.6).

In measuring the reliability and internal consistency of the web-based survey tool (online questionnaire) for this study, the researcher used Cronbach's alpha coefficient. According to Bujang, Omar and Baharum (2018: 85-89), Cronbach's alpha coefficient is used to measure the internal consistencies of a scale, making it reliable when the value is closer to one. Connelly (2011:

44-45) further states that a scale has internal consistency, making it reliable when all the items measure the same construct. The constructs that were measured in the web-based survey were the sections on *pedagogical knowledge for online instruction, online instruction role and technology for online instruction* (refer to Appendix H and Sections B, C and D of the web-based survey). These sections were used because they included multi-point scales. The use of Cronbach's alpha coefficient was to determine the internal consistency and correlations that exist in measuring the reliability of the instrument. This also allowed the researcher to probe underlying constructs and the reliability of sub-scales.

Sin and Rosli (2020: 17-18) posits that construct reliability between 0.70 and 0.80 is acceptable and any other value closer to the number one is good. In this study, the reliability of the multi-point scale using ordinal questions under the section's *pedagogical knowledge for online instruction, online instruction role and technology for online instruction* (refer to Appendix H and Sections B, C and D of the web-based survey) were measured to check reliability and internal consistency. The score of each of these constructs are presented in Table 5.1.

Table 5.1: Reliability of the measuring instrument (Cronbach's alpha coefficient)

Constructs	**Number of items**	**Cronbach's Alpha**
Pedagogical knowledge	21	0.864
Content knowledge	66	0.931
Technological knowledge	9	0.792
Overage average	**96**	**0.967**

Table 5.1 indicates that the web-based survey instrument (96 items) used for the study is reliable and evidently has a very high level of inter-item consistency ($\alpha = 0.967$). The pedagogical, content, and technological knowledge constructs for digital pedagogies have a high degree of internal consistency and reliability when measured. Consequently, content knowledge also has a high level of inter-item consistency ($\alpha = 0.931$), followed by pedagogical knowledge ($a = 0.864$) and technological knowledge ($a = 0.792$). Furthermore, the item reliabilities for the web-based survey range from 0.792 to 0.931 as separate constructs. Hence, the 96 items measuring pedagogical, content, and technological knowledge indicate a high degree of inter-item consistency and

reliability (a = 0.967). Therefore, the research instrument should be accepted and adopted for similar research in the future.

5.3 Presentation of findings

The data for this study was collected in the form of a web-based questionnaire and semi-structured interviews. The explanatory sequential mixed method design was used to collect the data. The quantitative method is the first phase of this type of MMR design. This is followed by the qualitative phase. In both instances of using these phases, the participants were the academic librarians at UoTs in South Africa. The academic librarians selected for both phases were those that were identified as teachers at higher education institutions. The findings in this chapter are presented according to the themes and relationships that exist between the constructs as framed in the instruments used and underpinned in the theoretical frameworks. For coherence and clarity, the research objectives are outlined as follows:

- To ascertain the digital pedagogies of academic librarians in the current digital environment in South Africa towards developing an online training model;
- To explore the pedagogical and digital skills needed by academic librarians within a digital environment at UoTs in South Africa;
- To establish the type of online teaching presence of academic librarians when engaging with students in a digital environment at UoTs in South Africa; and
- To design an online training model in pedagogical and digital skills required for the current LIS environment in South Africa.

5.3.1 Overall analysis of the quantitative data

5.3.1.1 Descriptive statistics

The web-based survey assessed the pedagogical, technological, and content knowledge of academic librarians at UoTs in South Africa concerning online teaching in the current digital environment. The respondents were asked to respond to various aspects of the items using a 1-to-5-point Likert scale. The overall results are presented in Table 5.2.

Table 5.2: Overall descriptive statistical analysis of digital pedagogies and academic librarians at UoTs in South Africa

Dimension	Mean	95 % Confidence Interval		Std. Dev.	Min.	Max.
		Lower Bound	Upper Bound			
Online teaching	3.31	3.19	3.46	52226	1.00	5.00
Pedagogical knowledge	2.68	2.50	2.76	0.34772	1.00	5.00
Technological knowledge	3.02	2.87	3.17	0.61988	1.00	5.00
Content knowledge	3.38	3.18	3.58	0.84615	1.00	5.00

As reflected in Table 5.2, content knowledge had the highest mean score value (Mean = 3.38), closely followed by online teaching in the current digital environment (Mean = 3.3.1), and technological knowledge (Mean = 3.811). However, pedagogical knowledge (Mean = 2.68) had the lowest mean score, which is below the threshold (Mean = 3.00). The results suggest more room for improvement in areas, especially the pedagogical and technological knowledge. The following section involves the description of the data using inferential statistics.

5.3.1.2 Inferential statistics using Pearson Product Moment Correlations

The inferential statistics such as correlations and multiple regressions were computed on the dimensions (pedagogical, technological, and content knowledge). This helped in drawing valid conclusions. The relationships amongst the pedagogical, technological, and content knowledge were assessed. The results are depicted in Table 5.3.

Table 5.3: Person Product Moment Correlation of online teaching and pedagogical, technological, and content knowledge of academic librarians at UoTs in South Africa

Dimension	**r/ p**	Online teaching	Pedagogical knowledge	Technological knowledge	Content knowledge
Online teaching	*r*	1.000			
Pedagogical knowledge	*r* *p*	0.285* 0.016	1.000		
Technological knowledge	*r* *p*	0.0967** 0.000	0.108 0.368	1.000	
Content knowledge	*r* *p*	0.702** 0.000	-.154 0.200	0. 647* **0.000***	1.000

*** p < 0.01**

As shown in Table 5.3, there is a weak positive relationship between online teaching and pedagogical knowledge in UoTs at the 1% level of significance. However, there is a weak negative relationship between online teaching and technological knowledge. Furthermore, a significant moderate relationship exists between online teaching and content knowledge at the 1% level of significance. There was also a strong positive relationship between pedagogical knowledge and technological knowledge at the 1% level of significance. Lastly, a strong positive interplay exists between technological knowledge and content knowledge at the 1% level of significance. From the analysis, it can be deduced that a positive relationship exists between the dependent and independent variables in the study.

5.3.1.3 Multiple regression and digital pedagogies

To assess the relationship between the dependent (online teaching) and independent variables (pedagogical, technological knowledge and content knowledge), linear regressions were computed. The results are presented in Table 5.4.

Table 5.4: Multiple regression between dependent and independent variables (pedagogical, technological, and content knowledge)

Independent variables	R	R-squared value	Adjusted R-squared value	F	Beta	T	P
	0.997[a]	0.993	0.993	3232.268	-	-	0.000[b]
Pedagogical knowledge					0.232	21.775	0.000
Technological knowledge					0.358	2.369	0.021
Content knowledge					0.220	15.846	0.000
Constant						-2.279	0.026

Table 5.4 indicates an R-squared value of 0.993 and an adjusted R-squared value of 0.993. The results suggest that the model (pedagogical, technological, and content knowledge) predicts 93% of the variations in online teaching in the current digital environment within UoTs. This is significant at the 1% level ($p < 0.01$), meaning that a significant positive relationship exists between the independent variables (pedagogical, technological, and content knowledge) and the dependent variable (online teaching). The results support the hypothesis that academic librarians at UoTs in South Africa have pedagogical and content knowledge to adopt online teaching in the current digital environment. However, the results do not support the hypothesis that academic librarians at UoTs in South Africa have the technological knowledge to adopt online teaching. The standardised Beta and the corresponding P-values for pedagogical, technological, and content knowledge ($\beta = 0.232$, $p < 0.001$), ($\beta = 0.222$, $p < 0.001$) and ($\beta = 0.021$, $p < 0.001$), respectively, indicated that pedagogical knowledge made the most considerable contribution to the model, followed by content knowledge. By contrast, technological knowledge made less contribution to the model. Based on the given the results, it can be argued that only the pedagogical and content knowledge of the academic librarians jointly serve as predictors of online teaching in the current digital environment within UoTs. From these perspectives, it can be argued that although academic librarians at UoTs have the pedagogical and content knowledge to adopt online teaching

in the current digital environment, they do not have the technological knowledge to adopt online teaching in the current digital environment.

The overall data analysis of the descriptive and inferential statistical methods presented have varying outcomes. The descriptive statistics indicated that academic librarians have content knowledge to teach in an online environment, but technological knowledge is average whilst pedagogical knowledge had the lowest mean of 2.68 as illustrated in Table 5.2. Furthermore, the use of inferential statistics in the form of the Pearson Product Moment Correlation pointed to online teaching and pedagogical knowledge having a weak positive relationship. This establishes that although both variable increase in response to each other positively, the relationship is weak.

In terms of content knowledge and online teaching, the analysis infers that the relationship is moderate. Furthermore, the Pearson Product Moment Correlation inferred a strong relationship between pedagogical and technological knowledge and possibly a strong interplay between technological and content knowledge for online teaching. The researcher dived deeper and assessed the variables using multiple regressions through the R-squared variation. Table 5.4 indicates that there was a significantly positive relationship between the dependent (online teaching) and independent variables (pedagogical, technological, and content knowledge). In terms of the regression model in Table 5.4, it indicated that academic librarians at UoTs have pedagogical and content knowledge, but do not have technological knowledge to adopt online teaching.

5.3.1.4 Descriptive statistics, correlations, and multiple linear regressions

The researcher deduced and made the following assumptions from the descriptive statistics, Pearson Product Moment correlations and multiple linear regressions. The descriptive statistics pointed to academic librarians lacking in pedagogical and technological knowledge, whilst indicating a good understanding of content knowledge for online teaching. The Pearson Product Moment correlations inferred that there was a strong interplay between the technological and content knowledge independent variables related to online teaching. Pearson Product Moment correlations also inferred that there was also a strong positive relationship between technological and pedagogical knowledge for online teaching. On the other hand, the multiple regressions inferred that academic librarians at UoTs have pedagogical and content knowledge. However, there is a lack in technological knowledge (digital skills). The assumption in terms of academic librarians lacking in technological knowledge (digital skills) was the same for multiple linear

regressions and descriptive analyses. However, the multiple linear regressions and descriptive analysis both differed in the analysis of pedagogical knowledge and academic librarians at UoTs in South Africa. Whilst the overall descriptive analysis revealed that pedagogical knowledge had the lowest mean (2.68) compared to technological and content knowledge, the multiple linear regressions indicated that academic librarians have pedagogical knowledge for online teaching.

The researcher considered the descriptive analysis, Pearson Product Moment correlations and multiple linear regressions in Tables 5.2, 5.3 and 5.4 as it indicated the interrelationships that existed between pedagogical, technological, and content knowledge. However, these interrelationships were either weak or strongly positive with no conclusive affinities across the descriptive analysis, Pearson Product Moment correlations and multiple linear regressions in terms of pedagogical knowledge and academic librarians at UoTs in South Africa. Thus, the researcher concluded that pedagogical and technological knowledge (digital skills) as independent variables and items from the quantitative results needed to be further examined and correlated with Pearson Product Moment correlations and the multiple linear regressions. The researcher decided to explore the pedagogical and technological knowledge of academic librarians through the microscopic lens of the sub-scales and items using the descriptive statistics from the web-based survey.

5.3.2 Presentation of quantitative findings from the web-based survey of academic librarians at UoTs

This section presents the findings from the web-based survey. The researcher placed emphasis on pedagogical knowledge as this needed to be explored further as discussed in the overall analysis of the quantitative data. The digital skills (technological knowledge) of academic librarians were also investigated as one of the research objectives for this study. The responses from participants were grouped and correlated into themes. The findings are presented in the form of tables and graphs.

5.3.2.1 Biographical Information

5.3.2.1.1 Number of respondents per UoT academic library

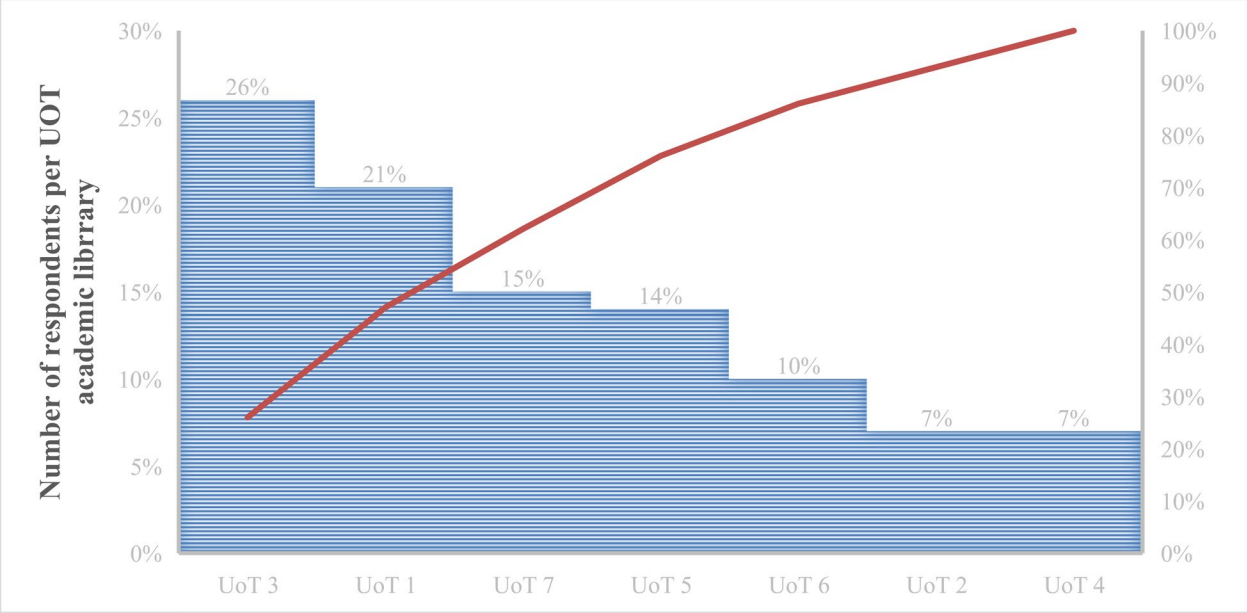


Figure 5.1: Number of respondents per UoT library

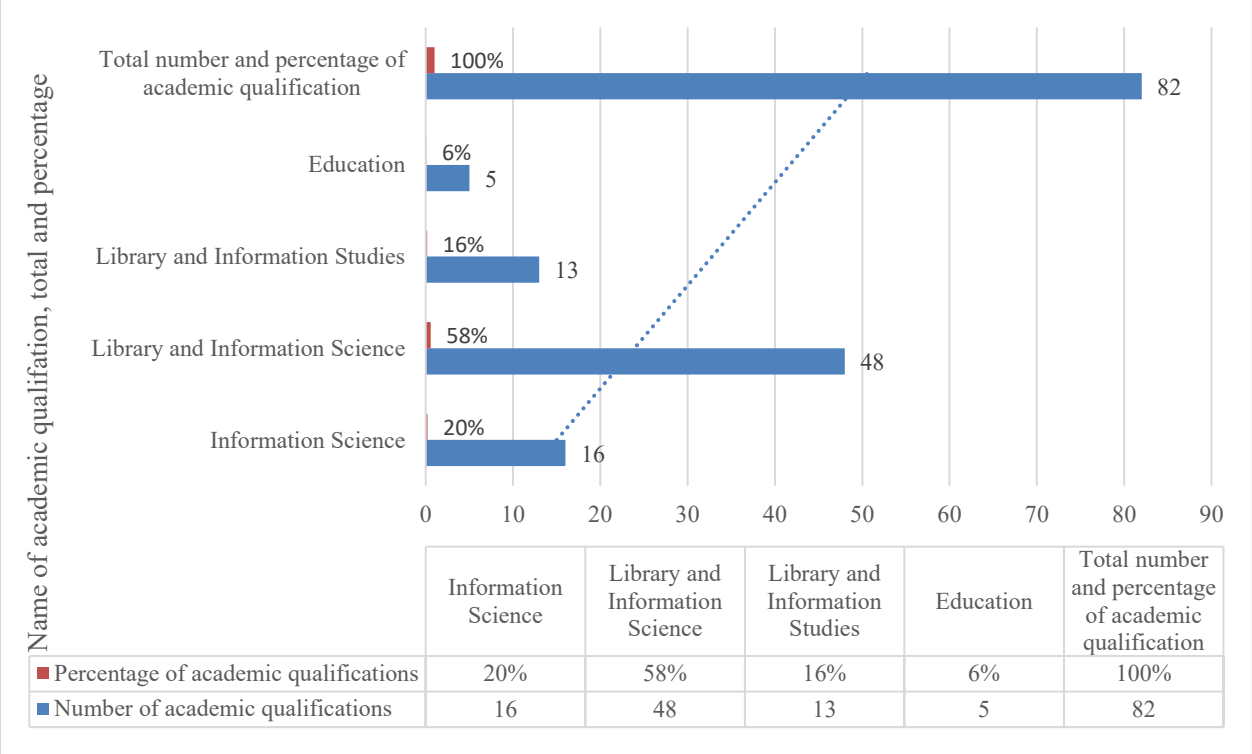
[N=72]

In Figure 5.1, participants are arranged from UoTs with the highest responses to the lowest responses in the web-based survey. Majority of respondents [19 (26%)] that participated in this study were from UoT 3, whilst a very small minority of respondents [5 (1%)] can be attributed to UoTs 2 and 4. However, the difference in responses from theses UoTs must be viewed in perspective. Some UoTs have a smaller number of academic librarians with a teaching profile since the institutions they work at are much smaller in size compared to other UoTs. Therefore,

UoTs with a less significant population size have fewer academics librarians with a teaching profile, and this could attribute to a lower response rate for the web-based survey. Furthermore, the 7 UoTs were listed, and respondents had to select the UoT they were working at when responding to this question in the web-based survey. The response rate from academic librarians at UoTs for this study was good. From a total of approximately 77 academic librarians with a teaching profile at UoTs, 72 (94%) responded to the web-based survey. In terms of the UoTs, the researcher used acronyms with a value as illustrated in Figure 5.1 to present each UoT and the total responses of academic librarians. This is in keeping with the ethical practices of research and confidentiality, including disclosure agreements. The researcher advocated this in the research methodology chapter of this study. Therefore, the names of the UoTs are not disclosed in Figure 5.1. The researcher used the same acronyms for the UoTs as identified in Figure 5.1 for the rest of this study when referring to the above-mentioned institutions.

5.3.2.2 Pedagogical Knowledge

5.3.2.2.1 Academic librarians at UoTs in South Africa and type of qualifications



	Information Science	Library and Information Science	Library and Information Studies	Education	Total number and percentage of academic qualification
Percentage of academic qualifications	20%	58%	16%	6%	100%
Number of academic qualifications	16	48	13	5	82

Figure 5.2: Academic librarians at UoTs and type of qualifications

[N=72]

To ascertain the type of qualifications academic librarians with a teaching profile at UoTs in South Africa obtained, respondents were asked to state their qualifications. Respondents were allowed to select more than one option for this question as some may have obtained a qualification in library and education. Therefore, the total and percentage [82 (100%)] is higher than the number of respondents, which is seventy-two (72). It is evident from Figure 5.2 that the majority of respondents obtained library qualifications. A combined ninety-four percent (94%) of respondents obtained library qualifications, whilst a very small minority of five respondents (6%) had a qualification in education. This was one the major concerns of Raju (2017: 266), who stated that there is a disconnect between LIS Schools in South Africa and the importance of academic librarians obtaining pedagogical knowledge for the workplace. Furthermore, the linear trend line illustrated in Figure 5.2 demonstrates that there is currently a consistent increase in library qualifications with minimal emphasis to pursue a qualification in education to support teaching at UoTs in South Africa. Figure 5.2 also leans towards agreeing with the descriptive analysis in Table 5.2 in which the overall pedagogical knowledge was lower than technological and content knowledge.

5.3.2.2.2 Academic librarians at UoTs and online instructional strategies

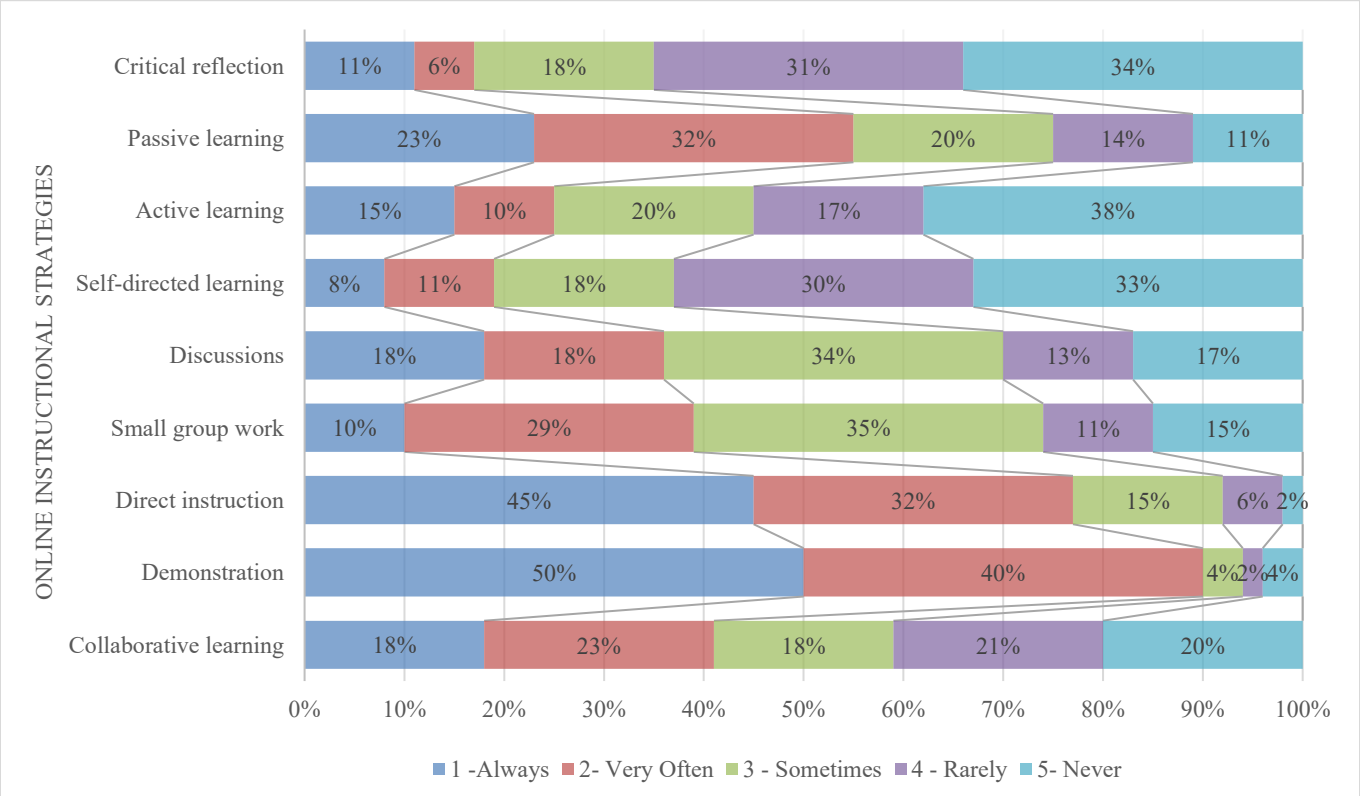


Figure 5.3: Academic librarians at UoTs and online instructional strategies

[N=72]

A 5-point Likert scale was used in Figure 5.3 to explore the instructional strategies academic librarians at UoTs used for online teaching. The findings demonstrated differing online teaching methods. A combined majority of ninety percent of respondents (90% - demonstration), seventy-seven percent of respondents (77% - direct instruction) and fifty-five percent of respondents (55% - passive learning) indicated using these types of instructional strategies *always or very often* when transferring information in a digital environment to students. A collective majority of sixty-four percent of respondents (64% - discussions), eighty-one percent of respondents (81% - self-directed learning), seventy-five percent of respondents (active learning - 75%) and seventy eight percent of respondents (78% - critical reflection) summarised that these types of instructional strategies was *never or rarely* used for online teaching. This implies that academic librarians used a more passive rather than active teaching style when engaging with students in digital learning. One can assume that the reason for this could be a lack in the technological pedagogical knowledge (TPACK) related to online teaching. Technological pedagogical knowledge is when a facilitator introduces

innovative new pedagogical affordances in online teaching using technology (Kohler and Mishra 2009). The facilitator understands how technological tools can be deployed with relevant pedagogical knowledge to a particular lesson, thereby enhancing the instructional method used and learning experience of students in a digital environment.

5.3.2.2.3 Pedagogical knowledge for online teaching and academic librarians at UoTs in South Africa

Table 5.5: Pedagogical knowledge for online teaching and academic librarians at UoTs in South Africa

Pedagogical knowledge for online teaching	**1 – Strongly Agree**	**2- Agree**	**3 - Undecided**	**4 - Disagree**	**5- Strongly Disagree**
I acquired knowledge for online teaching through a Library and Information Science qualification	10%	11%	5%	7%	67%
I acquired knowledge for online teaching through work related development	36%	18%	1%	2%	42%
I acquired knowledge for online teaching through independent professional development (personally funded)	10%	8%	14%	8%	60%
I acquired knowledge for online teaching through a previous library position through practice	17%	11%	10%	1%	61%
I acquired knowledge for online teaching through a formal teaching certificate, diploma or degree	8%	7%	8%	4%	73%
I acquired knowledge for online teaching through work colleagues	54%	38%	5%	3%	0%

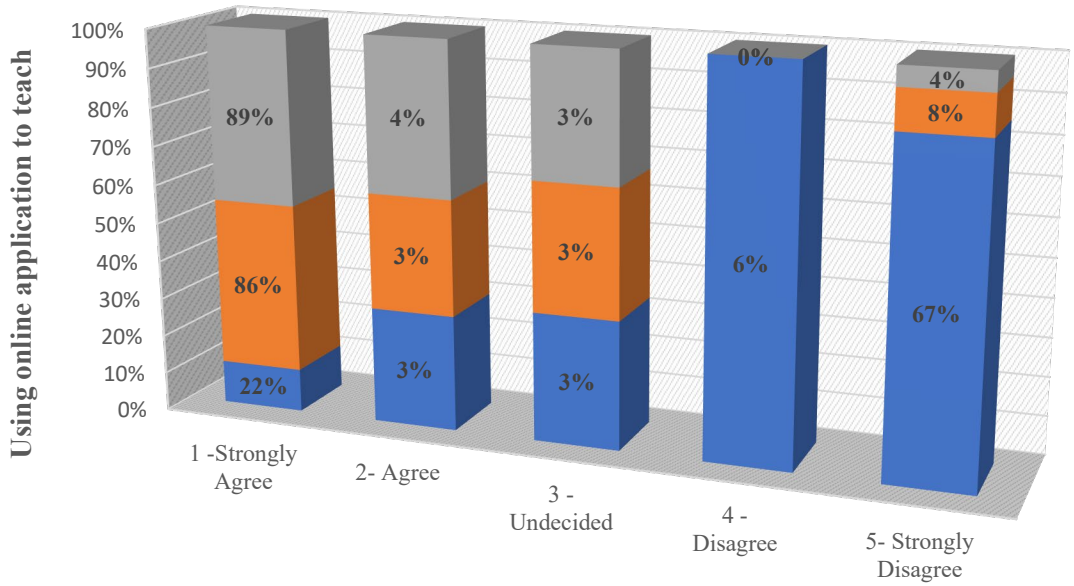
N [72]

A 5-point Likert scale was used in Table 5.5 to determine how academic librarians at UoTS acquired pedagogical knowledge (TPACK) for online teaching since this is a recent development in the higher education sector. These findings evidently illustrate that a combination of sixty-seven percent (67% - Library and Information Science qualification), sixty-percent (60% - independent professional development (personally funded) and seventy-three percent (73%- formal teaching certificate, diploma and degree) of respondents either *disagreed or strongly disagreed* that pedagogical knowledge was acquired through Library and Information Science Schools,

professional development (personally funded) or a formal qualification (highlight -blue). A combined twenty-seven percent (27%) of respondents remained *undecided* in terms of pedagogical knowledge and if it was acquired through Library and Information Science Schools, professional development, or a formal qualification (highlight -light green). A combined fifty-four percent (54%) *strongly agree or agree* that pedagogical knowledge was acquired through Library and Information Science Schools, professional development (personally funded) or a formal qualification (highlight -orange). This is interesting since Omar Saib *et al*. (2022: 1-13) and Raju (2017:251-269) highlight that academic librarians in South Africa lack the pedagogical knowledge related to library instruction because there is no formal offering in Library Science Schools in South Africa that covers this topic. However, it was also noteworthy to indicate that there is a gradual increase in work-related professional development opportunities in acquiring pedagogical knowledge for online teaching as a combined fifty-four percent (54%) respondents indicated in Table 5.5 (highlight - purple). Moreover, there is also a combined thirty-two (44%) respondents who *disagreed or strongly disagreed* with opportunities being available for work-related professional development at UoTs related to acquiring pedagogical knowledge for online teaching (highlight – pink). The result that the researcher found most intriguing in Table 5.5 is related to academic librarians at UoTs acquiring knowledge for online teaching through work colleagues. A combined majority of ninety-two percent (92%) of respondent either *strongly agree or agree* that pedagogical knowledge for online teaching in academic libraries at UoTs in South Africa was acquired through work colleagues (highlight - light grey).

5.3.2.3 Technological Knowledge

5.3.2.3.1 Academic librarians and using online applications to teach library instruction



	1 -Strongly Agree	2- Agree	3 - Undecided	4 - Disagree	5- Strongly Disagree
My online library instruction applications such as MS Teams and Zoom increased during the Covid 19 pandemic	89%	4%	3%	0%	4%
My first exposure to using applications such as MS Teams and Zoom was during the Covid 19 pandemic	86%	3%	3%	0%	8%
Online library instruction using applications such as MS Teams and Zoom before the Covid 19 pandemic	22%	3%	3%	6%	67%

Figure 5.4: Academic librarians and using online applications to teach

[N=72]

Figure 5.4 presents results wherein the researcher explored the point at which respondents start using online applications such as MS Teams and Zoom for online teaching. A combined majority of seventy-three percent (73%) of respondents *strongly disagreed or disagreed* that online applications such as MS Teams and Zoom were used prior to the Covid-19 pandemic. In terms of exposure to using these applications, a combined majority of eighty-nine percent (89%) of respondents *strongly agreed or agreed* that MS Teams and Zoom were used for the first time for

online teaching during the Covid-19 pandemic. Furthermore, a combined majority of ninety-three percent (93%) of respondents *strongly agreed or agreed* that the use of these applications for online teaching increased during the Covid-19 pandemic. It is interesting to note that a large majority of seventy-three percent (73%) of respondents were not using these online applications to teach prior to Covid. However, this exceedingly increased during the pandemic. When the percentages of these two items within the 5-point Likert scale, *exposure to using these applications for the first time and during the pandemic,* are added and divided using the *strongly agreed or agreed* options, the average percentage result is ninety-one percent (91%). Noor *et al.* (2020 169:184) agree that applications such as MS Teams were used astronomically for online teaching during the pandemic.

5.3.2.3.2 Academic librarians and e-Learning leadership roles at UoTs

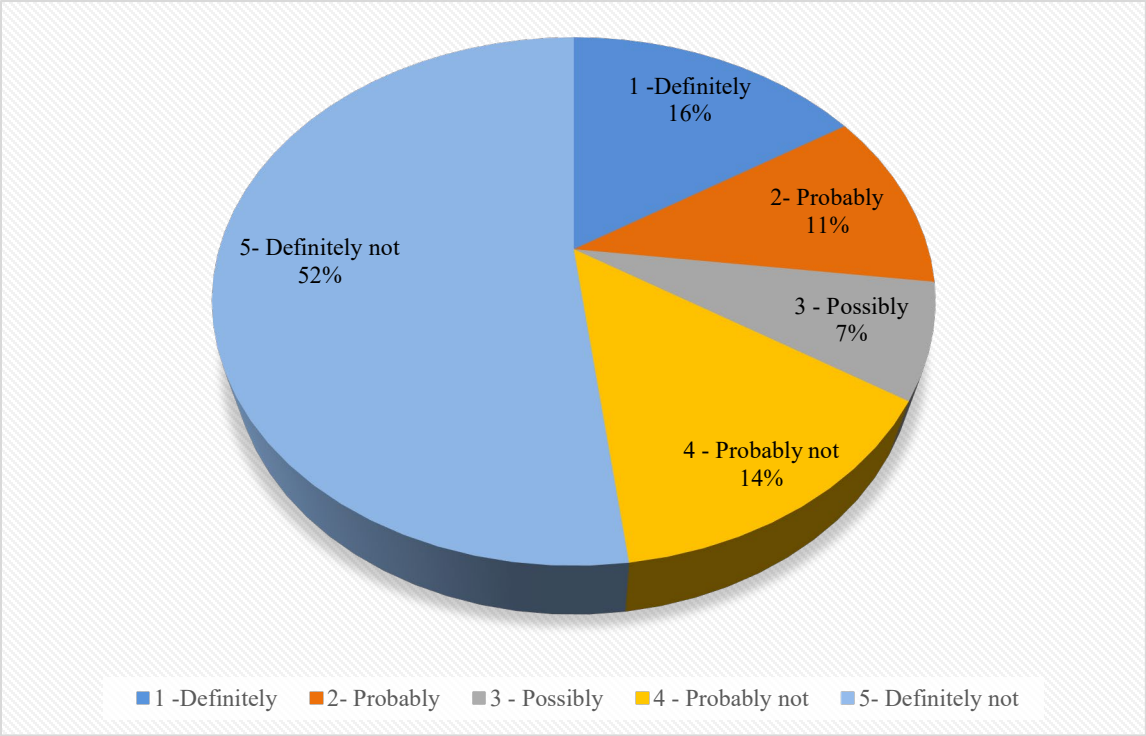


Figure 5.5: Academic librarians and e-Learning leadership roles

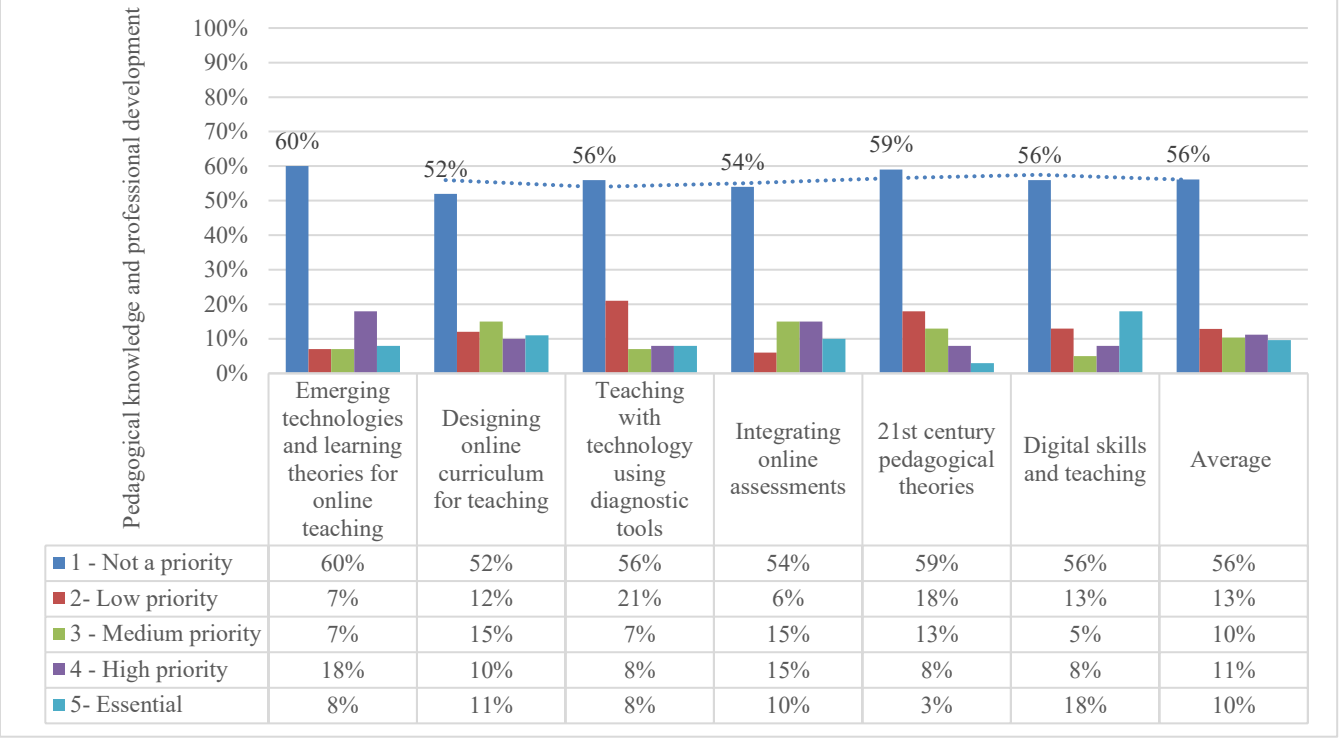
[N=72]

Figure 5.5 presents the results about leadership roles in e-Learning. Respondents were asked about leadership roles in e-Learning or as education technologists. A combined majority of sixty-six

percent (66%) of respondents indicated *definitely not or probably not* as identifying with having a leadership role in eLearning or as an educational technologist. This was followed by a combined minority of twenty-seven percent (27%) of respondents who indicated identifying with having a leadership role in e-Learning and as an educational technologist.

5.3.2.4 Technological Pedagogical Knowledge

5.3.2.4.1 Pedagogical knowledge for online teaching and the professional development of academic librarians at UoTs in South Africa



	Emerging technologies and learning theories for online teaching	Designing online curriculum for teaching	Teaching with technology using diagnostic tools	Integrating online assessments	21st century pedagogical theories	Digital skills and teaching	Average
1 - Not a priority	60%	52%	56%	54%	59%	56%	56%
2- Low priority	7%	12%	21%	6%	18%	13%	13%
3 - Medium priority	7%	15%	7%	15%	13%	5%	10%
4 - High priority	18%	10%	8%	15%	8%	8%	11%
5- Essential	8%	11%	8%	10%	3%	18%	10%

Figure 5.6: Pedagogical knowledge for online teaching and professional development

[N=72]

Figure 5.6 presents results wherein respondents were asked whether they considered professional development a priority or essential for online teaching. The topics covered included emerging technologies, designing online curriculum, diagnostic too tools, assessments, learning theories and digital skills. The average per topic presented in Figure 5.6 illustrates how respondents perceived the importance of these themes in relation to professional development and online teaching. A combined majority of sixty-nine (69%) respondents indicated that these topics were not a *priority*

or a low priority, whilst a collective minority of twenty-one percent (21%) revealed this was a *high or essential priority*. The remaining ten percent (10%) of respondents suggested that pedagogy related to online teaching was of *medium priority.* However, according to Eclevia (2022: 16-17), these topics are essential for academic librarians involved in online teaching. The findings also revealed that respondents did not perceive digital skills as being a priority for online teaching. This was one of the areas the researcher mentioned he will further explore when examining the descriptive statistics. A collective minority of twenty-six percent (26%) also revealed that these topics was a *high or essential priority*. The remaining five percent (5%) of respondents suggested that digital skills was of *medium priority* related to online teaching.

5.3.2.4.2 Modes of online library instruction

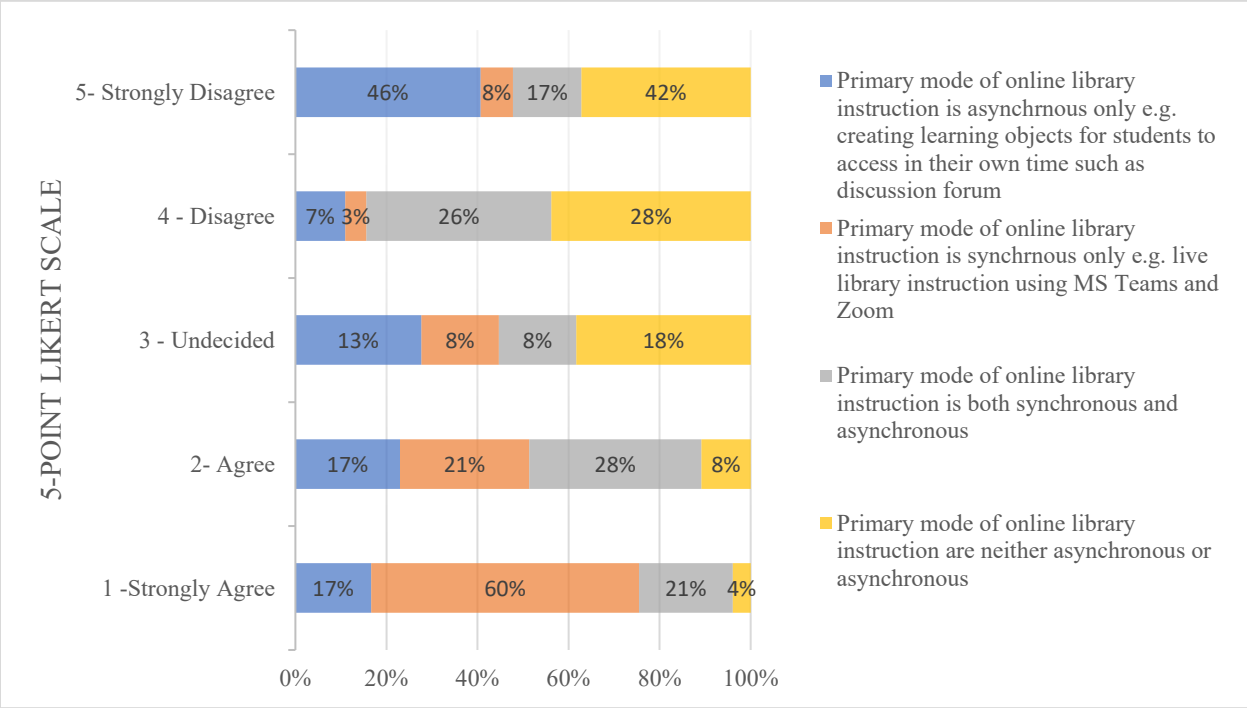


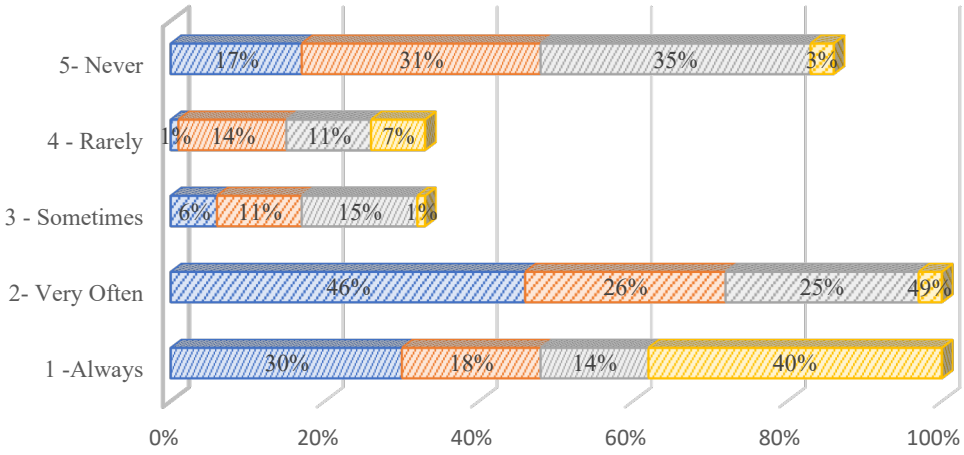
Figure 5.7: Modes of online library instruction

[N=72]

A 5-point Likert scale consisting of four items was used to measure the modes of online library instruction as illustrated in Figure 5.7. A combined majority of eighty-one percent (81%) of respondents *strongly agreed or agreed* that the primary mode of online instruction is synchronous only (e.g., live library instruction using MS Teams and Zoom). A collective forty-nine percent

(49%) of respondents also *strongly agreed or agreed* that the primary mode of online instruction is both synchronous and asynchronous. Furthermore, a combined fifty-three percent (53%) of respondents *strongly disagreed or disagreed* that the primary mode of online instruction is asynchronous only (e.g., creating learning objects for students to access in their own time such as discussion forums). This aligned with Figure 5.3, in which most respondents used direction instructions through synchronous channels only for online teaching.

5.3.2.4.3 Teaching and learning environments



	1 -Always	2- Very Often	3 - Sometimes	4 - Rarely	5- Never
I have been providing library instruction in a completely online learning environment	30%	46%	6%	1%	17%
I have been providing library instruction in a blended environment	18%	26%	11%	14%	31%
I have been providing library instruction in a hybrid environment	14%	25%	15%	11%	35%
I have been providing library instruction in a face to face environment	40%	49%	1%	7%	3%

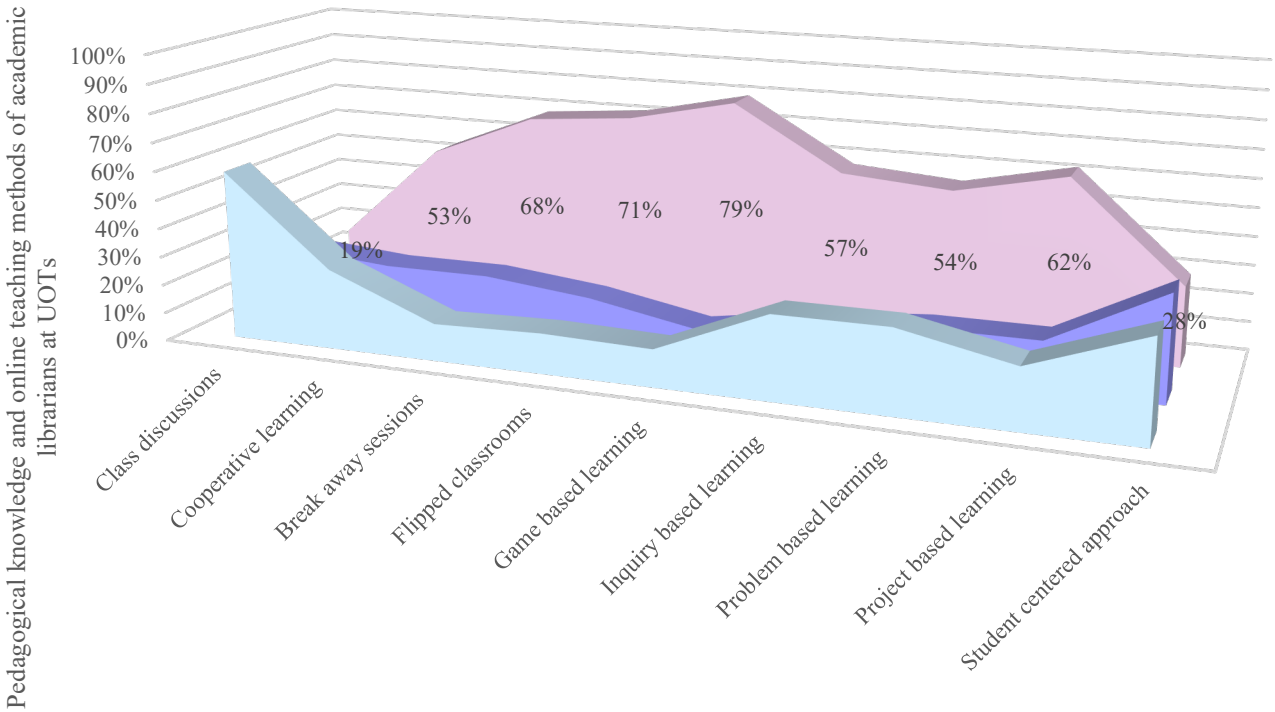
Figure 5.8: Teaching and learning environments

[N=72]

Multimodal learning environments became a reality in higher education institutions during the Covid-19 pandemic (Alameri *et al*. 2020: 21-33). The use of online applications such as Zoom and MS Teams was the medium used for teaching and learning as illustrated in Figure 5.7. In Figure 5.8, a combined majority of seventy-six percent (76%) of respondents indicated *Always or Very Often* using the online environment to teach library instruction. This is presumably related to social distancing policies at the time due to the pandemic as lectures were taking place remotely. At the

same time, a combined majority of eighty-nine percent (89%) of respondents revealed *Always or Very Often* using face-to-face as the learning environment for teaching library instruction. This can be attributed to respondents' experiences prior to the Covid-19 pandemic. In terms of using a blended learning environment for library instruction, a combined forty-five percent (45%) of respondents *Rarely or Never* taught students through this approach. A combined forty-four percent (44%) *Always or Very Often* used a blended learning approach for library instruction. Furthermore, hybrid learning for library instruction was *Rarely or Never* used, as indicated by a combined forty-six percent (46%) of respondents, whereas a collective thirty-nine percent (39%) revealed using the hybrid environment for library instruction.

5.3.2.4.4 Pedagogical knowledge and online teaching methods



	Class discussions	Cooperative learning	Break away sessions	Flipped classrooms	Game based learning	Inquiry based learning	Problem based learning	Project based learning	Student centered approach
Always and very often combined	59%	28%	13%	14%	13%	29%	29%	21%	35%
Sometimes	22%	19%	19%	15%	8%	14%	17%	17%	37%
Rarely and never combined	19%	53%	68%	71%	79%	57%	54%	62%	28%

Figure 5.9: Pedagogical knowledge and online teaching methods of academic librarians at UoTs

[N=72]

Some of the most common online teaching methods for effective learning outcomes include problem-based learning, game-based learning, flipped classrooms, student-centered approach, inquiry-based learning, project-based learning, break-away sessions, and cooperative learning (Saiyad *et al*. 2020; Hannigan and Gonzales 2019). Respondents were asked about the type of online teaching methods used in library instruction. A combined majority of fifty-four percent of respondents (54% - problem-based learning), seventy-nine percent of respondents (79% - game-based learning), seventy-one percent of respondents (71% - flipped classrooms), fifty-seven percent of respondents (57% - inquiry-based learning), sixty-two percent of respondents (62% - project-based learning), sixty-eight percent of respondents (68% - break away sessions) and fifty-three percent of respondents (53% - cooperative learning) indicated that these types of teaching methods was *rarely and never* used for online library instruction. Class discussions were the only online teaching methods that nine percent (59%) of respondents applied in a digital classroom. The findings in Figure 5.9 share a similar alignment to Figure 5.3 and the instructional strategies used in online library instruction. The instructional strategies deployed are of a passive nature in Figure 5.3 and lack engaging students through active learning styles in an online environment. The same patterns of engagements exist in the teaching methods explored in Figure 5.9 for this study.

5.3.2.4.5 Academic librarians and digital tools for online instruction

Table 5.6: Digital tools and online library instruction

Digital tools to teach	1 - Always	2- Very Often	3 - Sometimes	4 - Rarely	5- Never
Video tutorials	50%	35%	8%	4%	3%
Microsoft Office applications	34%	11%	22%	14%	19%
Moviemaker application	4%	3%	11%	14%	68%
Online library guides	59%	24%	10%	1%	6%
Mobile technologies	10%	14%	15%	11%	50%
Social media	7%	11%	19%	10%	53%
Learning objects (digital or open educational resources)	11%	13%	18%	8%	50%
Instant messaging	4%	8%	17%	11%	60%
Web based modules	21%	27%	24%	11%	17%

N [72]

Table 5.6 presents the results from respondents pertaining to digital tools and online teaching. A combined majority of eighty-five percent (85%) of respondents either indicated *always or very often* using video tutorials. Similarly, an identical pattern exists with the use of online library guides in relation to online teaching. A collective majority of eighty-three percent (83%) of respondents indicated either *always or very often* using online library guides for online library instruction. Academic librarians generally use online library guides and video tutorials as digital tools for teaching (Rafi, Jianming and Ahmad 2019: 203-217). Video tutorials and online library guides are digital tools that instructors use to transfer information to students. This allows students to internalise the information whilst learning. These types of digital tools do not afford students the opportunity to provide any feedback and reflect about the video tutorial or library guide. However, digital tools such as movie-maker applications, mobile technologies and learning objects (digital or open educational resource) provide opportunities for the instructor and students to actively engage in the online teaching and learning process through feedback, reflection, and creation. In Figure 5.6, a large combined majority of eighty-two percent (82%) of respondents *rarely or never* use movie-maker as a digital tool to enhance learning for online library instructions. Similar patterns exist in Table 5.6 for digital tools such as mobile technologies, learning objects social media and instant messaging. A combined majority of sixty-one percent (61%) of respondents *rarely or never* use mobile technologies for online instruction. Furthermore, a collective majority of respondents [sixty-three percent (63%) social media]; learning objects [fifty-eight percent (58%)] and instant messaging [seventy-one percent (71%)] also *rarely or never* use these tools for online instruction. It is interesting to note that a combined forty-five percent (45%) of respondents *always and very often* use Microsoft application. Assuming one adds the forty-five percent (45%) of respondents with twenty-two percent of respondents (22%) who indicated *sometimes* using Microsoft applications, this would then mean that sixty-seven percent (67%) of respondents use Microsoft applications. However, in most instances, online facilitators use PowerPoint as the primary Microsoft application tool for online teaching. This can be compared to face-to-face teaching using the principle of 'chalk and talk', with the instructor directing the learning. Thus, although the descriptive statistics in Table 5.2 and inferential statistics using Pearson Product Moment Correlations in Table 5.3 illustrate that academic librarians have content knowledge that is limited. Academics do have technological content knowledge (TCK) for online

teaching, but this is limited to passive and not active digital tools when creating content that will allow students to engage in learning through the influence of technology.

5.3.2.4.6 Academic librarians and learning management systems (LMSs)

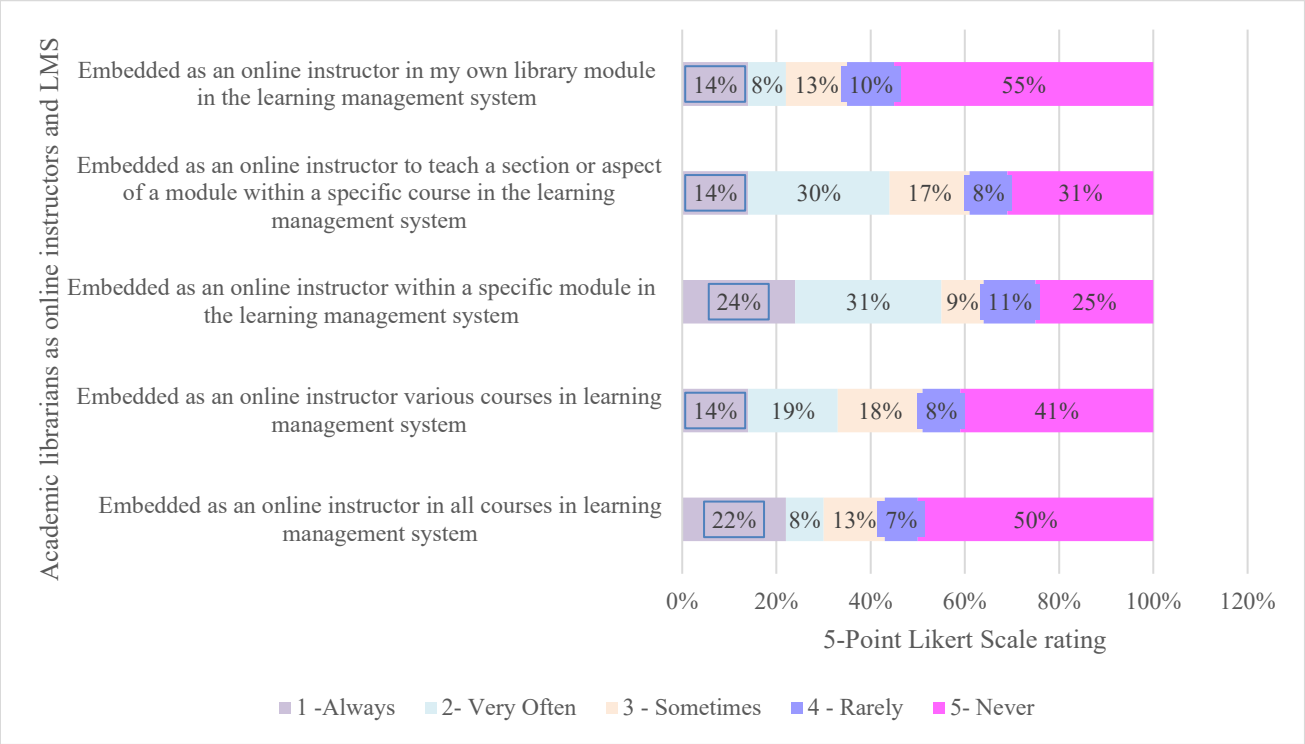


Figure 5.10: Academic librarians and learning management systems

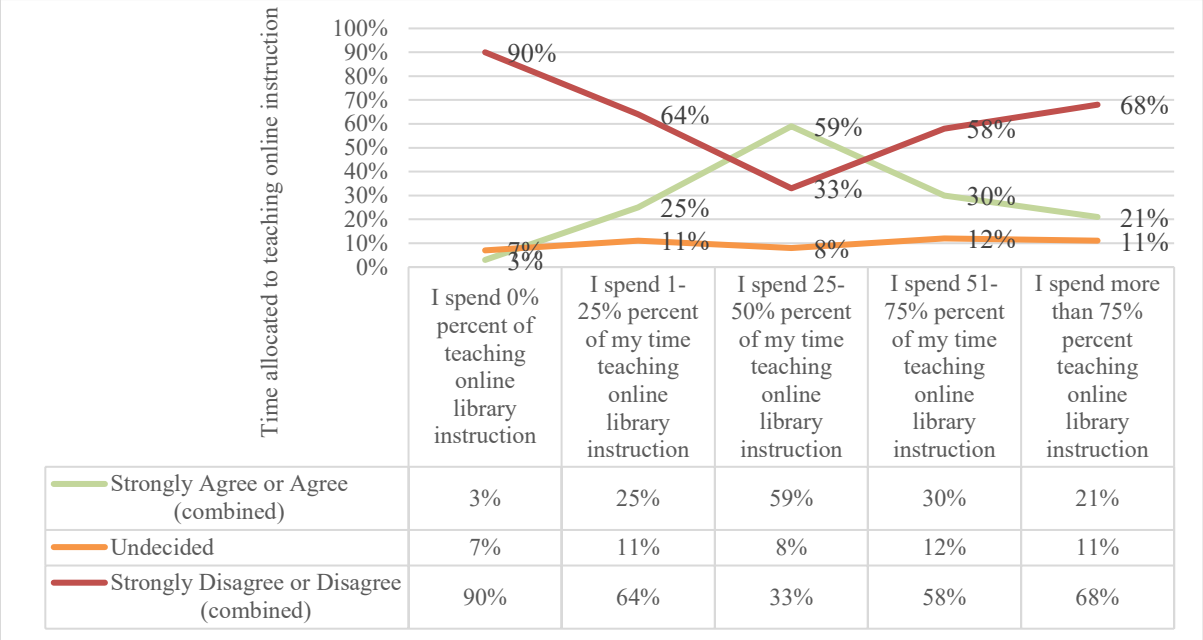
[N=72]

Figure 5.10 presents the results from respondents online instructor roles when using learning managements systems to asynchronously engage with students. Although library instruction is not ubiquitous at UoTs, a combined forty-four percent (44%) of respondents revealed *always or often* being embedded in a learning management system to teach a section or aspect of a module. However, a collective thirty-nine percent (39%) of respondents also stated *rarely or never* being embedded in a learning management system to teach a section or aspect of a module. A similar balance existed within the 5-point Likert scale for respondents embedded as online instructors within a specific module, with forty-six percent (46%) *rarely or never* being embedded whilst forty-five percent (45%) indicating *always or often* embedded into a specific module. The distinct differences existed in the last two items in Figure 5.10. A combined forty-nine percent (49%) of respondents indicated *rarely or never* are they embedded in various modules in the learning

management system at UoTs. A collective fifty-seven percent (57%) of respondents are not embedded as online instructors in all modules whilst a combined twenty-nine percent (29%) of respondents are embedded as online instructors in all modules at UoTs in South Africa. Hays and Handler (2020: 127-140) posit that the emphasis on using learning management systems to teach library instruction occurred during the Covid-19 pandemic. The findings from Figures 5.8 and 5.10 concur as teaching in a digital environment, including using learning management systems, became a reality during Covid-19.

5.3.2.5 Pedagogical Content Knowledge

5.3.2.5.1 Academic librarians and time allocated to preparing content for online instruction



	I spend 0% percent of teaching online library instruction	I spend 1-25% percent of my time teaching online library instruction	I spend 25-50% percent of my time teaching online library instruction	I spend 51-75% percent of my time teaching online library instruction	I spend more than 75% percent teaching online library instruction
Strongly Agree or Agree (combined)	3%	25%	59%	30%	21%
Undecided	7%	11%	8%	12%	11%
Strongly Disagree or Disagree (combined)	90%	64%	33%	58%	68%

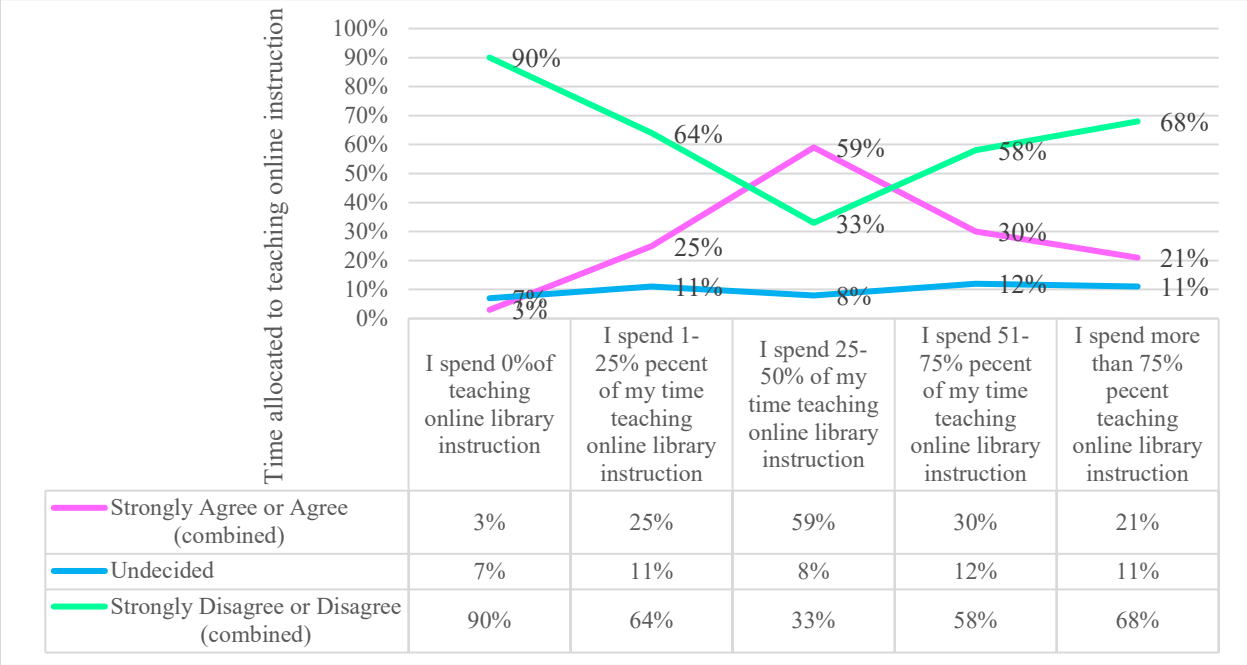
Figure 5.11: Academic librarians and time allocated to preparing content for online instruction

[N=72]

Figure 5.11 presents the results of respondents' time allocated for preparing content for online instruction as facilitators. A combined majority of seventy-one percent (71%) of respondents *strongly disagreed or disagreed that* more than seventy-five percent (75%) of their working time was spent in preparing content for online instruction. This was followed by a combined fifty-seven percent (57%) of respondents that also *strongly disagreed or disagreed* that fifty-one to

seventy-five percent (51%-75%) of their working time was spent in preparing content for online instruction. A collective fifty-seven percent (57%) of respondents *strongly agreed or agreed* that twenty-five to fifty - percent (25%-50%) of their working time is spent in preparing content for online instruction, whilst thirty-two percent (32%) of respondents *strongly agreed or agreed* that one to twenty -five percent (1%-25%) of their working time is spent in preparing content for online instruction.

5.3.2.5.2 Academic librarians and time allocated in teaching online library instruction



	I spend 0%of teaching online library instruction	I spend 1-25% pecent of my time teaching online library instruction	I spend 25-50% of my time teaching online library instruction	I spend 51-75% pecent of my time teaching online library instruction	I spend more than 75% pecent teaching online library instruction
Strongly Agree or Agree (combined)	3%	25%	59%	30%	21%
Undecided	7%	11%	8%	12%	11%
Strongly Disagree or Disagree (combined)	90%	64%	33%	58%	68%

Figure 5.12: Academic librarians and time allocated in teaching online instruction

[N=72]

Figure 5.12 presents the results wherein respondents were questioned concerning the time allocated for teaching online instruction as facilitators. A combined majority of sixty-eight percent (68%) of respondents *strongly disagreed or disagreed that* more than seventy-five (75%) of their working time was spent teaching online instruction. This was followed by a combined fifty-eight percent (58%) of respondents that also *strongly disagreed or disagreed* that fifty-one to seventy - five percent (51%-75%) of their working time was spent teaching online instruction. A combined fifty-nine percent (59%) of respondents *strongly agreed or agreed* that twenty-five to fifty - percent (25%-50%) of their working time is spent teaching online instruction, whilst twenty-five

percent (25%) of respondents *strongly agreed or agreed* that one to twenty - five percent (1%-25%) of their working time is spent teaching online instruction.

5.3.2.6 Technological Content Knowledge

5.3.2.6.1 Digital creation tools used for online teaching and academic librarians

Table 5.7: Digital creation tools used for online library instruction

Digital teaching and learning tools	1 -Always	2- Very Often	3 - Sometimes	4 - Rarely	5- Never
Presentation software e.g., Sway and WhiteBoard	13%	8%	14%	5%	60%
Video production software e.g., Wondershare Flimora and Doodly	10%	3%	11%	11%	65%
Screen capturing software e.g., Camtasia and Droplr	13%	5%	5%	11%	66%
Online author tools e.g., Storyline and Adobe Captivate	5%	2%	11%	9%	73%
Web authoring tools e.g., Content Management systems and Library Online Guides	63%	21%	8%	3%	5%
Learning management systems e.g., Blackboard and Moodle	45%	18%	6%	6%	25%
Educational/learning technologies e.g., EdPuzzle and Peardeck	13%	10%	11%	8%	58%
Video conferencing platforms to teach e.g., MS Teams and Zoom	68%	23%	2%	2%	5%
Gamification e.g., Kahoots	6%	3%	8%	10%	73%
Total average	**26%**	**10%**	**8%**	**7%**	**48%**

N [72]

In Table 5.7, the researcher explored the digital creation tools that academic librarians at UoTs in South Africa used to enhance online teaching. In the 5-point Likert scale, the categories *Always or Very Often and Rarely or Never* were combined to ascertain the production, web authoring and

educational tools that academic librarians engaged with to design content that was integrated into online lessons. A combined majority of sixty-five percent (65% - presentation software), seventy-six percent (76% - video production software), eighty-two percent (82% - online author tools), sixty-six percent (66% - educational/learning technologies) and eighty-three percent (83% - gamification) of respondents under the 5-point Likert scale *categories 4 (Rarely) and 5 (Never)* revealed that academic librarians at UoTs in South Africa lack in the use of digital creation tools to enhance online library instruction. However, under the categories *1 (Always) and 2 (Very Often),* the findings also indicated that a combined ninety-one percent (91%) of respondents used video-conferencing platforms such as MS Teams for online library instruction. This indicates that a high volume of library instruction was conducted using the digital environment. However, the video-conferencing platform are tools like face-to-face environments when delivering library instruction. These environments, such as MS Teams or a physical classroom, is just the setting for teaching and learning. The critical component when teaching in multi-modal environments is the overlapping relationships between pedagogical, technological, and content knowledge to make the learning experience meaningful for students (Omarsaib 2022: 259-260).

5.3.3 Presentation of the qualitative findings (semi-structured interviews) with academic librarians at UoTs

In the previous section, the objectives were to explore the pedagogical and digital skills of academic librarians at UoTs in South Africa. The data was collected, analysed and presented empirically through an objective lens. This was coordinated using a web-based survey (refer to sections 5.2 and 5.3). The other objectives were to probe whether academic librarians at UoTs in South Africa have an online teaching presence, including digital pedagogies, when engaging with students in an online environment.

This section presents the findings from the semi-structured interviews conducted with 11 academic librarians from UoTs in South Africa (refer to Annexure I). However, in this instance, one of the objectives was to ascertain the digital pedagogies of academic librarians at UoTs in South Africa for online teaching. The second objective was to probe the type of online teaching presence of academic librarians when engaging with students in a digital environment at UoTs in South Africa. In this instance, the data was collected, transcribed, coded, thematically analysed and presented through an interpretivist lens.

Furthermore, in designing the semi-structured interview schedule, two independent variables from the web-based survey (pedagogical and technological knowledge) were prioritised. The researcher also designed the semi-structured interview schedule by reflecting upon the theoretical frameworks from this study. The following two independent variables, pedagogical and technological knowledge (TPACK), was mixed with probing the teaching, social and cognitive presence in online teaching (CoI) for the design of the semi-structured interview schedule. The reason the researcher mentions this is that the findings from the overall quantitative analysis guided the research into the qualitative second phase. It created the platform to design the semi-structured interview schedule and use the data from one instrument (web-based survey) with the theoretical frameworks to explore the phenomenon for the next stage. It also directed the researcher to further delve into the quantitative data through the descriptive statistics to determine the pedagogical knowledge and digital skills of academic librarians at UoTs in South Africa. Thus, the explanatory sequential mixed method approach was being endorsed in this study through the findings.

The responses from the semi-structured interviews were analysed using NVivo 13 for Windows software. The researcher used the software to transcribe, code and create themes for topics that were germane to this study. Codes are themes that a researcher identifies in the data as it shows patterns of meaning related to the research problem. These themes emanate once the data is read and transcribed before being coded from the data file imported into NVivo. A code or theme that is created is termed a node in NVivo. The node is a container were all the relevant content linked to a theme is housed under a specific heading related to the study. In certain instances, transcribed passages can refer to several nodes (themes) and therefore will contribute to more than one theme in a study.

In this study, the themes that originated preceding the semi-structured interviews with academic librarians at UoTs are presented in narratives. Furthermore, wherever possible, word frequency counts and word trees relevant to the themes are illustrated. Purposive sampling, a form of non-probability sampling, was used to collect research data from the seven UoTs in South Africa since the academic librarians with a teaching profile have specific characteristics related to the field of Library and Information Science.

5.3.3.1 Academic librarians and the online teaching role at UoTs in South Africa

When asked about their online teaching role as academic librarians, the respondents mentioned that this form of instruction only started during the Covid-19 pandemic. Respondents also emphasised online instruction as an important method of teaching. The criteria used to identify with online teaching included setting clear expectations, making it engaging for students, setting clear goals and management of the online classroom.

Participant 1

'My role teaching in the digital environment only started during Covid 19. Previously I was only involved in face-to-face instruction. 'There was no blended, hybrid, or online library instruction that I was involved in prior to the Covid 19 pandemic.'

Participant 2

'The UoT I work for had not adopted online learning as other universities in South Africa did prior to the pandemic. This made it difficult to use technology for online teaching at my institution during the pandemic.'

Participant 4

'My role as an online facilitator is guided by my lesson plans when I am in class. I see myself as a facilitator who guides students through self-paced and student-centered learning approaches, simultaneously ensuring regular feedback for activities, exercises, and tasks.'

Participant 5

'Prior to the Covid 19 pandemic I was only involved in face-to-face instruction. I had to learn to teach with technology at a fast pace. It was learning for myself whilst teaching. I also reflected upon the content I delivered in the online classroom. This helped me improve my delivery of library instruction'.

Participant 7

'I learned how to teach online as I engaged in the digital environment. I also asked for assistance from colleagues.'

Participant 11

'My role teaching in the digital environment only started during Covid 19. Previously I was only involved in face-to-face instruction. The digital environment was not fundamental to teaching and learning prior to the pandemic although it did exist at my university.'

5.3.3.2 Academic librarians and online teaching methods

Respondents were asked about the various teaching methods used to enhance the online learning experience for students. Most respondents indicated using content-focused methods such as MS PowerPoint and video tutorials. However, a few respondents did engage students using student-centered and interactive teaching methods.

Participant 1

'Group work using breakaway sessions on MS Teams followed by a short presentation including feedback and comments. Short activities and feedback using emoticons, polls, and quizzes. The use of using emoticons, polls, and quizzes is to accommodate the passive learning student. The pre-recorded lesson with activity didn't work well.'

Participant 3

'I only use PowerPoint presentations, pre-recorded videos, and practical demonstrations.'

Participant 6

'The online teaching methods I use includes, breakaway groups, PowerPoint presentations and video tutorials. Video recordings for students to view asynchronously make notes about the topic and discuss in the online class when we meet for a lecture.'

Participant 7

'The online teaching methods I use include PowerPoint presentations, video tutorials, video recordings for students to view asynchronously.'

Participant 9

'I only use PowerPoint presentations, the internet, and pre-recorded video.'

Participant 11

'I only use PowerPoint presentations and demonstrate to students using the internet.'

5.3.3.3 Academic librarians and face-to-face vs online teaching

In this question, the researcher aimed to probe the experiences of academic librarians when teaching in a virtual compared to a physical setting. The digital compared to the physical environment presents a different form of design, preparation, instruction, assessment and reflection for instructors and students. The experiences of academic librarians in using the virtual environment to deliver library instruction provided insightful responses from participants.

Participant 2

'My teaching practices changed in the digital environment. It includes concise and precise presentations because of limitations for students such as access to devices and data for online learning. Content has changed to accommodate the students since their concentration span is limited in the online environment.'

Participant 3

'My teaching practices changed in the digital environment to include self-pace approach learning for students, flexibility to allow students to learn outside the class, independent learning so students can access content through videos outside the online class. Challenge to decide on how to engage students when teaching in the digital environment within the online class i.e., synchronously.'

Participant 5

'Flexibility when learning so my online lesson will have random questions to students to engage students in the learning, however, this can be challenging since students may not respond.'

Participant 6

'In a face-to-face environment teaching and learning were guided using print-based resources, activities, and exercises. This included group activities and physical interaction or engagements. Students focused and listened. I used to write on the whiteboard or share my screen using a computer projector. The online environment is challenging to teach students.'

Participant 7

'In the digital environment I can accommodate an unlimited number of students whilst in the face-to-face environment space used to be an issue, I now can record the library lecture allowing students to view it asynchronously. This allows flexibility in online teaching and learning.'

5.3.3.4 Cognitive presence and online library instruction

One of the theoretical frameworks used in this study is Community of Inquiry (CoI). Cognitive presence is a component of the COI framework. The other components are teaching and social presence. Cognitive presence is focused on how an individual actively, critically and objectively engages with content to enable meaningful experiences in online learning. This question was divided into two categories. Respondents were first asked if they use active learning styles such as problem, inquiry and project-based learning. The second part of the question asked respondents if they agree that active learning style are critical to online teaching.

Participant 1

'Agree, that students should not be just sitting and listening but actively engaging with content and facilitator in class. This will enable students to find solutions to a problem whilst making mistakes. In this way, students learn better.'

'Regular question and answer interactive sessions allow students the opportunity to reflect upon the concepts they are learning. Encourage students to interact with the resources and apply them in their class activities. This helps the students prepare for their formative tasks such as assignments.'

'To encourage students to reflect upon the concept and content taught and apply these in creating their own perspectives on the subject matter.'

'Reflective assignment, presentation, and use of a scaffold approach. I introduce a more intense activity that would require deeper engagement and critical thinking skills toward the end of the semester. My reasoning for this is that students have engaged with the content and have a better understanding to provide their own views on a topic. I also need to introduce student-led discussions as an activity as I lack in this area. I believe student-led discussion can stimulate critical thinking skills.'

Participant 2

'No, I do not use active learning to guide my online teaching in the digital environment e.g.,

problem and inquiry-based learning.'

Participant 4

'Yes, I agree using active learning style such as problem and inquiry-based activities it allows the online teacher to assess if learning is taking place.'

'No, I do not apply any of these learning styles to engage students, however, the activity I use to facilitate critical thinking is breakaway sessions on MS Teams. This helps me facilitate meaningful discussions with students. I can visit each breakaway group to check, observe and provide guidance while students are learning.'

Participant 5

'Yes, I agree using the active learning style such as problem and inquiry-based activities allows the online teacher to assess if learning is taking place. Some students are visual learners, others are slow paced, and some would like to look at a video maybe outside the class. Therefore, active learning can help students learn in different ways.'

'No, I do not apply any of these learning styles to engage students.'

'I do not use any active learning styles, activities and exercises since I find it difficult to engage students when teaching in the digital environment.'

Participant 8

'Yes, I agree using an active learning style such as problem and inquiry-based activities allows the online teacher to assess if learning is taking place.'

'No, I do not use active learning to guide my online teaching in the digital environment e.g., problem and inquiry-based learning.'

Participant 10

'Yes, I agree using an active learning style such as problem and inquiry-based activities allows

the online teacher to assess if learning is taking place. It also allows students to enhance their skills when learning the subject matter. Students will develop decision-making skills and explore ideas and concepts.'

'No, I do not apply any of these learning styles to engage students.'

'I do not use any active learning styles, activities and exercises since I find it difficult to engage students when teaching in the digital environment.'

Participant 11

'Yes, I agree using an active learning style such as problem and inquiry-based activities allows the online teacher to assess if learning is taking place. The online facilitator can also ascertain the level of understanding of concepts taught using active learning styles in a digital environment. Active learning in a digital environment is also important because it engages students in the activity or exercise.'

'No, I do not apply any of these learning styles to engage students.'

'I do not use any active learning styles, activities and exercises since I find it difficult to engage students when teaching in the digital environment.'

5.3.3.5 Teaching presence and online library instruction

Garrison, Anderson and Archer (2001: 10-12) define teaching presence as that component of the COI framework which enhances curriculum design and enables cognitive application in online instruction synchronously and asynchronously. In this question, the researcher examined the teaching presence of academic librarians in online library instruction. This included academic librarians' teacher presence related to activities, exercises, feedback, and reflection in an online learning environment for students.

Participant 4

'I only have an online teacher presence on MS Teams.'

Participant 5

'I only have an online teacher presence within the digital classroom e.g., MS Teams when teaching.'

Participant 6

'I do this by continuously engaging with students in the class and outside by ensuring a clear line of communication always through email.'

Participant 10

'I only have an online teacher presence within the digital classroom e.g., MS Teams when teaching. I am not on any learning management system such as Moodle or Blackboard to support my online teaching and learning of students.'

Participant 11

'I only have an online teacher presence in MS Teams when teaching. I do not use learning management systems to support my online teaching.'

5.3.3.6 Social presence and online library instruction

Social presence is the third component of the COI framework. Social presence emphasises using COI to provide students with an environment that is conducive to interacting while learning (Maddrell, Morrison and Watson 2017: 246-247). This means that students should be able to project themselves socially and emotionally in an online environment in order to enhance their learning experience. Online instructors are fundamental role-players in this process. Online instructors enable and enhance social interactions in the digital environment for students. This provides students with the opportunity to develop relationships with real people in a virtual environment while learning. Social presence also creates an atmosphere of trust between students and the facilitator. Moreover, it sets the foundation for teaching and cognitive presence.

Participant 1

'I do this by using: Chat section on MS Teams during lessons.'

'Presence in Moodle class where I would provide a personalised introduction with a profile

picture of myself.'

'Presence on Moodle using announcements section to communicate with students.'

'I attend the MS Teams lesson earlier so if students have questions, I can answer them.'

Participant 5

'I only have an online social presence within the digital classroom e.g., MS Teams when teaching.'

I am not on any learning management system such as Moodle or Blackboard to support my online teaching and learning.''

Participant 6

'I do this by using chat section on MS Teams during the class.'

'Presence on Moodle using announcements section to communicate with students.'

'Informally providing support through instant messaging platform e.g., WhatsApp for students.'

Participant 9

'I only have an online social presence within the digital classroom e.g., MS Teams when teaching.'

I am not on any learning management system such as Moodle or Blackboard to support my online teaching and learning.''

Participant 10

'I only have an online social presence within the digital classroom e.g., MS Teams when teaching.'

I am not on any learning management system such as Moodle or Blackboard to support my online teaching and learning.'

5.3.3.7 Formal training and using technology to teach in an online environment

Globally, the integration of technology into education has become the 'new norm' (Mellieon and Robinson 2021: 170-183). Prior to the Covid-19 pandemic, technology was used to teach within boundaries. During the pandemic, there was widespread interest in using technology to teach in an online environment (Whalen 2020: 191-194). Society has entered the endemic phase of Covid-19, and the pedagogical landscape has shifted for individuals with a teaching profile. Technology has now become the focus of teaching at all levels of education. However, technology needs to be adapted into teaching practices, activities, lesson plans and curriculum design with the aim of enhancing learning. This will enable educators to facilitate learning and students to engage with the content constructively in multi-modal environments. However, the ability to incorporate technology into a digital classroom requires pedagogical knowledge and appropriate digital skills to direct learning. Therefore, formal training or a course can be useful for individuals with a teaching profile.

Participant 2

'No, I did not receive any formal training in using technology to teach in a digital environment.'

Participant 3

'No, I did not receive any formal training in using technology to teach in a digital environment.'

Participant 4

'I only enrolled for a course teaching with technology last year because of the impact of the Covid pandemic as advised by my manager. Prior to the pandemic I had no formal training in teaching or using technology to teach. During the course, I found it difficult to grasp the educational theories, concepts, and principles. However, ultimately it was beneficial, and I can now apply pedagogical and technological knowledge when teaching with technology.'

Participant 6

'No, I did not receive any formal training in using technology to teach in a digital environment.'

Participant 7

'No, I did not receive any formal training in using technology to teach in a digital environment.'

Participant 10

'No, I did not receive any formal training in using technology to teach in a digital environment.'

5.3.3.8 Digital skills for academic librarians and online teaching

Digital skills are critical for facilitators involved in online teaching. Educators are becoming increasingly dependent on digital technologies to facilitate online learning (Junus *et al.* 2021: 8-14). These digital technologies include content creation software, video conferencing tools, screen casting, web authoring and educational tools. The effective use of these digital technologies optimises engagements with students in the online classroom. This results in constructive discussions and collaborative efforts in the digital environment between the facilitator and students. The teaching and learning also extends beyond the online classroom into asynchronous environments such as learning management systems. It is becoming ever more apparent that to teach in a digital environment, the facilitator must be efficient in digitally mediated education. Therefore, it is vital that online facilitators have the relevant digital skills to teach in an online environment.

Participant 1

'The digitals skills we as academic librarians need include the ability to design content for online library instruction, ability to use the online environment to clearly communicate with students, ability to solve technical problems whilst teaching online, efficient and effective use of learning management systems such as Moodle, Blackboard, etc. to teach asynchronously.'

'No, I do not have digital skills aligned to online teaching for the digital environment. I have not been taught to create online content to teach library instruction in the digital environment.'

Participant 2

'The digitals skills needed are creating innovative course content, interactive curriculum for students, designing of videos to captivate the students when learning library instruction, online presentation skills as teachers of library instruction.'

'No, I do not have digital skills aligned to online teaching for the digital environment. I have not been taught to create online content to teach library instruction in the digital environment'

Participant 4

'I have intermediate digital skills aligned to online teaching in a digital environment. I do need support and training that will enable me to teach effectively in a digital environment.'

Participant 6

'I have basic digital skills aligned to online teaching in a digital environment. I do need support and training that will enable me to teach effectively in a digital environment. This is a gap within my profession that needs a solution.'

Participant 7

'No, I lack the basic digital skills aligned to online teaching for the digital environment.'

5.3.3.9 Pedagogical skills for academic librarians and online teaching

Pedagogy is the teacher's ability to design, implement and apply content to guide the development of students whilst learning a particular topic. Pedagogy is framed through learning theories that provide teachers with the background in understanding students' social and cultural context (Yürekli Kaynardağ 2019 112:113). This assists teachers in the design of curriculum, assessments, and feedback in multi-modal environments. Ultimately, the teacher develops their teaching styles, methods, and practices to enable effective learning outcomes for students.

Participant 1

'No, I lack in having a teaching background and theory that governs the foundation of education. I also do not have the technological knowledge to teach in the digital environment.'

Participant 3

'No, I do not have the foundational knowledge of learning theories and teaching methods. I also do not have the technological knowledge to teach.'

Participant 4

'No, I lack in having a teaching background and theory that governs the foundation of education. In addition, the use of technology to teach has further complicated matters, however, technology can enhance online teaching.'

Participant 6

'No, I do not have the foundational knowledge that teachers require for multimodal environments. I also do not have the technological knowledge to teach in the digital environment. This was not taught to us in library school when we were studying for our qualifications. However, experience has been my biggest teacher. My colleagues have helped me to develop.'

Participant 9

'No, I do not have the foundational knowledge as an educator to teach. I also do not have the technological knowledge to teach in the digital environment. We did not receive any basic grounding of how to teach at library school at university.'

5.3.3.10 Digital pedagogies and the challenges of online teaching

Digital pedagogy can be succinctly defined as the effective use of technology to direct learning underpinned with pedagogy (Sadiku, Omotoso and Musa 2019: 881-882). Currently, the demands of education are dictating that facilitators must have knowledge of how to integrate technology into teaching for the digital environment. In this process of using technology to teach, facilitators must be able to self-reflect (Väätäjä and Ruokamo 2021: 2-3). The process of self-reflection will allow facilitators to ponder on which teaching methods can provide meaningful learning outcomes using technologically designed pedagogic principles. Feedback from students is also important as this provides the platform to correct and apply digital pedagogies with effectiveness in online teaching. Furthermore, digital pedagogies have the potential of creating the impetus for facilitators to develop a body of knowledge on the topic. This knowledge can help facilitators when directing learning in multi-modal environments. However, using digital pedagogies in online teaching also has challenges for the facilitator and students.

Participant 2

'Library instruction programmes are not integrated into the course modules. There is also a lack of support for online teaching.'

Participant 3

'Communication barriers e.g., lack of student engagement when teaching online.'

'Technological problems for the teacher and students e.g., data, technical difficulties when teaching and learning with online tools.'

Participant 4

'Lack of technological knowledge to teach in the digital environment.'

Participant 5

'Change of environment from face to face to online teaching. This has been my challenge as I have been teaching library instruction in a face-to-face environment for twenty years. It's like I am starting as a newly qualified professional with the introduction of technology in teaching.'

Participant 8

'Time management when teaching with technology in a digital environment.'

'Technological problems for the teacher and students e.g., data, technical difficulties when teaching and learning with online tools.'

'No support when we transitioned to online teaching with technology during the Covid 19 pandemic.'

'During the pandemic online teaching and for students to learn from home were difficult. The reasons also include social and economic factors such as small homes and noise.'

Participant 10

'Technology and infrastructure e.g., connectivity issues, technical problems etc.'

'Lack of technological knowledge to teach in the digital environment'

'At my university students are from previously disadvantaged communities therefore access was an issue as we moved into online teaching and learning during Covid.'

5.3.3.11 Teaching qualification or a training model for academic librarians at UoTs

Didactic teaching methods are becoming less prominent in academic circles as instructors favour actively engaging students while learning. Problem-based learning, project-based learning and flipped classrooms are but a few examples of the new teaching methods that facilitators are adopting at higher education institutions. These innovative teaching methods, coupled with the use of technology, are the new norm inside and outside the classroom. This has resulted in programmes such as Scholarship of Teaching and Learning (SOTL). The nature of these types of programmes is to foster dialogue related to teaching and research within the higher education sector. It is geared towards assisting instructors to reflect upon current teaching practices and incorporate new methods of instruction. This is achieved through benchmarking with contemporaries in the higher education sector. However, in many instances, there needs to be a more focused approach than merely sharing practices or developing skills such as *'teaching with technology'* through SOTL's or short courses, which have merit.

Participant 1

'I think the latter – training programme/model because things change all the time. It would be a useful way to keep up to date with the latest developments in teaching with technology. A sustainable programme/model will provide ongoing support.'

Participant 2

'I believe there needs to be a module added at the third-year level of library school e.g., teaching with technology. This will prepare librarians' industry should they be placed in a position to teach library instruction. I also believe a training model can be extremely useful, however, it must have a support system for academic librarians who may need assistance. Additionally, regular workshops and seminars on topics such as teaching with technology, pedagogies and digital tools will be useful, especially for those that are afraid to use technology to teach e.g., the older staff.'

Participant 3

'I think the latter – training programme/model because things change all the time. It would be a useful way to keep up to date with the latest developments in teaching with technology. A sustainable programme/model will provide ongoing support. I also cannot see myself going back to study a formal qualification in education unless it becomes a prerequisite for as an academic

librarian who is involved in teaching either face to face or in a digital environment.'

Participant 4

'I believe there needs to be a module added at the third-year level of library school e.g., teaching with technology including teaching methods. I also believe a training model can be extremely useful, however, it must have a support system for academic librarians who are new to teaching as well as experienced colleagues.'

Participant 5

'Training model because things change all the time. It would be a useful way to keep up to date with the latest developments in teaching with technology.'

5.3.4 Coding process and emerging themes

In the qualitative phase, interviews proved to be engaging, robust and revealing. Respondents discussed issues related to pedagogy, technology, digital skills, and online information literacy which was also inferred in the empirical evidence from the analysis of the quantitative data. The data from the interviews were transcribed and coded through a process of thematic analysis, with ten themes emerging as illustrated in Table 5.8. The ten themes were directly aligned to the digital pedagogies of academic librarians at UoTs in South Africa. Themes included digital pedagogies and challenges, digital skills, and online teaching, face-to-face versus online teaching, online social presence, online cognitive presence, online teaching experience, online teaching methods, online teaching presence, pedagogical skills, content knowledge, and online teaching. In certain instances, themes proved to be interrelated, hence their interdependence became apparent.

Table 5.8: Clustering and emerging themes

CLUSTERING	EMERGING THEMES	RESEARCH OBJECTIVES
Technological knowledge Pedagogical knowledge and digital environment Teaching and technology	Digital pedagogies and challenges Digital skills Digital tools	1. What are the digital pedagogies needed by academic librarians for the current digital environment in South Africa? 2.What pedagogical skills do academic librarians within a digital environment at UoTs in South Africa need? 3. What digital skills do academic librarians at UoTs in South Africa need for teaching in the current digital environment? 4. What type of online teaching presence is needed by academic librarians when engaging with students in a digital environment in South Africa? 5. What effective design can be developed for an online training model?
Learning management systems Online curriculum design Interactive learning	Digital skills and online teaching Pedagogical skills Digital pedagogies	
Time management Concise lessons Student engagement	Active engagements	
Digital classroom e.g., MS Teams Learning management systems	Online social presence Online teaching presence Online social presence	
Interactive lessons Active engagements Reflective activities Critical thinking activities Problem based learning	Online cognitive presence Digital tools Teaching methods Pedagogical skills	
Formal training Teaching with technology	Online teaching experience Digital tools	
PowerPoint presentation Recorded videos Video tutorials Practical demonstration	Online teaching methods Pedagogical skills Technology Digital skills	
Learning theories Qualifications Classroom management Assessments Teaching methods	Pedagogical skills	
Information literacy	Content knowledge	
Covid 19 Formal training Teaching with technology	Digital pedagogies Pedagogical skills Digital skills Short course Training model	

5.3.5 Word frequency (themes) related to digital pedagogies and academic librarians at UoTs in South Africa

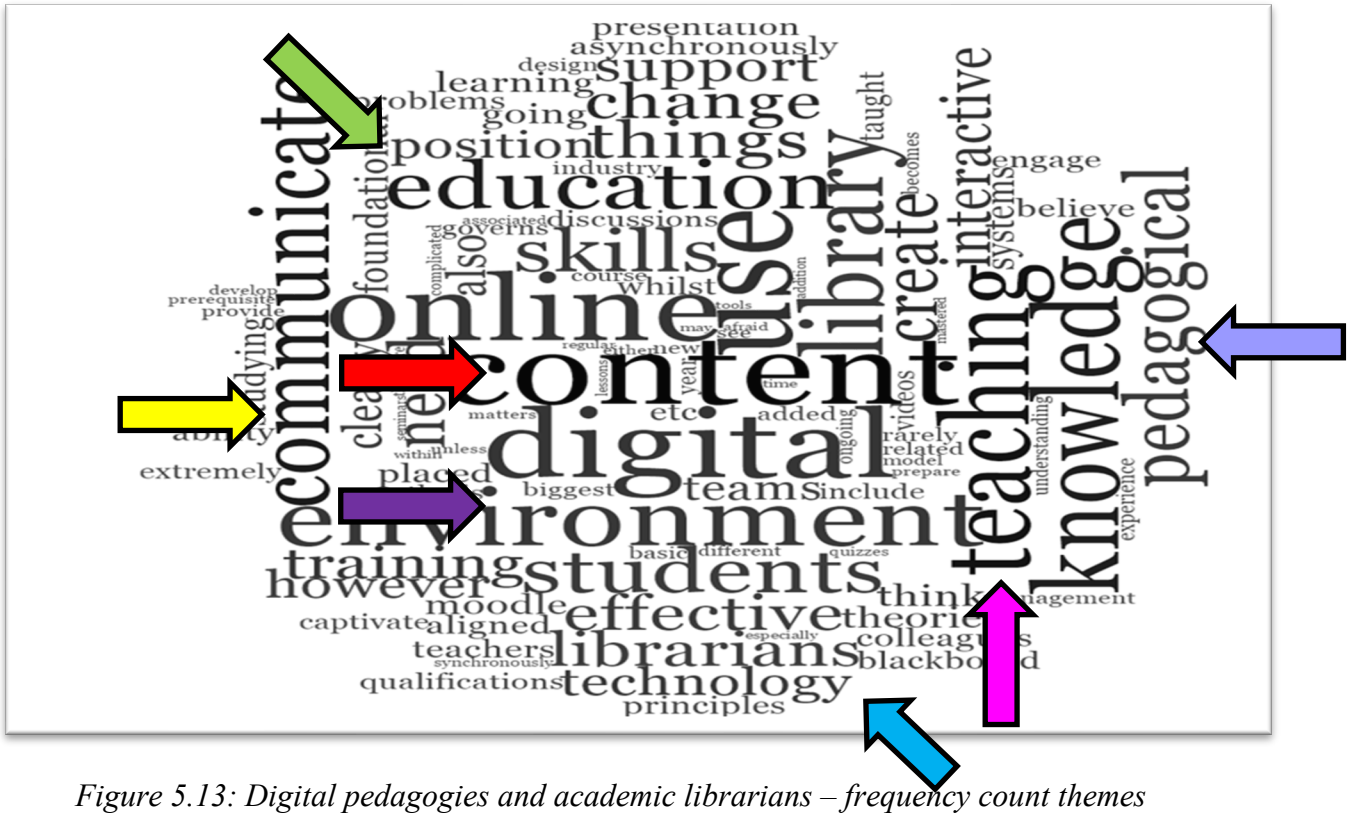


Figure 5.13: Digital pedagogies and academic librarians – frequency count themes

Figure 5.13 presents the results of the themes that emanated when analysing the qualitative data from the semi-structured interviews using the word frequency option in NVivo. The themes grouped were *digital skills and online teaching, pedagogical skills and online teaching and online training model*. This resulted in 110 items being selected. The displayed words were limited to 300 words, with a specialisation option selected to group the themes. The minimum length of three words was selected to ensure that the data generated projected the true results of the semi-structured interviews. The coloured arrows in Figure 5.13 refer to the main themes that emanated from the coded data. These themes align to the research objectives of the study. The main themes include teaching, pedagogical knowledge, technology and librarians, digital skills, digital/online environment, education, and training.

5.3.6 Word tree (themes) related to digital pedagogies and academic librarians at UoTs in South Africa

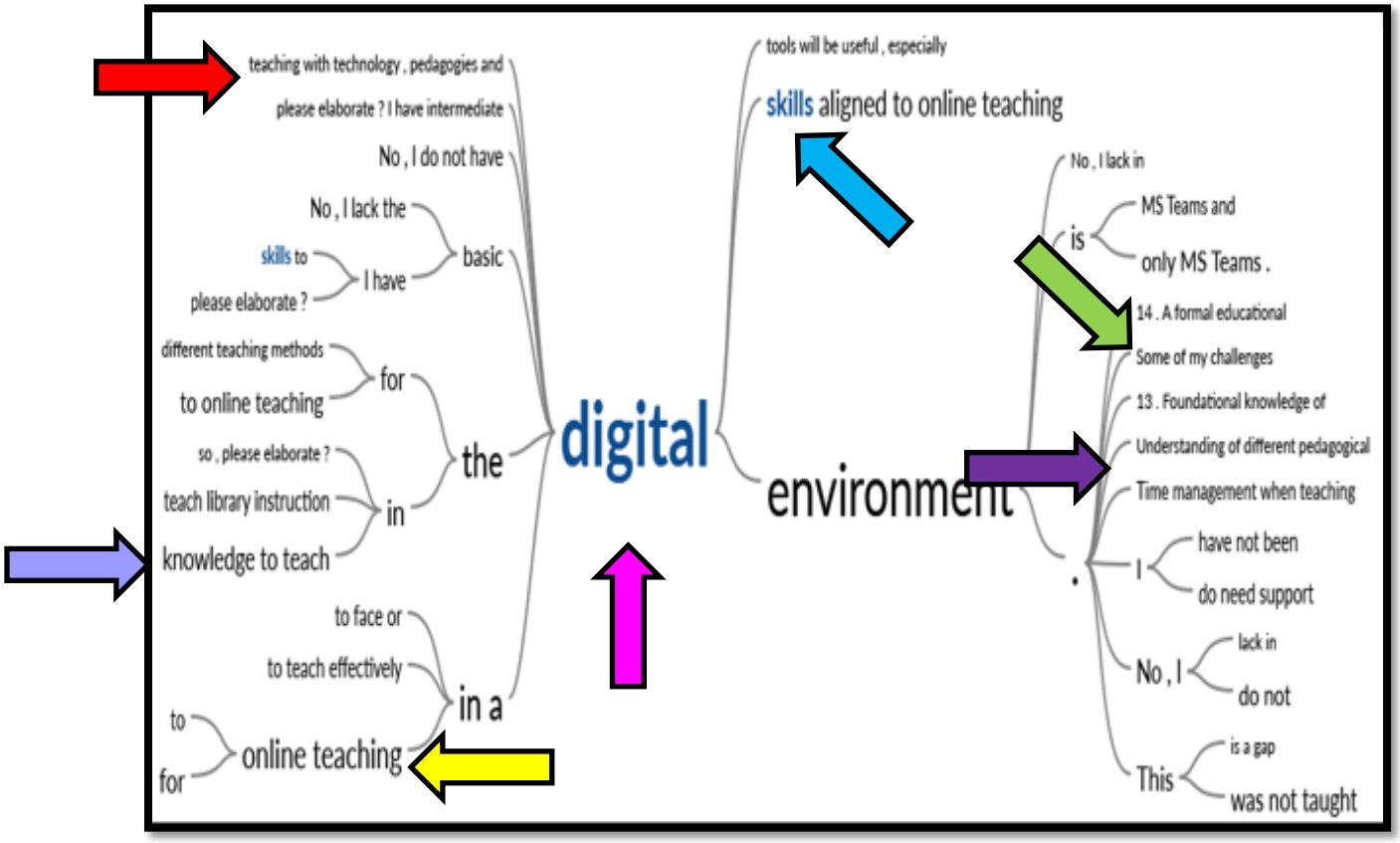


Figure 5.14: Digital pedagogies and academic librarians – word tree themes

N [11]

Figure 5.14 presents the themes that emanated from analysing the qualitative data of the semi-structured interviews when grouped using the text search query option in NVivo. The themes grouped were *digital skills and online teaching, pedagogical skills and online teaching and online training model*. This resulted in 94 unfiltered items being selected. The results were refined to the root word of digital skills, with the synonyms option selected to run the query and create the word tree. The arrows in Figure 5.14 refer to the main themes that emanated from the word tree. These themes align to the research objectives of the study. The main themes as illustrated in Figure 5.14 using coloured arrows are digital skills, pedagogical and technological knowledge.

5.4 Summary

Chapter Five presented the findings of the study. The first phase of the findings was based on empirical evidence collected using a web-based survey from academic librarians at UoTs in South Africa. This was followed by the results and interpretations from the second phase of the study. The results from the second phase were analysed and interpreted after semi-structured interviews were held with academic librarians from UoTs in South Africa. Chapter 6 focuses on the main findings of the study. The discussions in Chapter 6 are related to the aim, objective, critical questions, theoretical frameworks, and the literature reviewed in the study.

CHAPTER SIX
SUMMARY, DISCUSSION OF FINDINGS, CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATION OF THE STUDY

6.1 Introduction

This chapter provides a concise summary of the findings from the entire thesis. The chapter focuses on the broad objectives and the critical questions that were generated to address the research problem. It presents and discusses the salient findings in the study based on the interpretations from Chapter 5. This is followed with conclusions, recommendations, and implications for the study. The chapter concludes with a proposed design of a training model on digital pedagogies to support academic librarians at UoTs in South Africa, and perhaps worldwide, in relation to the digital environment. The training model can be extended to academic staff with a teaching identity across a range of faculties and departments. It has the potential to be adapted and used to support various academic modules in a digital environment.

Furthermore, in view of the researcher's choice of pragmatism as the epistemological lens for this study, an action orientated approach was used to discuss and provide conclusions and implications from the research findings. The researcher charted a scientific path that explored theoretical frameworks related to the digital environment; reviewed literature on digital pedagogies and selected a research approach underpinned within the pragmatic paradigm using mixed method research, resulting in multiple findings, interpretations and conclusions that framed this research.

The aim of this study was the '*Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology (UoTs) in South Africa'*. The critical questions generated to meet the research objective were:

> [RO1]: What are the digital pedagogies needed by academic librarians in the current digital environment in South Africa?
>
> [RO2]: What pedagogical skills do academic librarians within a digital environment at UoTs in South Africa need?
>
>]RO3]: What digital skills do academic librarians within the current digital environment at UoTs in South Africa need?

[RO4]: What type of online teaching presence is needed by academic librarians when engaging with students in a digital environment in South Africa?

[RO5]: What effective design can be developed for an online training model?

6.2 Summary of the research findings

In this section, the research findings are summarised according to the research objectives. Firstly, the researcher explored digital pedagogies in the literature. Digital pedagogy is a grey area in the literature as experts have not agreed on a definition for the concept. However, the literature succinctly refers to digital pedagogies as the mixing of technology with pedagogy to enhance teaching (Omarsaib *et al.* 2022). In describing digital pedagogy, the literature underscores technology as a support mechanism to enable interactive teaching and learning. Although the term is complex to conceptualise, it can be explored, probed, and implemented in relation to multi-modal environments. One such multi-modal environment is termed *digital or online* within the educational context.

Secondly, the pedagogical and digital skills of academic librarians were explored and probed through reviewed literature, findings from the web-based survey and the semi-structured interviews. The analysis and interpretation of the data revealed that academic librarians at UoTs in South Africa were lacking in pedagogical and digital skills in relation to the digital environment.

Thirdly, the online teaching presence of academic librarians was prodded in the digital environment when engaging in online instruction. The online teaching presence of academic librarians at UoTs was found to be limited in relation to the digital environment. This is due to various factors such as inexperience with using technology to teach in the digital environment, the novelty of teaching in the digital environment, limited asynchronous engagements and integration beyond the digital classroom.

Lastly, academic librarians at UoTs in South Africa were probed in the interviews since the findings from the web-based survey provided differing evidence. The empirical overall analysis from the multiple linear regressions, inferential and descriptive statistics varied in the analysis of pedagogical and digital skills (technology) related to academic librarians at UoTs in South Africa. However, after closer inspection of the descriptive statistics and the semi-structured interviews, the data pointed to a lack in the pedagogical, digital, and online presence of academic librarians

related to teaching in the digital environment. Therefore, the philosophical underpinning of pragmatism and the MMR approach was justified in this study as the questionable issues in the empirical evidence from the web-based survey was clarified through the findings from the semi-structured interviews.

Furthermore, the semi-structured interviews also allowed academic librarians at UoTs in South Africa to voice their opinions and provide solutions to the research problem. Academic librarians expressed their concerns, indicating that a module needed to be introduced at LIS schools in South Africa. The LIS curriculum should include a concise understanding of pedagogy for academic librarians. Additionally, technology must be added as a component in the curriculum to demonstrate how technology and pedagogy can be integrated into the digital environment. Additionally, a training model was deemed as being an extremely useful proposition, particularly for academic librarians who are currently practicing in the profession and who do not have the desire to pursue any further qualifications.

6.3 Discussion of findings

The discussions section presents the findings and interpretations from the results. It deliberates on the relationships between the literature, theoretical frameworks, results from the web-based survey and semi-structured interviews. There are varying definitions in the literature related to digital pedagogies as experts have not agreed on a definition of the concept. This adds to the flexibility of digital pedagogies. Ultimately, digital pedagogies can be implemented in multimodal learning environments with an educational underpinning that is technologically geared towards enhancing teaching methods and practices. In terms of this study, digital pedagogies are explored through the lens of academic librarians as teachers in the digital environment at UoTs in South Africa. Hence, the findings are discussed in relation to the critical questions that were generated from the objective to address the phenomenon of digital pedagogies and academic librarians at UoTs in South Africa.

6.3.1 [RO2] Academic librarians and qualifications

Historically, the role of academic librarians as teachers in higher education institutions has been consistently questioned. The literature points to academic librarians lacking in learning theories, curriculum design, teaching methods, classroom management, and assessments to guide library instruction (Omar Saib *et al* 2022; Ciccone and Hounslow 2019). In terms of this study, a combined ninety-four percent (94%) of academic librarians indicated in the web-based survey that they only

have a library qualification, with the remaining six percent (6%) having more than one qualification (e.g., LIS and teaching qualifications). In the online interviews conducted with 11 academic librarians in the second phase of this study, all the respondents mentioned that they did not have any foundational knowledge in education. The participants mentioned that this was not taught to them in LIS schools in South Africa. From the responses, this seems to be an area that is not emphasised at LIS schools in South Africa. Therefore, it can be construed as even being neglected within the South African context (Raju 2017: 264-265). Moreover, the literature constantly highlights the absence of pedagogical knowledge and academic librarians at higher education institutions (Ramos Eclevia 2022; McTavish 2020).

Furthermore, according to the linear trend in Figure 5.2, there is an upward increase in pursuing library qualifications at UoTs in South Africa. This trend is also prevalent at postgraduate levels in the LIS profession. There seems to be an inconsequential attitude related to academic librarians at UoTs in South Africa and a teaching qualification. However, a background knowledge of teaching can improve the profile of academic librarians at higher education institutions in South Africa. More importantly, a grounding in pedagogy will improve the design of library instruction programmes offered to faculties and departments at UoTs. A well-thought of library instruction programme can automatically increase in weighting and prominence, which is commonly seen as not being ubiquitous at UoTs in South Africa. Therefore, a teaching qualification can be invaluable. It has the potential to increase the credibility of academic librarians as facilitators and the importance of library instruction at UoTs in South Africa.

Ultimately, the findings from the web-based survey and the semi-structured interviews when mixed with the literature explored in this study points to academic librarians at UoTs in South Africa lacking in teaching qualifications. Generally, teaching is underpinned through philosophies of education such as learning theories, pedagogical knowledge and teaching methods that guide an educator. The same teaching philosophies are applicable to academic librarians for library instruction. These are important *skills sets* that develop an individual as a teacher. However, the limitation of teaching qualifications is not restricted to academic librarians. Globally, a similar pattern exists with lecturers at higher education institutions who have the content knowledge and expertise in a particular field but do not have a teaching qualification to guide the process of learning (Ödalen *et al*. 2019: 339-353).

6.3.2 [RO2] Academic librarians and online instructional strategies

The researcher delved deeper into the findings and interpretations to ascertain the pedagogical skills of academic librarians at UoTs in South Africa. The instructional strategies used for online teaching in a digital environment were explored and probed through the web-based survey and semi-structured interviews. The interpretations of the findings from the web-based survey revealed that academic librarians used passive rather than active instructional strategies in the digital environment for online library instruction (refer to Figure 5.3.). This meant that passive instructional strategies such as direct instruction and demonstration were more frequently applied than critical reflection, small-group work, and collaborative learning. Passive instructional strategies have limitations in online learning, such as a lack of interaction, collaboration and self-reflection when engaging with students (Martin and Bolliger 2018: 205-222).

Furthermore, although the web-based survey revealed that passive rather than active instructional strategies was used for online teaching, it did not suggest reasons as to why academic librarians adopted this in their online library instruction. However, a similar pattern was prevalent in the findings from the semi-structured interviews. Nine (9) out of eleven (11) respondents did not use active instructional strategies such as collaborative learning, critical reflection and small- group work. Academic librarians at UoTs cited that they were unfamiliar with and did not know how to apply active instructional strategies in online library instruction. Academic librarians also indicated that they found it difficult to actively engage students when teaching in a digital environment.

One solution is for academic librarians explore learning theories as this can provide background knowledge on how to use active instructional strategies in online teaching. Omarsaib *et al*. (2022: 12) agree that knowledge of learning theories can prepare academic librarians for an online teaching role. One such learning theory is Constructivism, which can be applied when using active instructional strategies for online teaching. According to Hu *et al*. (2021: 286-292), the fusion of social and cognitive constructivism can provide the grounding for instructors on how to actively engage students in the learning process. Furthermore, theoretical frameworks such as TPACK and COI underpinned through a constructivist perspective can direct the design of technologically driven instructional strategies to assist instructors involved in online teaching (Kim and Gurvitch 2020; Watson and Rockinson-Szapkiw 2021).

6.3.3 [RO2] Academic librarians and Pedagogical Knowledge to teach in a digital environment

Academic librarians surveyed through the web-based questionnaire were asked how they acquired knowledge to teach in the digital environment. Sixty-six percent (66%) of academic librarians indicated that they acquired pedagogical knowledge for online teaching from work colleagues. Similarly, a majority of nine out of eleven respondents from the semi-structured interviews indicated that pedagogical knowledge was acquired for online teaching through work colleagues. The knowledge sharing practices of work colleagues, whether formal or informal, helped academic librarians at UoTs in South Africa to develop pedagogical skills to teach in an online environment. Respondents also indicated via the semi-structured interview that *'experience was the biggest teacher'* as academic librarians at UoTs learnt to teach on-the-job.

Gore and Rosser (2022: 226) used an approach termed Quality Teaching Round to explore the pedagogical development of teachers. There were three key findings from the study. One of the findings was attributed to working with colleagues. The opportunity to observe and collaborate with colleagues helped teachers improve their pedagogical knowledge. It also allowed teachers to re-envision teaching practices. However, in these types of initiatives, confidentiality must be ensured to allow individuals to feel safe when critically engaging to improve their pedagogical knowledge and skills with work colleagues.

The concept of Quality Teaching Round proved beneficial for teachers. It allowed teachers to share experiences and learn from colleagues to improve their pedagogical skills. Therefore, the importance of knowledge sharing sessions and communities of practice cannot be underestimated in developing pedagogical skills. Likewise, this can be a point of consideration for academic librarians at UoTs in South Africa. This type of programme has the potential to improve the teaching practices of academic librarians in preparation for the digital environment. It can also provide a platform for academic librarians to learn from colleagues who are experienced in online teaching. This can include seasoned professionals who have been involved in library instruction for numerous years, LIS lecturers, and young aspiring academic librarians who are knowledgeable in online teaching within the industry.

In the discussions thus far, the pedagogical skills of academic librarians at UoTs in South Africa were examined. The researcher reflected upon academic librarians and their qualifications, online instructional strategies and pedagogical knowledge from the findings and interpretations. It became clear at this stage, as the data was being triangulated from the literature reviewed, theoretical frameworks, results, and interpretations that academic librarians lacked in pedagogical skills for online teaching. However, the researcher not only had to explore the pedagogical but also the digital skills of academic librarians at UoTs in South Africa. Although a lack of pedagogical skills was apparent, the researcher had to also analyse and interpret the digital skills of academic librarians at UoTs in South Africa when teaching in a digital environment. Thus, the researcher examined the findings and interpretations related to academic librarians and digital skills for teaching in a digital environment. Additionally, the digital skills of academic librarians were scrutinised when using technology to support pedagogy in the digital environment.

6.3.4 [RO3] Academic librarians and Technological Knowledge (applications to teach online library instruction)

In terms of using MS Teams and Zoom for library instruction, a significant seventy-three percent (73%) of respondents did not use these online applications to teach prior to the Covid-19 pandemic. However, a large majority of respondents [ninety-one percent (91%)] indicated that their first exposure and immediate acceleration in the usage of these applications for online teaching was because of the pandemic. This provides insightful empirical evidence into two critically important points in terms of academic librarians and online teaching in a digital environment at UoTs in South Africa. Firstly, the online mode of teaching was not being explored by most academic librarians at UoTs in South Africa prior to the pandemic. Secondly, the boundaries of social distancing forced academic librarians to deliver library instruction in a digital environment.

The MMR design used for this study was a *fully mixed sequential design* with an *equal weighting* in terms of the quantitative and qualitative approaches. Therefore, the researcher probed the eleven academic librarians in the semi-structured interviews to ascertain their views related to online application and teaching in a digital environment. The eleven academic librarians interviewed also agreed with the empirical findings from the web-based survey that they did not use MS Teams or Zoom prior to Covid-19 to teach online library instruction. One respondent went further to state that there was no blended, hybrid or online prior to Covid-19, just face-to-face library instruction.

The exposure to these applications because of Covid-19 is not limited to academic librarians at UoTs in South Africa. In developed economies of the world, similar patterns ensued due to the pandemic, as highlighted in the literature reviewed in this study. According to Ibacache, Koob and Vance (2021: 15-16), hundreds of academic librarians at higher education institutions in America busied themselves in learning to use video-conferencing applications such as Zoom and MS Teams for online teaching because of the pandemic. This points to a lack of technological knowledge in using online applications for teaching prior to and at the onset of the pandemic. One can also assume that not knowing how to effectively use these online applications such as MS Teams when teaching created barriers to actively engaging students in learning during the pandemic. Furthermore, Ramos Eclevia (2020) also opines that although there was limited scope and emphasis for online library instruction prior to the pandemic, this shifted at the start of the pandemic and accelerated during the pandemic. The same pattern is clearly visible with academic librarians at UoTs in South Africa, from the finding and interpretations in Figure 5.4 of this study.

6.3.5 [RO2, RO3, RO4] Technological Pedagogical Knowledge and academic librarians at UoTs in South Africa

Technological pedagogical knowledge (TPK) is an overlapping component of the TPACK framework. The three-underlying components of TPACK are content, pedagogy and technology. When these three components interact, integrate, and combine the true essence of TPACK comes to fruition through an interplay enhancing teaching and learning with technology. Technological pedagogical knowledge is the outcome of such an interplay. Technology and pedagogy combine to produce new methods of teaching using technology. The other aspect of TPK concerns itself with selecting germane technology that is suitable for teaching a specific concept to students. In terms of this study, TPK was explored through *professional development, modes of online library instruction, teaching and learning environments, online teaching methods, digital tools and learning management systems*.

Professional development and teaching in a digital environment were divided into six themes for academic librarians at UoTs in South Africa. These themes included emerging technologies and learning theories for online teaching, designing online curricula for teaching, teaching with technology using diagnostic tools, integrating online assessments, 21st century pedagogical approaches, digital skills, and teaching. A large majority of sixty-nine percent (69%) from the

web-based survey indicated that these themes were insignificant to academic librarians' online teaching role. However, in the semi-structured interviews, all eleven respondents indicated that skills such as regular workshops and seminars covering topics such as teaching with technology, emerging online technologies and pedagogy would be extremely useful to their online teaching role. The researcher decided to explore the literature since the findings from the web-based survey and the semi-structured interviews provided contrasting views on professional development and teaching in a digital environment.

Borup and Evmenoya (2019: 14-17) posit that professional development initiatives improved the knowledge, skills and general confidence of teachers related to the digital environment. Furthermore, TPACK was used as a framework to underscore the teacher's knowledge and skills. The findings revealed that teachers who had some forms of technological knowledge were able to delve deeper and expand their TPK for online teaching. Philipsen *et al*. (2019: 20-21) also states that higher education institutions must provide facilitators the support to transition into online teaching roles. This should include pedagogical development, time, infrastructure, and tools to develop themselves for the digital environment. Therefore, in terms of this study, the themes attached to professional development and TPK are critical for academic librarians at UoTs in South Africa. Professional development initiatives such as workshops, seminars and mentorship programmes have value and can provide academic librarians with support to implement digital pedagogies when teaching in a digital environment.

The other concern that manifested was with reference to digital skills and TPK. In terms of the web-based survey, a combined majority of sixty – nine percent (69%) of respondents indicated that digital skills for online teaching were not a *priority or a low priority.* However, the eleven respondents from the semi-structured interviews emphasised that they are lacking in digital skills aligned to pedagogies and teaching in a digital environment. Respondents from the semi-structured interviews stressed that they need skills to design online library content and solve technical problems when teaching in a digital environment. Furthermore, respondents suggested that they need digital skills to effectively use LMS systems such as Moodle and Blackboard for teaching and learning. The researcher chose not to elaborate on this point since other findings in the study provided conclusive evidence on the digital skills of academic librarians at UoTs in South Africa.

Technological pedagogical knowledge and Community of Inquiry were used to explore what modes of library instruction were used for online teaching. Whilst TPACK provided insight into design and implementation through TPK, the CoI framework identified with the teaching and social presence of academic librarians in synchronous and asynchronous activities. The combined majority of eighty-one percent (81%) of academic librarians indicated that the primary mode of online instruction is only synchronous (in class). The findings from the web-based survey corresponds with the interpretations of respondents from the semi-structured interviews who indicated that they only have a teaching and social presence in the digital classroom. There are no asynchronous activities designed and implemented for online library instruction outside the digital class, except for one of the eleven respondents who had an online teaching and social presence outside the digital classroom. However, academic librarians at UoTs in South Africa did mention that pre-recorded videos explaining library concepts were made available to students asynchronously via the library website or guide.

In terms of TPK and online teaching methods, the findings were indicative of the instructional strategies deployed for library instruction (refer to Figure 5.3 and 5.9). A combined majority of sixty-two percent (62%) of respondents did not use active online teaching methods such as problem-based learning, game-based learning, flipped classrooms, student-centered approach, inquiry-based learning, project-based learning, break-away sessions, and cooperative learning. The findings from the semi-structured interviews agreed with the empirical evidence from the web-based survey. Nine out of eleven respondents in the semi-structured interviews indicated that the teaching methods adopted were limited to the digital classroom, and this only included PowerPoint presentations and video recordings. However, two of the eleven respondents from the semi-structured interviews indicated that there were limited active teaching methods implemented in the digital classroom in the form of breakaway sessions to engage students while learning.

According to Saiyad *et al*. (2020 151:152), active teaching methods must be implemented for online teaching as it engages students in online learning. It creates opportunities for student to *'think outside the box'* when learning course material. Furthermore, it allows student to create their own learning patterns and take responsibility in the digital environment. Active teaching methods also allow online facilitators to guide and direct the lesson rather than become the *sage on the*

stage in a virtual classroom. Another important element of online teaching methods is cognitive presence, which is part of the CoI framework. Cognitive presence guides facilitators when designing online content to select appropriate instructional strategies and teaching methods to engage students in the learning process. It allows the online facilitator to guide the process and students to reflect when exploring a concept whilst learning in a digital environment. Students can then draw their own conclusions on the topic. Ultimately, cognitive presence comes into fruition when students begin to become independent thinkers when learning in a digital environment.

Cognitive presence enables students to become objective and critical thinkers through synchronous and asynchronous activities in a digital environment. In terms of this study, for academic librarians to apply meaningful online learning strategies, TPK and cognitive presence were identified as key areas for the digital environment. However, active teaching methods, instructional strategies and cognitive presence are lacking in academic librarians at UoTs in South Africa. This is an issue that needs to be addressed as it will guide academic librarians to design, teach, assess, and evaluate students with greater purpose when teaching in a digital environment.

The web-based survey did reveal that academic librarians used digital tools for online library instruction. However, a combined majority of eighty-four percent (84%) indicated using either online library guides or video tutorials for library instruction in the digital environment. Video tutorials and online library guides are digital tools that instructors use to transfer information to students. This allows students to internalise the information whilst learning from the video or browsing the online library guide. These types of digital tools do not afford students the opportunity to provide any feedback and reflect upon the learning outcomes.

However, digital tools such as movie-maker applications, mobile technologies and learning objects (digital or open educational resource) provide opportunities for instructors and students to actively engage in online teaching and learning through feedback, reflection, and creation. Matumba (2022: 26) concurs that digital tools such as mobile technologies are being used to teach library instruction programmes worldwide. In terms of this study, a collective minority of thirty percent (35%) used social media, learning objects, instant messaging, and mobile technologies to teach library instruction in a digital environment. This implies that a significant majority of sixty-five percent

(65%) of respondents from the web-based survey did not use these digital tools for online library instruction. Furthermore, a combined majority of eighty-two percent (82%) of respondents *rarely or never* use moviemaker as a digital tool to enhance learning for online library instructions. Once again, this pattern was prevalent in the semi-structured interviews. PowerPoint presentations, pre-recorded videos and the internet were used to demonstrate to students when teaching in a digital environment. The respondents from the semi-structured interview pointed to a lack in digital skills as being the primary reason for them not engaging with other digital tools to teach in the digital environment.

6.3.6 [RO2, RO3, RO4] Pedagogical Content Knowledge and academic librarians at UoTs in South Africa

Pedagogical Content Knowledge (PCK) is another overlapping component of the TPACK framework. Central to PCK is the transformation of the content used for teaching. This transformation occurs when pedagogy and content knowledge overlap, leading to the design of innovative instructional material to enhance learning through several teaching methods. The purpose of PCK is to focus on the core areas of teaching and learning. This refers to the content designed and taught to students to meet learning outcomes.

In terms of this study, the overall quantitative analysis revealed that academic librarians had content and lacked in pedagogical knowledge. Furthermore, the multiple and linear regressions assumed that academic librarians at UoTs in South Africa had content and pedagogical knowledge. However, a deeper exploration of the descriptive statistics revealed that pedagogical knowledge was indeed lacking, while content knowledge was present in academic librarians at UoTs in South Africa. It was therefore difficult to ascertain the strength of PCK when content and pedagogical knowledge were combined and overlapped as a component in the TPACK framework. One may wonder that the other components of the TPACK components were easily fused, such as TPK in the study. However, these components, although underpinned with pedagogy, were driven by technology. In this instance, pedagogy was the driving force that overlapped and combined with content knowledge. Therefore, it was difficult to ascertain the efficacy of these components as a component of TPACK.

According to Ndongfack (2015: 1704), using technology to teach, underpinned with TPACK, requires continually creating, sustaining, and reinforcing to maintain a dynamic balance between the components. This is exactly what the researcher kept doing when interpreting the findings that were outlined through the TPACK components, including their overlapping relationships. Similarly, the researcher ensured that the same principles were applied when interpreting findings in relation to the CoI framework. However, pedagogical knowledge was frequently lacking in academic librarians at UoTs, from the findings. Therefore, it was difficult to distinguish the actual potential of PCK of academic librarians at UoTs in South Africa, although academic librarians had library content knowledge. Nevertheless, the researcher still endeavoured to probe PCK and evaluate academic librarians at UoTs from the *time allocated spent preparing content* and in *teaching library instruction in a digital environment*.

In both instances, in terms of *time allocated to prepare content* and *teach library instruction,* a substantial collective minority of forty-one (41) respondents spent twenty-five to fifty percent (25%-50%) of their *working time in preparing content* for online instruction, and a collective minority of forty-two (42) respondents spent twenty-five to fifty percent (25%-50%) of their *working time in teaching online instruction*. This is a justifiable amount of time spent in preparing content and teaching online instruction in a digital environment. The reason for the preparation of content and teaching time not exceeding working hours could be because online library instruction is not ubiquitous at UoTs in South Africa. Therefore, the amount of time spent in a digital class or in preparing content can be managed within working hours for academic librarians. According to Avidov-Ungar and Forkosh-Baruch (2018:188), preparing content for online instruction can be time-consuming. Facilitators find it difficult to keep a balance between personal life and screen time. Furthermore, it can be difficult to integrate PCK into online instruction as the challenges of work overload for academics can be overwhelming.

6.3.7 [RO1, RO3] Technological Content Knowledge and academic librarians at UoTs in South Africa

Technological Content Knowledge (TCK) is another component of the TPACK framework that enhances online teaching and learning. The purpose of technology and content in TCK is to influence effective online teaching and learning outcomes. Technological Content Knowledge (TCK) enables the facilitator to explore and create content that can have a positive impact in the

digital classroom when teaching. When using TCK, the facilitator develops effective digital skills related to digital tools. The facilitator then begins to understand which digital tools would be most suitable when creating and teaching subject matter in a digital classroom. The aim in using TCK is to create innovative content for teaching and learning using digital tools. This will enable the facilitator to achieve learning goals and introduce students to new technologies in a digital classroom.

In terms of this study, the researcher explored the TCK of academic librarians at UoTs in South Africa to understand what digital tools were used to create content to enhance online teaching and learning in a digital classroom. A combined majority of sixty-five percent (65% - presentation software), seventy-six percent (76% - video production software), eighty-two percent (82% - online author tools), sixty-six percent (66% - educational/learning technologies) and eighty-three percent (83% - gamification) of respondents under the 5-point Likert scale *category 4 (Rarely) and 5 (Never)* used digital tools for creating content to enhance online teaching and learning at UoTs in South Africa. Although a combined ninety-one percent (91%) of academic librarians used applications such as MS Teams and Zoom (Table 5.9), this only became a reality during Covid-19 (Figure 5.4).

Academic librarians at UoTs used the digital environment to teach in a similar way to face-to-face instruction. Although the setting changed from face-to-face to online teaching methods, the instructional strategies and tools used to mediate teaching remained the same. PowerPoint presentations and direct instruction methods continued in the digital environment, as unearthed from interpretations of the findings. Most academic librarians at UoTs did not explore and use digital creation tools such as gamification, educational/learning technologies, and video production software, amongst others, to enhance online library instruction in the digital environment. Thus, academic librarians could not design cutting-edge content using TCK for the digital classroom since they lacked digital skills prior and during the Covid-19 pandemic. This finding corresponds with a global systematic review on digital pedagogies and academic librarians (Omarsaib *et al*. 2022: 1-13). In the conclusions from the systematic review on digital pedagogies and academic librarians, it was evident that there was a lack of pedagogical and digital skills for online teaching in a digital environment.

6.4 [RO1, RO2, RO3, RO4] Frameworks in the study and academic librarians at UoTs

The TPACK and CoI frameworks were used to explore, probe, and ascertain the pedagogical skills, digital skills, and online presence of academic librarians at UoTs in South Africa when teaching in the digital environment. Figures 6.1 and 6.2 show the various components of TPACK and the elements of CoI. The researcher succinctly dissects each TPACK component and CoI element, presenting how they link to the digital pedagogies of academic librarians at UoTs in Figures 6.1 and 6.2.

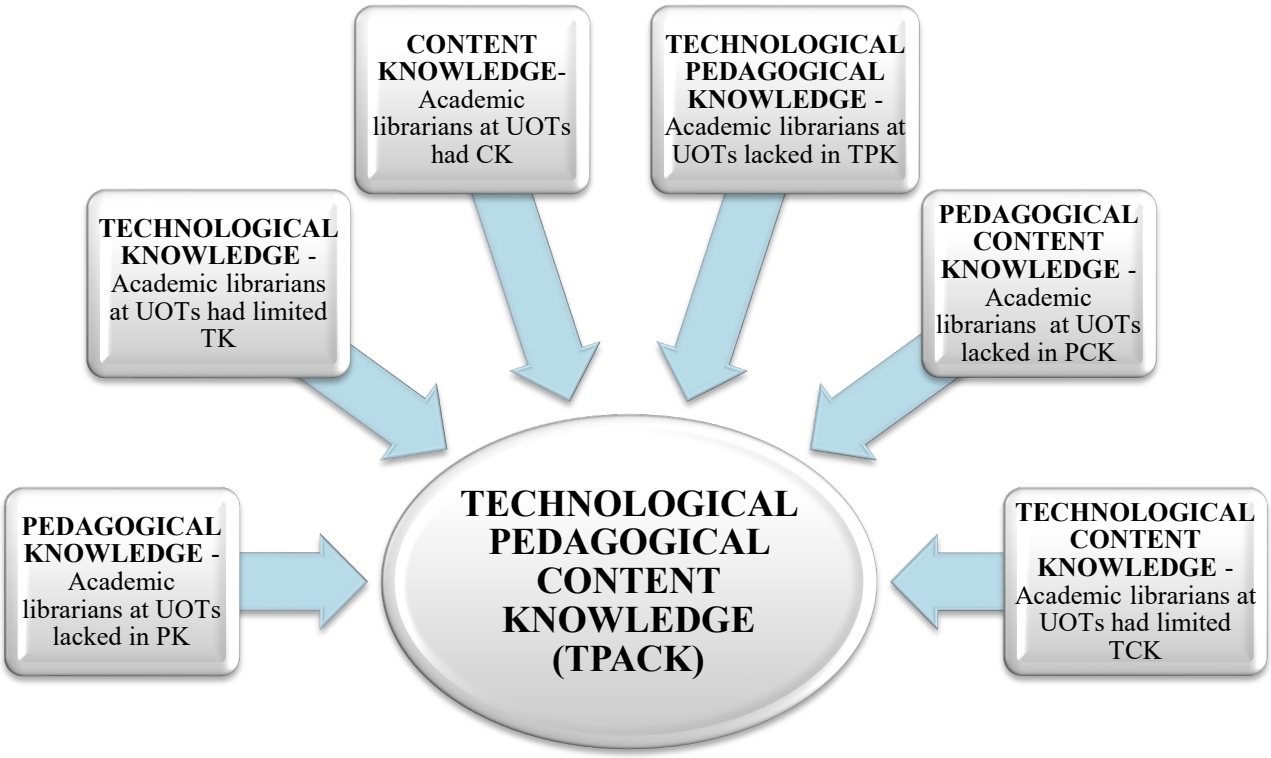


Figure 6.1: TPACK and academic librarians at UoTs (adapted fromKoehler and Mishra 2009)

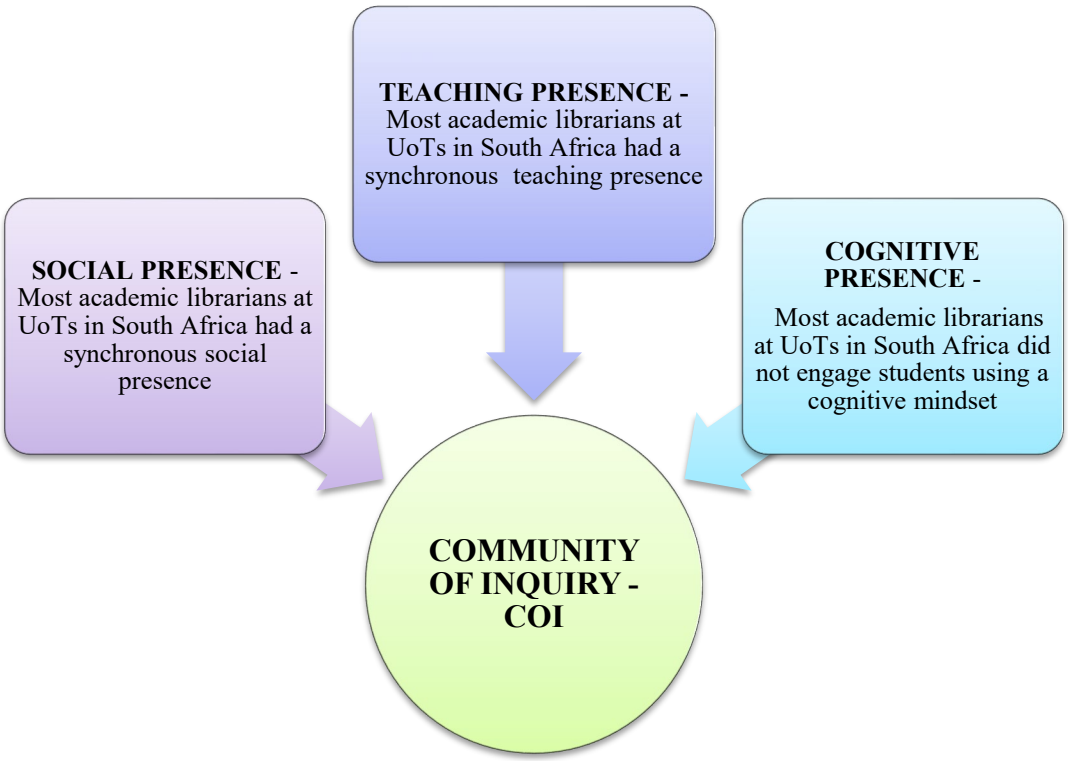


Figure 6.2: COI and academic librarians at UoTs (adapted from Garrison, Anderson and Archer 2001)

Figures 6.1 and 6.2 present the theoretical frameworks used to underpin this study. The questions for the web-based survey and online semi-structured interviews were generated from these frameworks. In the results, components of TPACK and elements from CoI prominently feature in the analysed statistics. Independent variables from the analysis included terms such as content, pedagogical and technological knowledge that are aligned to TPACK. Social, teaching, and cognitive presence became apparent in the thematic themes produced from semi-structured interviews in this study, which are elements of CoI. The strength of TPACK and CoI as frameworks selected for this study came to the forefront when interpretations and discussions were reviewed. In the discussion section, pedagogical skills, digital skills, and the online presence of academic librarians at UoTs in South Africa related to the digital environment were examined. Technological Pedagogical Content Knowledge and Community of Inquiry charted the path for the researcher to arrive at the conclusions that academic librarians at UoTs in South Africa lacked in pedagogical and digital skills for teaching in the digital environment. The conclusions also revealed that academic librarians had a compromised social, teaching, and cognitive online

presence when teaching in the digital environment at UoTs in South Africa. Thus, the next section presents the conclusions and implication for revising this gap in digital pedagogies and academic librarians at UoTs in South Africa.

6.5 [RO1, RO2, RO3, RO4] Conclusions to the study

The previous sections summarised the study, discussed the findings and which theoretical frameworks underpinned this study. Generally, the findings in this study were supported by the theoretical frameworks and the literature reviewed, reinforced with an action-oriented approach using pragmatism, resulting in data that was collected, analysed, and interpreted, including discussed in a logical manner. This section draws conclusions from the discussion of the findings. The conclusions aim to ascertain if the critical questions which were generated from the objectives addressed the issues related to this study.

Firstly, the researcher explored and probed academic librarians at UoTs in South Africa related to their online presence, pedagogical and digital skills. The theoretical frameworks were selected, literature was reviewed, and the MMR approach in the form of an explanatory sequential design used through pragmatism. The explanatory sequential mixed method design carried an equal weighting from both measuring instruments for this study. This meant that the results interpreted from the measuring instruments were used equally to interpret the online presence, pedagogical and digital skills of academic librarians in relation to the online environment. The impact of using measuring instruments from varying philosophical roots proved precise when actioned through the pragmatic paradigm for this study.

Furthermore, the reliability of the web-based survey had a high reliability closer to the value one as established from using Cronbach's Alpha Coefficient, whilst the validity of both instruments was established in the research procedures. Additionally, the high reliability of the web-based instrument made it seamless for the researcher to understand the quantitative data collected through descriptive, inferential statistics and correlations, including multiple regressions using Pearson Product Model Correlations. The researcher personally analysed the online semi-structured interviews using NVivo. The data was coded using nodes and themes emanating from the transcriptions. In the next step, empirically analysed data from the web-based survey and thematic evidence from the semi-structured was interpreted. This led to the interpretations being discussed

in the findings section of this chapter. The discussion of the findings included interpretations from the empirically analysed data, thematic evidence from semi-structured interviews, the literature reviewed and theoretical frameworks. These were all triangulated when the findings were discussed in this chapter.

Secondly, one of the critical questions this research aimed to address was the pedagogical skills of academic librarians at UoTs in South Africa when teaching in a digital environment. From a historical perspective, the literature in many instances pointed to academic librarians lacking in pedagogical skills. Recently, experts still questioned the pedagogical skills of academic librarians with a teaching profile. However, with the recent emphasis on teaching with technology across the higher education landscape, it was important to re-visit this perception as indicated in the literature. The influence of technology on teaching brought a new dynamic to the teaching identity of staff in higher education institutions. Thus, the pedagogical skills of academic librarians at UoTs in South Africa were explored through the lens of the digital environment.

The researcher ascertained from the literature reviewed academic librarians lacked pedagogical skills. Additionally, there was a dearth of studies that explored this in relation to the digital environment. In terms of academic librarians at UoTs in South Africa and the digital environment, this study concludes that there is a lack in pedagogical skills for online teaching. There are key skill sets that academic librarians at UoTs in South Africa need to address this issue. This includes knowledge of emerging technologies, learning theories, designing online curriculum for teaching, teaching with technology using diagnostic tools, integrating online assessments and 21st century pedagogical approaches to ascertain efficacy in digital pedagogies as online facilitators. Academic librarians also need to explore active learning styles to engage students in online learning. These active learning styles must be driven using online teaching methods and strategies such as problem-based learning, game-based learning, collaborative learning, inquiry-based learning and flipped classrooms, amongst others.

The other issue that needs to be explored is the *age-old complaint* in terms of library instruction not being ubiquitous at higher education institutions across the globe. The LIS profession needs to make inroads at higher education institutions to address this issue. Ultimately, this can only be directed through strategic policies from professional bodies such as the International Federation of Library Association and their subsidiaries, including key role-players within the LIS sector.

However, in the meantime, academic librarians need to focus on developing the pedagogical skills to offer an enriching online library instruction programme in the digital environment, irrespective of whether these are once-off, extended curriculum programmes or credit-bearing modules. The fact is that any form of instruction means transferring knowledge to students. Therefore, it is important to know how to transfer knowledge as a teacher. In terms of the digital environment, this requires using suitable online teaching methods and instructional strategies that allow students to grasp concepts when learning. Thus, pedagogical skills, although lacking in academic librarians at UoTs in South Africa, are critical to teaching not only for the digital environment, but in multi-modal settings and for any staff involved in teaching at higher education institutions.

Secondly, the digital skills of academic librarians at UoTs in South Africa were also probed through the same research channels as pedagogy in relation to the digital environment. In terms of the literature explored, digital skills related to academic librarians for online teaching were also limited. Within the context of the current literature in developing world economies, digital skills and academic librarians were linked to compromised technological infrastructure and a lack of opportunities to learn ICTs at higher education institutions. In many ways, this became apparent during the pandemic as higher education institutions from developing economies grappled with technical student support and the knowledge of how to transition into the digital environment in relation to online teaching. Hence, organisational unpreparedness for the digital environment prior to Covid-19 became evident in developing economies as global societies experienced a hard lockdown.

However, more importantly, the literature from developing economies is limited in terms of academic librarians, digital skills and teaching in the digital environment. There is a dearth of knowledge surrounding academic librarians integrating technology with pedagogy to enhance online teaching in the digital environment. In developed countries such as America, Australia and Canada, there is an understanding of ICTs. Academic librarians are comfortable with using ICTs for teaching and learning. However, these ICTs in the literature refer to soft skills such as using Microsoft Excel and PowerPoint. This became apparent in this study, as the researcher discovered from the literature reviewed. During the pandemic, academic librarians from developed economies busied themselves with learning how to teach library instruction using video-conferencing tools such as Zoom and MS Teams. This points to the fact that there was minimal emphasis being placed

on online library instruction using the digital environment prior to the pandemic from developed economies. In this study, a similar trajectory was discovered with academic librarians at UoTs in South Africa. Academic librarians at UoTs in South Africa also embraced online teaching during the pandemic. The same challenges arose from the findings of this study. Academic librarians did not use Zoom and MS Teams and had to explore these video-conferencing tools to support online teaching during the pandemic.

Digital pedagogies have been accelerated through the pandemic. However, globally, academic librarians need to embrace this *new norm* and use digital pedagogies in the endemic phases of the pandemic. Academic librarians must also develop germane digital skills using TPK and TCK from the TPACK framework. These digital skills include learning how to create content using gamification, video production software, web authoring tools, learning management systems and presentation software for online library instruction. This will allow academic librarians to formulate and design appropriate lessons for online library instruction. This can only be achieved through a deep understanding of knowing how to integrate technology with pedagogy to allow meaningful learning outcomes in the digital environment. Therefore, the integration of technology with pedagogy for the digital environment is relevant to the LIS field in South Africa and globally.

Furthermore, it is of critical importance to understand which digital tools are most suitable for specific learning outcomes. The next step is knowing how to apply these digital tools when engaging students in the teaching and learning process. However, through these steps of selecting and reflecting upon digital tools, pedagogy must be the underpinning force. This will ensure that the science of teaching is guiding the digital tools being selected to enhance learning in a digital environment. These are key points to adopt when teaching in a digital environment.

In this study, academic librarians applied digital skills to teach preceding and during the Covid-19 pandemic, but within limitations. The study revealed that academic librarians only started engaging in online teaching during the pandemic. Therefore, the digital tools used for face-to-face instruction in the form of PowerPoint presentations and demonstrations was transferred into the online setting using video-conferencing applications such as MS Teams and Zoom. Academic librarians at UoTs in South Africa continued teaching in the digital environment using the same tools that were familiar to them from face-to-face lessons. There were very limited new online instructional strategies implemented in the digital environment besides direct instruction, as

academic lacked in pedagogical and digital skills. This resulted in online teaching being a one-way communication in the digital classroom. There were brief discussions, as indicated by academic librarians, in the digital classroom through questions asked by students or pre-recorded videos as needed for lessons.

Furthermore, academic librarians at UoTs in South Africa did not know how to integrate digital tools such as educational technologies, video production software and learning objects into online lessons for the digital environment. The only digital tool used was pre-recorded videos that were screened from the internet or recorded lectures from previous digital classes during the pandemic. Ultimately, the lack in digital skills compromised their level of integration and engagement with students in the digital environment. The understanding of how to use digital tools to enhance pedagogy in the digital environment for teaching and learning was absent in academic librarians at UoTs in South Africa. Thus, this study, after exploring and probing, established academic librarians at UoTs in South Africa lacked in pedagogical and digital skills.

In the currently digital age, a prerequisite for using digital pedagogies in the online environment is digital skills. This is an area that needs development and support from UoTs in South Africa. It can be assumed that similar challenges are prevalent with other teaching staff at UoTs in South Africa, but this needs to be scientifically explored. Thirdly, the researcher explored the type of online social, teaching, and cognitive presence that academic librarians at UoTs in South Africa had in the digital environment related to library instruction. This was probed through examining academic librarians' synchronous and asynchronous online presence in the digital environment when engaging students in activities. The digital environment, online instructional strategies, and teaching methods that academic librarians adopted were inspected through the web-based survey and semi-structured interviews conducted with academic librarians at UoTs in South Africa.

The Community of Inquiry framework and its elements guided the researcher to comprehensive findings and interpretations related to academic librarians at UoTs in South Africa. In terms of online social and teaching presence, this was only evident in the synchronous (live digital classes). In applications such as MS Teams and Zoom, academic librarians had a teaching and social presence, but with limitations. There were no online instructional strategies such as critical reflection, self-directed and interactive learning, used to engage students in the digital environment. The teaching presence was limited to online direct instruction and demonstrations

using PowerPoint presentations. The social presence and support did exist in the live digital classes. However, this was only through the chat section and video-sharing options from MS Teams and Zoom digital tools. The positive spin to this is that it allowed academic librarians to put a face to the voice behind the screen.

Online teaching methods did not include flipped classrooms, game-based learning, inquiry-based learning, project-based learning, or problem-based learning, which is normally used to stimulate the minds of students when engaging in digital learning. It was the same principle applied in the face-to-face setting of *chalk and talk* as in the digital environment, just transformed to *sage on the electronic stage*. As mentioned, direct instruction and videos were preferred over all other types of interventions because of a lack in pedagogical and digital skills related to the digital environment. Online teaching methods such as problem-based learning, which is widely accepted as one of the gold standards, was compromised in online library instruction. These type, of online teaching methods create the ambience for cognitive presence aligned to the CoI framework and actively engages students in the learning process.

Active engagements in the digital classroom also lift barriers of social and teaching presence. It allows students and facilitators to create meaningful discussions about subject matter. Students at some point start developing their own perspectives and objective mind-sets related to subject matter. This is orchestrated with guidance from the social and teaching presence of the facilitator in a digital classroom using active online teaching methods. At this stage, the CoI elements in the form of social, teaching, and cognitive factors, begin to develop a confluence in the digital classroom to facilitate the learning process. However, these types of engagements are absent in terms of academic librarians and online presence in the digital classroom.

In terms of academic librarians and asynchronous activities (outside the digital class), this was practically non-existent. There was no social, teaching, and cognitive presence outside the digital classroom. This was an obvious reality since the engagements in the digital classroom were limited. However, the academic librarians from the various UoTs in South Africa did mention that there is a need to learn how to use learning management systems such as Blackboard and Moodle to engage students asynchronously. Academic librarians mentioned that although there is a dire need to development active teaching practices in the digital classroom, this is also required outside the classroom. Academic librarians at UoTs in South Africa are mindful of the potential of using

a LMS to direct online learning asynchronously e.g., problem-based learning activities. However, there is a lack in knowing how to use this to enhance teaching and learning in relation to library instruction. Thus, this study concluded that academic librarians at UoTs in South Africa lacked in digital pedagogies for the digital environment.

6.6 [RO1, RO2, RO3, RO4] Recommendations of the study

Recently, the impact of technology on teaching has complicated the role of academic librarians as teachers. Moreover, the acceleration and integration of technology with pedagogy has transformed learning processes at higher education institutions. The endemic phase of Covid-19 has seen normality return at higher education institutions. The question that remains is: are academic librarians reflecting upon the lessons learnt and strategising for teaching and learning in the digital environment? In this study, the researcher established academic librarians at UoTs in South Africa lacked in digital pedagogies for the digital environment. The literature has continuously challenged academic librarians and their pedagogical skills. However, in recent times the prominence of the digital environment has created a confluence between pedagogy and technology in the form of digital pedagogies needed when teaching in the digital environment.

Another important point is the weighting and credibility of library instruction that academic librarians teach in the form of information literacy. This is not ubiquitous at higher education institutions worldwide. Historically, the role of academic librarians as teachers has been marginalised in the higher education landscape in relation to information literacy. Information literacy rightfully does not hold the same weight and credibility as mainstream modules. However, there should be policy that governs the importance of it as an entry-level generic module or subject at higher education institutions. Information literacy is differently placed and valued at higher education institutions across the globe. It is designed, implemented, assessed, and evaluated uniquely at various higher education institutions.

There are pockets of success stories related to information literacy that emanate at conferences, research papers and postgraduate studies. However, this is not a module that is cast in stone in the higher education sector. It largely depends on the needs of faculties and departments at higher education institutions for information literacy to be adopted. The intent of information literacy at some higher education institutions is noteworthy. However, it is not a module that is emphasised on a global scale, except by academic librarians and a limited number of lecturers who see the

value of information literacy for students. This is an interesting topic because it is linked to the development of the academic librarian as teacher in the higher education sector. On the other hand, information literacy as a module and the value it adds to the South African higher education sector is an important topic, but it is one for another study.

In terms of this study, the researcher recommends the following to address digital pedagogies and academic librarians at UoTs in South Africa for the digital environment:

1. The role of library associations such as the Library and Information Association of South Africa (LIASA) and Committee of Higher Education Libraries South Africa (CHELSA) is critical to developing academic librarians' online presence, pedagogical skills, digital skills, and digital pedagogies for the digital environment. These LIS associations need to be protagonists in preparing academic librarians for digital teaching roles in the tertiary education sector of South Africa. The LIS associations need to strategise in providing opportunities for academic librarians in developing pedagogical and digital skills through subsidiaries within their associations. These opportunities can be provided through workshops, seminars, and interest groups at a regional and national level in South Africa.
2. Simultaneously, LIASA, CHELSA and experts from the LIS industry need to begin a process of negotiation with stakeholders and policymakers within the higher education sector to outline the importance of information literacy to the holistic development of students at South African higher education institutions. The goal must be to ensure that information literacy becomes ubiquitous at higher education institutions in South Africa at the first-year level for all students.
3. Library and Information Science schools at South African higher education institutions must offer a concise module covering teaching-with-technology to prepare graduates for a teaching role in the workplace. This module should cover aspects such as foundational knowledge in pedagogies, learning theories, emerging technologies with teaching and the role of the librarian as teacher in multi-modal environments. The introduction of such a module within the LIS curriculum in South Africa will indefinitely develop, prepare and support academic librarians in their future teaching roles within academia.
4. Library management at higher education libraries in South Africa need to create opportunities for staff with teaching profiles to develop pedagogical and digital skills for

the digital environment. These can include in-house continuous professional development programmes such as Scholarships of Teaching and Learning, mentorships, workshops and seminars on digital pedagogies.

5. Academic librarians must consider online platforms that offer Massive Open Online Courses (MOOCs). These types of courses are modelled for individuals or organistions without incurring any costs. It provides learning opportunities with purposeful intent and flexibility. Online platforms that offer MOOCs, such as edX, can be consulted to create a course to suit the needs of a specific workforce such as academic librarians at UoTs in South Africa. Some of these MOOCs are even credit-bearing and are accompanied by online course badges upon completion. The content designed when creating MOOCs can be negotiated and tailor-made to the needs of a particular workforce. Therefore, it has the potential to provide academic librarians with the digital and pedagogical skills related to the digital environment.
6. Library management and academic librarians with a teaching profile at UoTs must explore short courses related to teaching with technology in 4IR. These courses are offered by many universities in South Africa and address relevant topics related to the online presence, pedagogical skills, digital skills, and digital pedagogies in 4IR. Furthermore, these short courses are offered as a level six or seven on the National Qualification Framework in South Africa. This implies that these short courses are highly credible since the Council on Higher Education or Department of Higher Education have validated and approved their legitimacy.
7. Benchmarking and practice-sharing sessions with fellow academic librarians in a similar portfolio from UoTs can provide impetus in improving pedagogical and digital skills for the digital environment. Library management needs to create opportunities through sustainable programmes to share knowledge and measure practices with colleagues from UoTs in South Africa. The purpose must be to create a community of practice for academic librarians to enhance their pedagogical and digitals skills related to the digital environment.

6.6.1 [RO5] Design for the development of a training model on digital pedagogies for academic librarians in South Africa

The main purpose of this study was to design a training model to address the research problem. In general, academic librarians at UoTs in South Africa lacked pedagogical skills, digital skills, and

an online presence for teaching in the digital environment. The study revealed that academic librarians need these skills as a prerequisite for teaching in the digital environment. Academic librarians also expressed their concerns through this study. Academic librarians believed that pedagogical skills, digital skills, and an active online presence for teaching in the digital environment were critical to the current context at UoTs in South Africa.

Furthermore, the study also found that UoTs only began embracing teaching with technology due to the pandemic. Therefore, the concept of using digital pedagogies for teaching and learning in the digital environment is new for academic librarians at UoTs in South Africa. However, there is an urgent need to embrace innovative teaching and learning practices using technology in the digital environment as it is rapidly becoming the preferred medium for academic librarians at UoTs in South Africa. Academic librarians did not know how to actively engage students in the digital environment through library instruction. Academic librarians at UoTs in South Africa did not have the skills to design online library content using technology. As a result, teaching became challenging in the digital environment. Therefore, the use of direct instruction continued as this was the only form of teaching that academic librarians were familiar with from previous face-to-face interventions. However, this is not limited to academic librarians and presumably is the challenge facing most staff at UoTs in South Africa who are involved in digital teaching and learning.

The researcher reflected on the analysis, results, and discussions from this mixed method study. Outcomes were clear in relation to the digital pedagogies, pedagogical skills, digital skills and online teaching presence of academic librarians at UoTs in South Africa, as established from this study. Therefore, the researcher decided to gather experts in the LIS field to develop a digital pedagogies training model for academic librarians at UoTs in South Africa. Experts from the LIS field such as seasoned academic librarians with a teaching profile have vast knowledge of teaching. Hence, their expertise was important in designing an effective training model to meet the teaching needs of academic librarians at UoTs in South Africa. Furthermore, the need for a training model was also proposed during the semi-structured interviews, as revealed under the heading *'Teaching qualification or a training model'* in Chapter 5 of this study. The researcher decided to use the Delphi method to engage experts from the LIS field on digital pedagogies (Yeh *et al*. 2014: 707-

722.). Figure 4.5 under the research methodology chapter illustrates and explains the Delphi method.

The researcher was positioned as a *facilitator* during the Delphi process for this study. Participants that were seasoned experts were selected on anonymity from the LIS field. This ensured that at each round in the Delphi process, opinions remained independent or unbiased from other participants. There was a series of three collection rounds. The **first round** was in the form of an open-ended questionnaire (Appendix K) that was used to brainstorm ideas as to how the training model can be developed. Once participants completed and returned the responses, the facilitator prepared a summary report. The summary report was distributed to experts who participated in the Delphi process from the LIS field. The facilitator ensured that the summary report did not disclose the identities of participants.

In the **second round**, a short questionnaire (Appendix K) was shaped in the form of a 5-point Likert scale that included statements. The questionnaire was developed after analysing the data from the first round. The facilitator removed irrelevant and redundant answers from the first round. Similarities in content from the first round were included as statements. The responses from the second round showed glimpses of consensus being reached as to the design of the training model. The facilitator once again sent a summary report to experts, ensuring anonymity.

In designing the questionnaire for **round three**, ideas from the second were included. Therefore, the questionnaire in round three was similar to round two (Appendix K). At this point, experts in the LIS field reached consensus related to the effective design of a training model for academic librarians at UoTs in South Africa. The forecast clearly depicted experts broadly agreeing with each other on the design of the training model. The Delphi method, combined with data analysed from this mixed method study, contributed to the design of the training model for academic librarians at UoTs in South Africa.

The intent of the researcher for this study was to contribute to the LIS knowledge base. However, the proposed training model for academic librarians at UoTs in South Africa can be adapted and used within academia in the higher education sector. The researcher also believes that contributing to the knowledge base in any field should be through a lived experience and shared meaning with the aim to develop society. Therefore, the theoretical frameworks chosen, literature reviewed,

methodology underpinned through pragmatism, results from the data collection instruments, interpretations and discussion of findings and Delphi method epitomise the development of the training model on digital pedagogies for academic librarians at UoTs in South Africa. This training model is not intended to be dictatorial, but rather a provision to enhance teaching and learning in the digital environment for academic librarians. Figure 6.3 presents the training model on digital pedagogies for academic librarians at UoTs in South Africa.

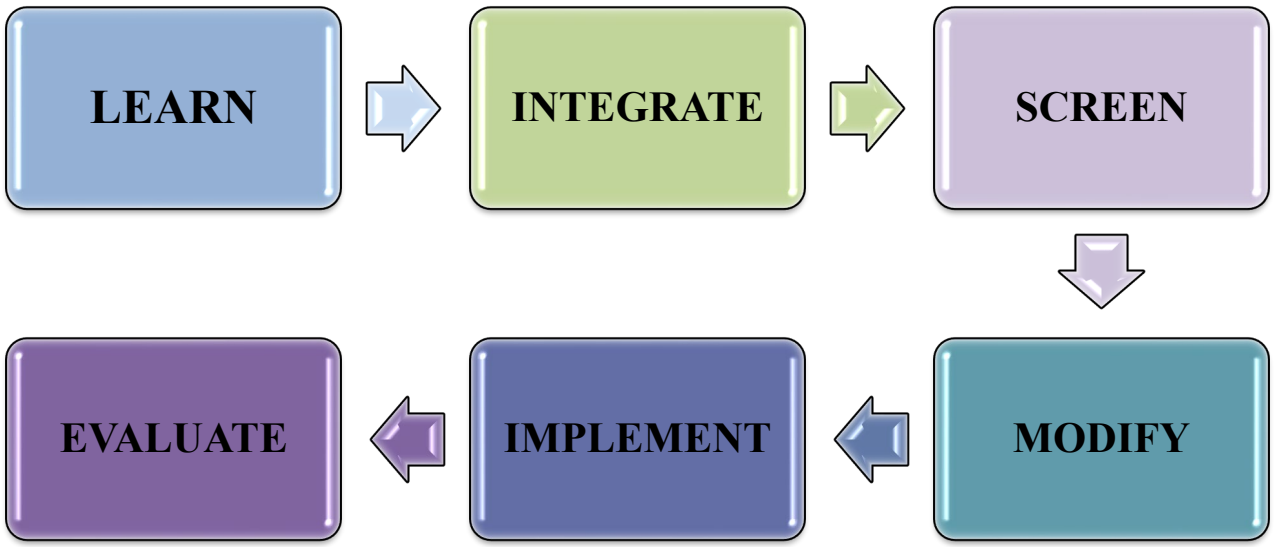


Figure 6.3: Digital pedagogies training model for academic librarians at UoTs

In Figure 6.3, the researcher proposes a design for developing an online training model for academic librarians at UoTs in South Africa. The design has six key elements. The analysis and interpretation together with the theoretical frameworks, literature reviewed, findings and Delphi method informed the design of the training model. The design and convergence at each stage is logical and supported by every element in the model. The aim of each element is for academic librarians at UoTs to Learn, Integrate, Screen, Modify, Implement and Evaluate (LISMIE) digital skills, underpinned with pedagogical knowledge to create an online presence when teaching library instruction in the digital environment.

The first element, titled *Learn* in Figure 6.3, proposes that academic librarians obtain pedagogical and digital skills related to the content delivered as online library instruction (information literacy)

in the digital environment. Pedagogical skills mean briefly exploring which learning theory, teaching methods and instructional strategies can be applied to design lessons for different topics within information literacy. Furthermore, the type of online information literacy activities and assessments would be relevant to students when planning for the class. Academic librarians also need to reflect on how the knowledge of pedagogy can be used to develop information literacy content that would actively engage students in the digital environment. In terms of digital skills in the *Learn* element, this refers to examining various digital content and creation tools that can stimulate learning for students in the digital environment. The digital content or creation tool selected must be integrated with the activity and assessment in preparation for the online lesson. This leads to the next stage.

The next element in Figure 6.3 is *Integrate*. In this stage, academic librarians can decide what learning activity and digital tool is most suitable for a particular topic related to library instruction in the digital environment. It can then be *integrated* as a digital pedagogy. The mixing of the learning activity or content with a digital tool (digital pedagogy), underpinned by a learning theory, should be screened for errors, suitability, and efficacy. This element is termed *Screen* in Figure 6.3. The *Screen* element is critical as it determines whether the learning activity and teaching method is converging or diverging with the digital tool being tested. It provides the opportunity for academic librarians to reflect upon their pedagogical underpinnings for the learning activity and tool selected. Furthermore, it allows the academic librarian to consider if the digital tool is appropriate for actively engaging students for the topic to be covered in the lesson.

Modify is the element in Figure 6.3 that provides the flexibility for academic librarians to adjust or change the learning activity and digital tool. This will ensure that the product in terms of instructional method, activity and digital tool can be effectively integrated in the *implement* stage. *Implement* is when the digital pedagogy is applied in the digital classroom. At this point, the academic librarian would have already screened and modified the teaching method, learning activity and digital tool (digital pedagogy) to ensure that implementation is effective and seamless as it is operationalised in the digital environment.

The last element in the model, *Evaluate,* is a two-fold process. Firstly, the academic librarian must reflect on the digital pedagogy used for the lesson and its efficacy in terms of the learning outcome. Secondly, the academic librarian should conduct a *quick-fire* survey or discussion to ascertain

whether students were comfortable with the digital pedagogy used in the digital classroom. This will help establish whether the digital pedagogy can be implemented again, modified, or not used, depending on the outcome of the lesson.

6.7 Implications of the study

The design proposed in Figure 6.3 is a work-in-progress, although the researcher conducted a Delphi study. The intention of the researcher is to brainstorm this design with experts in education, educational technologists, and staff from the centre of teaching and research excellence, besides scholars from the LIS field. The researcher aims to create a mobile application at post-doctoral level to provide seasoned and entry-level academics the opportunity to use the LISMIE model to improve their understanding of how to use pedagogy and technology to create innovative lessons for the digital environment. The researcher envisions that the mobile application will provide resources to understand pedagogy, learning theories and emerging digital tools aligned to the relevant elements within the LISMIE model. The research findings in this study have the potential to influence policies and strategies related to academic librarians and their teaching role at UoTs in South Africa. If the recommendations of the current study are taken into consideration, this could enable academic librarians to develop a grounded understanding of digital pedagogies for teaching in the digital environment.

6.8 Future research

Knowledge production is important in the 21st century. It demands that society reflects upon issues and challenges in various fields. This creates opportunities to find solutions to challenges. It also provides communities of practice to contribute towards the global knowledge economy through research and practice. In terms of this topic, the researcher explored digital pedagogies through the microscopic lens of academic librarians at UoTs in South Africa. There are research areas that are as important in relation to digital pedagogies and other relevant topics. These research topics can also contribute to the higher education knowledge economy in South Africa and perhaps globally. Some of these topics include digital pedagogies and academics at higher education institutions in South Africa and designing a credit-bearing generic information literacy module for higher education institutions in South Africa.

6.9 Summary and conclusion

The final chapter of this study has established the digital pedagogies of academic librarians at UoTs in South Africa. The discussion section was based on the main findings which informed the research. The discussions of the findings through the theoretical frameworks, literature reviewed, analysis and interpretations reflected the structure of this research; whilst the methodology provided the blueprint for the researcher. Therefore, the final chapter was the culmination of all research processes in the study. This enabled the researcher to arrive at the conclusions, recommendations, and implications of the study.

This chapter is a manifestation of the critical questions generated to address the objective of this study, as articulated in Chapter 1. The researcher is confident that the study has answered the critical questions and addressed the objective: The *Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology (UoTs) in South Africa*. The use of an action-orientated pragmatic approach through the MMR design using a web-based survey and online semi-structured interviews was adequate in collecting the data to respond to the critical questions in the study. The researcher believes that the proposed design for the training model, post-doctoral aim of creating a mobile application and recommendations drawn from the conclusions of this study have the potential to significantly contribute to the LIS profession related to academic librarians as teachers in the digital environment linked to the South African context.

Furthermore, this research can be adapted and used to explore the digital pedagogies of academics across the higher education spectrum in South Africa and globally. The use of digital pedagogies for the digital environment is becoming a *must know and have* as higher education institutions are released from the clutches of the pandemic and normality is re-established in society. However, it remains to be seen through which lens facilitators in South Africa embrace the digital environment for teaching and learning regarding 4IR. The researcher concludes that academic librarians at UoTs in South Africa should re-position themselves to effortless transcend into the digital environment.

REFERENCES

Abu-Alhajja, A. S. 2019. From epistemology to Structural Equation Modeling: An essential guide in understanding the principles of research philosophy in selecting the Appropriate Methodology. *Australian Journal of Basic and Applied Sciences*, 13 (9): 122-128.

Adeniran, A. 2019. Application of Likert scale's type and Cronbach's alpha analysis in an airport perception study. *Scholar Journal of Applied Sciences and Research*, 2 (4): 1-5.

Aharony, N., Julien, H. and Nadel-Kritz, N. 2019. Survey of information literacy instructional practices in academic libraries. *Journal of Librarianship and Information Science*, 52 (4): 964-971.

Ahmad, S., Sultana, N. and Jamil, S. 2020. Behaviorism vs constructivism: A paradigm shift from traditional to alternative assessment techniques. *Journal of Applied Linguistics and Language Research*, 7 (2): 19-33.

Akyol, Z. and Garrison, D. R. 2011. Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*, 42 (2): 233-250.

American Library Association. 2017. *ACRL Standards for Proficiencies for Instruction Librarians and Coordinators*. Available: https://www.ala.org/acrl/standards/teachinglibrarians (Accessed 28 October 2020).

Al-Ababneh, M. M. 2020. Linking ontology, epistemology and research methodology. *Science & Philosophy*, 8 (1): 75-91.

Alameri, J., Masadeh, R., Hamadallah, E., Ismail, H. B. and Fakhouri, H. N. 2020. Students' Perceptions of E-learning platforms (Moodle, Microsoft Teams and Zoom platforms) in The

University of Jordan Education and its Relation to self-study and Academic Achievement during COVID-19 pandemic. *Advanced Research and Studies Journal*, 11 (5): 21-33.
Alharahsheh, H. H. and Pius, A. 2020. A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2 (3): 39-43.

Alise, M. A. and Teddlie, C. 2010. A continuation of the paradigm wars? Prevalence rates of methodological approaches across the social/behavioral sciences. *Journal of Mixed Methods Research*, 4 (2): 103-126.

Aliyu, A. A., Bello, M. U., Kasim, R. and Martin, D. 2014. Positivist and non-positivist paradigm in social science research: Conflicting paradigms or perfect partners. *Journal of Management and Sustainability*, 4 (3): 79-95.

Archibald, M. M., Ambagtsheer, R. C., Mavourneen, G. C. and Lawless, M. 2019. Using zoom videoconferencing for qualitative data collection: perceptions and experiences of researchers and participants. *International Journal of Qualitative Methods*, 18: 1-8.

Anderson, V. 2020. A digital pedagogy pivot: re-thinking higher education practice from an HRD perspective. *Human Resource Development International*, 23 (4): 452-467.

Anderson, T., Rourke, L., Garrison, D. R. and Archer, W. 2001. Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks*, 5 (2): 1-1-17.

Antoniou, J. 2021. Adopting new educational technologies and the need for digital pedagogies. In: *Quality of Experience and Learning in Information Systems*. Springer, 9-18.

Aprinaldi, A., Widiaty, I. and Abdullah, A. 2018. Integrating SAMR learning model in vocational education. In: Proceedings of *IOP Conference Series: Materials Science and Engineering*. IOP Publishing, 012309.

Aspers, P. and Corte, U. 2019. What is qualitative in qualitative research? *Qualitative Sociology*, 42 (2): 139-160.

Assalahi, H. 2015. The philosophical foundations of educational research: a beginner's guide. *American Journal of Educational Research*, 3 (3): 312-317.

Audi, R. P. 2015. *The Cambridge dictionary of philosophy*. Cambridge: Cambridge University Press.

Austin, T. and Bhandol, J. 2013. The academic librarian: buying into, playing out, and resisting the teacher role in higher education. *New Review of Academic Librarianship*, 19 (1): 15-35.

Avidov-Ungar, O. and Forkosh-Baruch, A. 2018. Professional identity of teacher educators in the digital era in light of demands of pedagogical innovation. *Teaching and Teacher Education*, 73: 183-191.

Awadelkarim, A. A. 2021. An analysis and insight into the effectiveness of scaffolding: EFL instructors'/teachers' perceptions and attitudes. *Journal of Language and Linguistic Studies*, 17 (2): 828-841.

Babbie, E. R. 2021. *The practice of social research*. 15th ed. Boston: Cengage.

Babbie, E. 2008. *The basics of social research*. California: Thomson Higher Education.

Banihashem, K. and Macfadyen, L. P. 2021. Pedagogical Design: Bridging Learning Theory and Learning Analytics. *Canadian Journal of Learning and Technology*, 47 (1).

Bardhoshi, G. and Erford, B. T. 2017. Processes and procedures for estimating score reliability and precision. *Measurement and Evaluation in Counseling and Development*, 50 (4): 256-263.

Baro, E. E., Obaro, O. G. and Aduba, E. D. 2019. An assessment of digital literacy skills and knowledge-based competencies among librarians working in university libraries in Africa. *Digital Library Perspectives*, 35 (3/4): 172-192.

Baskarada, S. and Koronios, A. 2018. A philosophical discussion of qualitative, quantitative, and mixed methods research in social science. *Qualitative Research Journal*, 18 (1): 2-21.

Becker, B. W. 2018. Information literacy in the digital age: Myths and principles of digital literacy. *School of Information Student Research Journal*, 7 (2): 1-8.

Berndt, A. E. 2020. Sampling Methods. *Journal of Human Lactation*, 36 (2): 224-226.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O. and Kerres, M. 2020. Mapping research in student engagement and educational technology in higher education: a systematic evidence map: Revista de Universidad y Sociedad del Conocimiento. *International Journal of Educational Technology in Higher Education*, 17 (1).

Bonk, C. J. 2020. Pandemic ponderings, 30 years to today: synchronous signals, saviors, or survivors? *Distance Education*, 41 (4): 589-599.

Borup, J. and Evmenova, A. S. 2019. The effectiveness of professional development in overcoming obstacles to effective online instruction in a College of Education. *Online Learning*, 23 (2): 1-20.

Bryman, A. 2016. *Social research methods*. London: Oxford university press.

Bujang, M. A., Omar, E. D. and Baharum, N. A. 2018. A review on sample size determination for Cronbach's alpha test: a simple guide for researchers. *The Malaysian Journal of Medical Sciences: MJMS*, 25 (6): 85-89.

Burkholder, G. J., Cox, K. A., Crawford, L. M. and Hitchcock, J. H. 2019. *Research design and methods: An applied guide for the scholar-practitioner*. London: Sage Publications.

Cameron, R. 2011. Mixed methods research: the five Ps framework: EJBRM. *Electronic Journal of Business Research Methods*, 9 (2): 96-108.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D. and Walker, K. 2020. Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25 (8): 652-661.

Cabañero, J. 2022.RThe emerging concept of the digital pedagogy. *International Journal of Academic Pedagogical Research (IJAPR)*, 4 (6): 63-67.

Candy, P. C. 1989. Constructivism and the study of self-direction in adult learning. *Studies in the Education of Adults*, 21 (2): 95-116.

Caruth, G. D. 2013. Demystifying Mixed Methods Research Design: A Review of the Literature. *MIJE Mevlana International Journal of Education*, 3 (2): 112-122.

Caskurlu, S., Richardson, J. C., Alamri, H. A., Chartier, K., Farmer, T., Janakiraman, S., Strait, M. and Yang, M. 2021. Cognitive load and online course quality: Insights from instructional designers in a higher education context. *British Journal of Educational Technology*, 52 (2): 584-605.

Cassell, C., Cunliffe, A. L. and Grandy, G. 2018. *The SAGE handbook of qualitative business and management research methods: methods and challenges*. California: Sage Publications.

Catalano, A. J., Glasser, S., Caniano, L., Caniano, W. and Paretta, L. 2018. An analysis of academic libraries' participation in 21st century library trends. *Evidence Based Library and Information Practice*, 13 (3): 4-16.

Chanetsa, B. and Ngulube, P. 2017. Qualifications and skills of subject librarians in selected African countries. *International Information & Library Review*, 49 (3): 187-200.

Chaterera, F. 2017. A framework for access and use of documentary heritage at the National Archives of Zimbabwe. UNISA.

Cheema, S. 2018. Research paradigm & paradigm wars. *Dilemma of a Researcher. SAMIKSHA*, 1 & 2: 36-41.

Chen, J. and Neo, P. 2019. Texting the waters: An assessment of focus groups conducted via the WhatsApp smartphone messaging application. *Methodological Innovations*, 12 (3): 1-10.

Chewe, P. and Zulu, Z. 2020. A survey of digital literacy skills among librarians in Zambia. *Zambia Journal of Library & Information Science (ZAJLIS),* 4 (1): 1-18.

Chipindi, F. M., Serenje-Chipindi, J. and Daka, H. 2020. An analysis of epistemological considerations in educational research. *Journal of Lexicography and Terminology.* 4 (2): 105-118.

Chirkov, V. and Anderson, J. 2018. Statistical positivism versus critical scientific realism. A comparison of two paradigms for motivation research: Part 1. A philosophical and empirical analysis of statistical positivism. *Theory & Psychology*, 28 (6): 712-736.

Chisita, C. T., Chiparausha, B., Tsabetse, V., Olugbara, C. T. and Letseka, M. 2022. Remaking academic library services in Zimbabwe in the wake of COVID-19 pandemic. *The Journal of Academic Librarianship*, 48 (3): 1-7.

Chiware, E. R. and Becker, D. A. 2018. Research trends and collaborations by applied science researchers in South African universities of technology: 2007–2017. *The Journal of Academic Librarianship*, 44 (4): 468-476.

Chowdhury, S. and Halder, S. 2019. Academic help-seeking: a constructivist approach in learning and achievement. *International Journal of Education and Management Studies*, 9 (4): 227-231.

Chowdhury, N., Katsikas, S. and Gkioulos, V. 2022. Modeling effective cybersecurity training frameworks: A delphi method-based study. *Computers & Security*, 113: 1-15.

Ciccone, A. and Hounslow, L. 2019. Re-envisioning the role of academic librarians for the digital learning environment: The case of UniSA Online. *Journal of University Teaching & Learning Practice*, 16 (1): 1-21.

Clark, K. R. 2018. Learning theories: cognitivism. *Radiologic Technology*, 90 (2): 176-179.

Clifton, J. D. 2020. Managing validity versus reliability trade-offs in scale-building decisions. *Psychological Methods*, 25 (3): 259-270.

Cramer-Petersen, C. L., Christensen, B. T. and Ahmed-Kristensen, S. 2019. Empirically analysing design reasoning patterns: Abductive-deductive reasoning patterns dominate design idea generation. *Design Studies*, 60: 39-70.

Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika*, 16 (3): 297-334.

Cohen, L., Manion, L. and Morrison, K. R. B. 2018. *Research methods in education*. 8th ed. London: Routledge.

Cohen, L., Manion, L. and Morrison, K. 2013. *Research methods in education*. 7th ed. London: Routledge.

Cohen, L., Manion, L. and Morrison, K. R. B. 2007. *Research methods in education*. 6th ed. London: Routledge.

Connelly, L. M. 2011. Research roundtable: Cronbach's alpha. *Medsurg Nursing*, 20 (1): 44-45.

Cordero, A. 2013. Naturalism and Scientific Realism. In: Galparsoro, J. I. and Cordero, A. eds. *Reflections on Naturalism*. New York: Brill, 61-84.

Corfe, S. 2018. *4IR in the Workplace: Ensuring employers and employees benefit*. London: Social Market Foundation.

Corrall, S. and Jolly, L. 2019. Innovations in Learning and Teaching in Academic Libraries: Alignment, Collaboration, and the Social Turn. *New Review of Academic Librarianship*, 25 (2-4): 113-128.

Crawford, J Butler-Henderson, K, Rudolph, J, Malkawi, B, Glowatz, M, Burton, R, Magni, P and Lam, S. 2020. COVID-19: 20 countries higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, 3(1): 1-20. Available: doi: 10.37074/jalt.2020.3.1.7 (Accessed 20 June 2021).

Cremin, L. A. 1959. John Dewey and the progressive-education movement, 1915-1952. *The School Review*, 67 (2): 160-173.

Creswell, J. W. and Creswell, J. D. 2020. *Research design: qualitative, quantitative, and mixed methods approaches*. 5th ed. California: SAGE.

Creswell, J. W. and Clark, V. L. P. 2018. *Designing and conducting mixed methods research*. 3rd ed. Los Angeles: SAGE.

Creswell, J. W. 2014. *Research design: qualitative, quantitative, and mixed methods approaches*. 4th ed. California: SAGE.

Creswell, J.W. 2013. *Qualitative inquiry and research design: choosing among the five approaches*. Los Angelos: SAGE.

Creswell, J. W. 2009. *Research design: qualitative, quantitative, and mixed methods approaches*. 3rd ed. Los Angeles: Sage.

Creswell, J. W. and Plano Clark, V. L. 2007. *Designing and conducting mixed methods research*. California: SAGE.

Creswell, J. W. and Plano Clark, V. L. 2011. *Designing and conducting mixed methods research*. 2nd ed. California: SAGE.

Creswell, J., Plano-Clark, V., Gutmann, M. and Hanson, W. 2003. Advanced mixed methods research designs. In: Tashakkori, A. and Teddlie, C. eds. *Handbook of mixed methods in social & behavioral research*. California: Sage Publications, 209-240.

Crotty, M. 1998. *The foundations of social research*. London: Routledge.

Daniels, H. and Tse, H. M. 2021. Bernstein and Vygotsky: how the outside comes in and the inside goes out. *British Journal of Sociology of Education*, 42 (1): 1-14.

da Silva, H. C. C., de Oliveira Siqueira, A., Araújo, M. A. V. and Dornelas, J. S. 2018. Let's be pragmatic: research in information systems with relevance and rigor. *International Journal of Business Management & Economic Research*, 9 (4). 1314-1321.

Davids, Z. and Omar, Y. 2018. Implementing a Certificate of Information Literacy programme and engaging with faculty: a case study of the Cape Peninsula University of Technology. *South African Journal of Libraries and Information Science*, 84 (1): 1-9.

Davidson-Shivers, G. V., Rasmussen, K. L. and Lowenthal, P. R. 2018. Overview of online instruction and learning environments and communities. In: *Web-based learning*. Springer, 3-41.

Davies-Hoffman, K., Alvarez, B., Costello, M. and Emerson, D. 2013. Keeping pace with information literacy instruction for the real world: When will MLS programs wake up and smell the lilacs? *Communications in Information Literacy*, 7 (1): 9-23.

De Jager, K. and Nassimbeni, M. 2005. Information literacy and quality assurance in South African higher education institutions. *Libri*, 55: 31-38.

Denzin, N. K. and Lincoln, Y. K. 2018. *The SAGE handbook of qualitative research*. 5th ed. California: Sage Publiations.

Denzin, N. K. and Lincoln, Y. S. 2000. *Handbook of qualitative research*. California: Sage Publications.

Denzin, N. 1978. *The logic of naturalistic inquiry in sociological methods.* New Jersey: Prentice Hall.

Devi, K. S. 2019. Constructivist approach to learning based on the concepts of Jean Piaget and Lev Vygotsky. *Journal of Indian Education*, 44 (4): 5-19.

Denzin, N. K. 1970. *The research act in sociology: A theoretical introduction to sociological methods*. New York: Routledge.

de Villiers, C., Farooq, M. B. and Molinari, M. 2021. Qualitative research interviews using online video technology–challenges and opportunities. *Meditari Accountancy Research*, 1-19.

Dholakia, N. and Firat, A. F. 2019. Markets, consumers and society in the age of heteromation. *European Journal of Marketing*, 53 (8): 1504-1520.

Dillman, D. A., Christian, L., Melani, S. and Joelene, D. 2014. *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. 4th ed. New Jersey: Wiley.

Dixon, B. S. 2020. *Dewey and design: a pragmatist perspective for design research*. Cham: Springer.

Drumm, S., Bradley, C. and Moriarty, F. 2022. 'More of an art than a science'? The development, design and mechanics of the Delphi Technique. *Research in Social and Administrative Pharmacy*, 18 (1): 2230-2236.

Ducas, A., Michaud-Oystryk, N. and Speare, M. 2020. Reinventing ourselves: New and emerging roles of academic librarians in Canadian research-intensive universities. *College & Research Libraries,* 81(1): 43-64.

Efgivia, M. G., Adora Rinanda, R. Y., Suriyani, Hidayat, A., Maulana, I. and Budiarjo, A. 2021. Analysis of Constructivism Learning Theory. In: Proceedings of *Advances in Social Science, Education and Humanities Research*. Atlantis Press, 208-212.

Elfil, M. and Negida, A. 2017. Sampling methods in clinical research: An educational review. *Emergency*, 5 (1): 1-3.

Engel, S. and Simpson Reeves, L. 2018. What do they need to know? Core skills for postgraduate development studies students. *Asia Pacific Viewpoint*, 59 (2): 212-225.

English, M., West, P. and Jackson, J. 2019. Building a community of inquiry in online library instruction: The CoI Framework Applied. *Journal of Library & Information Services in Distance Learning*, 13 (3): 283-293.

Farrell, O. and Brunton, J. 2020. A balancing act: a window into online student engagement experiences: Revista de Universidad y Sociedad del Conocimiento. *International Journal of Educational Technology in Higher Education*, 17 (1).

Feng, X. and Behar-Horenstein, L. 2019. Maximizing NVivo utilities to analyze open-ended responses. *The Qualitative Report*, 24 (3): 563-572.
Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J. and García-Martínez, I. 2020. Digital competences for teacher professional development. Systematic review. *European Journal of Teacher Education*, 1-19.

Fernández-Ramos, A. 2019. Online information literacy instruction in Mexican university libraries: The librarians' point of view. *The Journal of Academic Librarianship*, 45 (3): 242-251.

Fidel, R. 2008. Are we there yet? Mixed methods research in library and information science. *Library & Information Science Research*, 30 (4): 265-272.

Findley, M. G., Kikuta, K. and Denly, M. 2021. External validity. *Annual Review of Political Science*, 24: 365-393.

Flick, U. 2018. Triangulation in Data Collection. In: Flick, U. ed. *The SAGE handbook of qualitative data collection*. Los Angeles: Sage Publications, 527-599.

Flick, U. 2004. Triangulation in qualitative research. In: *A companion to qualitative research*, 3: 178-183.

Frechette, J., Bitzas, V., Aubry, M., Kilpatrick, K. and Lavoie-Tremblay, M. 2020. Capturing lived experience: Methodological considerations for interpretive phenomenological inquiry. *International Journal of Qualitative Methods*, 19: 1-12.

Fricker, R. D. 2008. Sampling methods for web and e-mail survey. In: Fielding, N., Lee, R. M. and Blank, G. eds. *The SAGE handbook of online research methods*. Los Angeles: Sage Publications.

Garnjost, P. and Lawter, L. 2019. Undergraduates' satisfaction and perceptions of learning outcomes across teacher- and learner-focused pedagogies. *The International Journal of Management Education*, 17 (2): 267-275.

Garraway, J. and Winberg, C. 2019. Reimagining futures of universities of technology. *Critical Studies in Teaching and Learning*, 7 (2): 38-60.

Garrison, D. R., Anderson, T. and Archer, W. 2001. Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, 15 (1): 7-23.

Garrison, D. R., Anderson, T. and Archer, W. 1999. Critical inquiry in a text-based environment: computer conferencing in higher education. *The Internet and Higher Education*, 2 (2-3): 87-105.

Gao, R. 2021. The vocabulary teaching mode based on the theory of constructivism. *Theory and Practice in Language Studies*, 11 (4): 442-446.

Gelo, O., Braakman, D. and Benetka, G. 2008. Quantitative and qualitative research: Beyond the debate. *Intergrative Psychological and Behavioral Science*, 42 (3): 266-290.

Ghiara, V. 2020. Disambiguating the role of paradigms in mixed methods research. *Journal of Mixed Methods Research*, 14 (1): 11-25.

Gillani, D. 2021. Can and" should" qualitative research be value-free? Understanding the epistemological tussle between positivists and interpretivists. *Journal of Political Studies*, 28 (1): 181-192.

Givens, M., Holdsworth, L., Mi, X., Rascoe, F., Valk, A. and Viars, K. E. 2020. Multimodal information literacy in higher education: Critical thinking, technology, and technical skill. In: *Handbook of research on integrating digital technology with literacy pedagogies*. IGI Global, 97-120.

Glassman, M. 2001. Dewey and Vygotsky: Society, experience, and inquiry in educational practice. *Educational Researcher*, 30 (4): 3-14.

Goldman, A. I. 2019. The what, why, and how of social epistemology. In: *The Routledge Handbook of Social Epistemology*. Routledge, 10-20.

Gore, J. and Rosser, B. 2022. Beyond content-focused professional development: powerful professional learning through genuine learning communities across grades and subjects. *Professional Development in Education*, 48 (2): 218-232.

Greene, J. C. 2007. *Mixed methods in social inquiry*. San Francisco: Jossey-Bass.

Greene, J. C. C., Valerie J. 1997. *Advances in mixed-method evaluation: the challenges and benefits of integrating diverse paradigms*. San Francisco: Jossey-Bass Publishers.

Greene, J. C., Caracelli, V. J. and Graham, W. F. 1989. Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11 (3): 255-274.

Grombly, A. and Anderson, A. M. 2020. Information and media literacy: integrating literacies into library instruction. *Media Literacy and Academic Research*, 1: 6-17.

Grybauskas, A., Stefanini, A. and Ghobakhloo, M. 2022. Social sustainability in the age of digitalization: A systematic literature review on the social implications of industry 4.0. *Technology in Society*: 101997.

Guba, E. G. and Lincoln, Y. S. 1994. Competing paradigms in qualitative research. In: Denzin, N. K. and Lincoln, Y. S. eds. *Handbook of Qualitative Research*. Thousand Oaks: Sage Publications, 105-117.

Günbayi, I. and Sorm, S. 2018. Social paradigms in guiding social research design: The functional, interpretive, radical humanist and radical structural paradigms. *Online Submission*, 9 (2): 57-76.

Hall, R. 2013. Mixed methods: In search of a paradigm. *Conducting research in a changing and challenging world*, 71-78.

Hall and Shannon-Baker, P. 2016. Making paradigms meaningful in mixed methods research. *Journal of Mixed Methods Research*, 10 (4): 319-334.

Hannigan, J. and Gonzalez, J. C. 2019. Doctoral faculty teaching online: a qualitative understanding of methods to improve online teaching. *Journal of Educators Online*, 16 (1): 1-13.

Harmes, C. J., Welsh, J. L. and Winkelman, R. J. 2016. A framework for defining and evaluating technology integration in the instruction of real-world skills. In Y. Rosen, S. Ferrara, and M. Mosharraf (Eds.), *Handbook of research on technology tools for real-world skill development* (pp. 137–162). IGI Global.

Hartman, R. S. 1962. Axiology as a Science. *Philosophy of Science*, 29 (4): 412-433.

Hawthorne, B. S., Vella-Brodrick, D. A. and Hattie, J. 2019. Well-being as a cognitive load reducing agent: a review of the literature. *Frontiers in Education*. Available: https://doi.org/10.3389/feduc.2019.00121 (Accessed 20 June 2021).

Hays, L. and Studebaker, B. 2019. Academic instruction librarians' teacher identity development through participation in the scholarship of teaching and learning. *International Journal for the Scholarship of Teaching and Learning*, 13 (2): 1-9.

Henriksen, D., Creely, E., Henderson, M. and Mishra, P. 2021. Creativity and technology in teaching and learning: a literature review of the uneasy space of implementation. *Educational Technology Research and Development*, 69 (4): 2091-2108.

Heotis, E. 2020. Phenomenological research methods: Extensions of Husserl and Heidegger. *International Journal of School and Cognitive Psychology*, 7 (221): 1-3.

Hoover, A. and Krishnamurti, S. 2010. Survey of college students' MP3 listening: Habits, safety issues, attitudes, and education. *American Journal of Audiology*, 19 (1): 73-83.

Howard, M. C. 2018. Scale pretesting. *Practical assessment, research, and evaluation*, 23 (1): 1-11.

Howard, H. A., Wood, N. and Stonebraker, I. 2018. Mapping information literacy using the Business Research Competencies. *Reference Services Review*, 46 (4): 543-564.

Hennink, M., Hutter, I. and Bailey, A. 2020. *Qualitative research methods*. Los Angeles: Sage.

Hensley, M. K. 2015. Improving LIS education in teaching librarians to teach. In: Mueller, D. ed. Proceedings of *ACRL 2015 Conference*. Oregon, 25-28 March 2015. ACRL, 1-19.

Hernon, P. 1982. Instruction in the use of academic libraries: A preliminary study of the early years based on selective extant materials. *The Journal of Library History*, 17 (1): 16-38.

Hiremath, S. S. and Bankapur, V. 2019. Awareness and proficiency in digital literacy skills among librarians of first grade degree colleges of Bagalkot District with respect to age group. *International Journal of Librarianship and Administration*, 10 (1): 11-18.

Hirst, W., Yamashiro, J. K. and Coman, A. 2018. Collective memory from a psychological perspective. *Trends in Cognitive Sciences*, 22 (5): 438-451.

Hoosain, M. S., Paul, B. S. and Ramakrishna, S. 2020. The impact of 4IR digital technologies and circular thinking on the United Nations Sustainable Development Goals. *Sustainability*, 12 (23): 1-16.

Houlden, S. and Veletsianos, G. 2020. Coronavirus pushes universities to switch to online classes–but are they ready. *The Conversation*, 12.

Hu, G., Fan, S., Su, J., Chi, L. and Zhou, J. 2021. Estimation of erroneous enumerations in the census. *Mathematical Population Studies*, 28 (4): 243-258.

Hu, X., Xu, Z., Neshyba, M., Geng, Z. and Turner, R. 2021. A multi-dimensional model: implications for preparing pre-service teachers for culturally responsive teaching. *Asia-Pacific Journal of Teacher Education*, 49 (3): 282-299.

Hussein, A. 2015. The use of triangulation in social sciences research: can qualitative and quantitative methods be combined? *Journal of Comparative Social Work,* 4 (1): 1-12.

Ibacache, K., Koob, A. R. and Vance, E. 2021. Emergency remote library instruction and tech tools. *Information Technology and Libraries*, 40 (2): 1-30.

Ikart, E. M. 2019. Survey questionnaire survey pretesting method: An evaluation of survey questionnaire via expert reviews technique. *Asian Journal of Social Science Studies*, 4 (2): 1-17.

Ikram, M. and Kenayathulla, H. B. 2022. Out of touch: comparing and contrasting positivism and interpretivism in Social Science. *Asian Journal of Research in Education and Social Sciences*, 4 (2): 39-49.

Jacobs, A. M., Büthe, T., Arjona, A., Arriola, L. R., Bellin, E., Bennett, A., Björkman, L., Bleich, E., Elkins, Z. and Fairfield, T. 2021. The qualitative transparency deliberations: insights and implications. *Perspectives on Politics*, 19 (1): 171-208.

Jesionkowska, J., Wild, F., Fominykh, M. and Molka-Danielsen, J. 2020. Pandemic-induced constraints on rapid transformation to digital education. In: Proceedings of *EC-TEL (Impact Papers)*.

Johnson, R. B., Onwuegbuzie, A. J. and Turner, L. A. 2007. Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1 (2): 112-133.

Johnson, R. B. and Onwuegbuzie, A. J. 2004. Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33 (7): 14-26.

Johnston, E., Burleigh, C., Rasmusson, X., Turner, P., Valentine, D. and Bailey, L. 2021. Multimedia Open Educational Resource Materials for Teaching-Online Diversity and Leadership: Aligning Bloom's Taxonomy and Studio Habits of Mind. *Higher Learning Research Communications*, 11 (2): 3.

Julien, H., Gross, M. and Latham, D. 2018. Survey of information literacy instructional practices in U.S. Academic Libraries. *College & Research Libraries*, 79 (2): 179-199.

Junus, K., Santoso, H. B., Putra, P. O. H., Gandhi, A. and Siswantining, T. 2021. Lecturer readiness for online classes during the pandemic: a survey research. *Education Sciences*, 11 (3): 1-14.

Kadiri, J. A. and Adetoro, N. A. 2012. Information explosion and the challenges of information and communication technology utilization in Nigerian libraries and information centres. *Ozean Journal of Social Sciences*, 5 (1): 21-30.

Kamau, G. N. u. 2022. ICT4D Research in developing countries: a call for pragmatism approach. *International Journal of Computer and Information System (IJCIS)*, 3 (2): 51-55.

Kanwar, A. and Carr, A. 2020. The impact of covid-19 on international higher education: new models for the new normal. *Journal of Learning for Development*, 7 (3): 326-333.

Kapilas, P. and Devaki, N. 2021. *Digital pedagogy for digital age education*. Saarbrucken: Lambert Academic.

Kaushik, V. and Walsh, C. A. 2019. Pragmatism as a Research Paradigm and Its Implications for Social Work Research. *Social Sciences*, 8 (9). 1-17.

Keen, S., Lomeli-Rodriguez, M. and Joffe, H. 2022. From challenge to opportunity: virtual qualitative research during COVID-19 and beyond. *International Journal of Qualitative Methods*, 21: 1-11.

Kelly, L. M. and Cordeiro, M. 2020. Three principles of pragmatism for research on organizational processes. *Methodological Innovations*, 13 (2): 1-10.

Kelly, M., Dowling, M. and Millar, M. 2018. The search for understanding: the role of paradigms. *Nurse Researcher*, 25 (4): 9-13.

Khan, A. 2020. Digital information literacy skills of Pakistani librarians: exploring supply-demand mismatches, adoption strategies and acquisition barriers. *Digital Library Perspectives*, 36 (2): 167-189.

Kivunja, C. and Kuyini, A. B. 2017. Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education*, 6 (5): 26-41.

Klockner, K., Shields, P., Pillay, M. and Ames, K. 2021. Pragmatism as a teaching philosophy in the safety sciences: A higher education pedagogy perspective. *Safety Science*, 138: 1-8.

Koehler, M. 2011. *Using the TPACK image*. Available: http://tpack.org/ (Accessed 25 February 2022).

Koehler, M. and Mishra, P. 2009. What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, 9 (1): 60-70.

Kuhn, T. S. 1970. *The structure of scientific revolutions*. 2nd ed. Chicago: Chicago University Press.

Kuhn, T. S. 1962. *The structure of scientific revolutions*. Chicago: Chicago University Press.

Kumatongo, B. and Muzata, K. K. 2021. Research paradigms and designs with their application in education. *Journal of Lexicography and Terminology.* 5 (1): 16-32.

Kusuma, J. W., Rochmad, R., Isnarto, I. and Hamidah, H. 2021. Constructivism from philosophy to mathematics learning. *International Journal of Economy, Education and Entrepreneurship*, 1 (2): 104-111.

Kuusisaari, H. 2014. Teachers at the zone of proximal development – Collaboration promoting or hindering the development process. *Teaching and Teacher Education*, 43: 46-57.

Lam, S. 2020. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, 3 (1): 1-20.

Lather, P. 1986. Research as praxis. *Harvard Educational Review*, 56 (3): 257-278.

Lee, S. J. and Branch, R. M. 2022. Students' reactions to a student-centered learning environment in relation to their beliefs about teaching and learning. *International Journal of Teaching and Learning in Higher Education*, 33 (3): 298-305.

Lee, C.-J. and Kim, C. 2014. An implementation study of a TPACK-based instructional design model in a technology integration course. *Educational Technology Research and Development*, 62 (4): 437-460.

Leech, N. L. and Onwuegbuzie, A. J. 2009. A typology of mixed methods research designs. *Quality & Quantity*, 43 (2): 265-275.

Leedy, P. D., Johnson, L. R. and Ormrod, J. E. 2021. *Practical research: planning and design*. 12th ed. New York: Pearson.

Leedy, P. D., Johnson, L. R. and Ormrod, J. E. 2015. *Practical research: planning and design*. 11th ed. New York: Pearson

Leedy, P. D. and Ormrod, J. E. 2009. *Practical research: planning and design*. 9th ed. Boston: Pearson Education.

Leedy PD Ormrod JE. 2005 *Practical research: planning and design*. 8th ed. New .Jersey: Prentice Hall.

Leschziner, V. and Brett, G. 2021. Have Schemas been good to think with?*. *Sociological Forum*, 36 (S1): 1207-1228.

Lewitzky, R. A. 2020. Educating, learning, and growing: A review of the teaching role in academic librarianship. *College & Undergraduate Libraries*, 27 (1): 32-40.

Liu, Y. 2022. Paradigmatic compatibility matters: a critical review of qualitative-quantitative debate in mixed methods research. *SAGE Open*, 12 (1): 1-14.

Llewellyn, A. 2019. Innovations in learning and teaching in academic libraries: a literature review. *New Review of Academic Librarianship*, 25 (2-4): 129-149.

Lofland, J. 1995. Analytic ethnography: Features, failings, and futures. *Journal of Contemporary Ethnography*, 24 (1): 30-67.

Logan, J. R. 2018. Relying on the census in urban social science. *City &Community*, 17 (3): 540- 549.

Loughran, J. 2013. Pedagogy: Making sense of the complex relationship between teaching and learning. *Curriculum Inquiry*, 43 (1): 118-141.

Lu, Y., Xu, X. and Wang, L. 2020. Smart manufacturing process and system automation – A critical review of the standards and envisioned scenarios. *Journal of Manufacturing Systems*, 56: 312-325.

Maarouf, H. 2019. Pragmatism as a supportive paradigm for the mixed research approach: Conceptualizing the ontological, epistemological, and axiological stances of pragmatism. *International Business Research*, 12 (9): 1-12.

Mackenzie, N. and Knipe, S. 2006. Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research*, 16 (2): 193-205.

Maddrell, J. A., Morrison, G. R. and Watson, G. S. 2017. Presence and learning in a community of inquiry. *Distance Education*, 38 (2): 245-258.

Majeed, I. 2019. Understanding positivism in social research: A research paradigm of inductive logic of inquiry. *International Journal of Research in Social Sciences*, 9 (11): 118-125.

Mali, D. and Lim, H. 2021. How do students perceive face-to-face/blended learning as a result of the Covid-19 pandemic? *The International Journal of Management Education*, 19 (3): 1-17.

Malmqvist, J., Hellberg, K., Möllås, G., Rose, R. and Shevlin, M. 2019. Conducting the pilot study: a neglected part of the research process? Methodological findings supporting the importance of piloting in qualitative research studies. *International Journal of Qualitative Methods*, 18: 1-11.

Mandefro, E. 2022. Identifying improvements in teaching and learning via supervision support: a pragmatic perspective. *Professions and Professionalism*, 12 (1): 1-19.

Maor, D. 2017. Using TPACK to develop digital pedagogues: a higher education experience. *Journal of Computers in Education*, 4 (1): 71-86.

Maree, K. 2020. *First steps in research*. 3rd ed. Pretoria: Van Schaik.

Maree, K. 2016. *First Steps in Research*. 2nd ed. Pretoria: Van Schaik.

Matteson, M. L. and Gersch, B. 2019. Unique or ubiquitous: information literacy instruction outside academia. *Reference Services Review*, 47 (1): 73-84.

Mathotaarachchi, K. and Thilakarathna, K. 2021. Philosophy of approaches in social sciences: a review of positivism, phenomenology and critical social sciences in qualitative research. *Technium Social Science Journal*, 20: 944-952.

Matriano, E. A. 2020. Ensuring student-centered, constructivist and project-based experiential learning applying the Exploration, Research, Interaction and Creation (ERIC) Learning Model. *International Online Journal of Education and Teaching*, 7 (1): 214-227.

Martin, F. and Bolliger, D. U. 2018. Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning*, 22 (1): 205-222.

Martin, J. J. and Guerrero, M. D. 2020. Social cognitive theory. In: *Routledge Handbook of Adapted Physical Education*. Routledge, 280-295.

Martzoukou, K. 2021. Academic libraries in COVID-19: a renewed mission for digital literacy. *Library Management*, 42 (4/5): 266-276.

Matumba, M. R. 2022. Perceptions of academic librarians' use of mobile technology in providing library services at UoTs in KwaZulu-Natal. M.A. Faculty of Accounting and Informatics, Durban University of Technology.

McCoyd, J. L. and Kerson, T. S. 2006. Conducting intensive interviews using email: A serendipitous comparative opportunity. *Qualitative Social Work*, 5 (3): 389-406.

McDougale, C. B., Richling, S. M., Longino, E. B. and O'Rourke, S. A. 2020. Mastery criteria and maintenance: A descriptive analysis of applied research procedures. *Behavior Analysis in Practice*, 13 (2): 402-410.

McGuinness, C. 2011. *Becoming confident teachers: a guide for academic librarians*. Elsevier.

McTavish, H. 2019. Emerging online roles for academic librarians in Canada. M.A.

(Education), Ontario Tech University.

Mellieon, J. H. I. and Robinson, P. A. 2021. The new norm: faculty perceptions of condensed online learning. *American Journal of Distance Education*, 35 (3): 170-183.

Mertens, D. M. 2019. *Research and evaluation in education and psychology: integrating diversity with quantitative, qualitative, and mixed methods*. 5th ed. Thousand Oaks: Sage Publications.

Mertens, D. M. 2012. What comes first? The paradigm or the approach? *Journal of Mixed Methods Research*, 6 (4): 255-257.

Michael, V. and Evangelia, L.-V. 2016. Digital pedagogy from the perspective of early childhood education. In: Elena, A. R., Gabriela, W., Atilla, E. and Liz, J. eds. *Handbook of research on applied learning theory and design in modern education*. Hershey: IGI Global, 93-114. Available: https://www.igi-global.com/gateway/chapter/140737 (Accessed 12 February 2021).

Michela, E. 2020. Cognitivism. In: Kimmons, R. and Caskurlu, S. eds. *The students' guide to learning design and research*. London: EdTech Books.

Mishra, B. S. and Alok, S. 2022. *Handbook of research methodology: a compendium for scholars & researchers*. New Delhi: Educreation Publishing.

Mitchell, A. and Education, A. E. 2018. A review of mixed methods, pragmatism and abduction techniques. In: Proceedings of *the European Conference on Research Methods for Business & Management Studies*. 269-277.

Mohajan, H. 2017. Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University Economics Series*, 17 (3): 58-82.

Morgan, D. L. 2018. Living within blurry boundaries: The value of distinguishing between qualitative and quantitative research. *Journal of Mixed Methods Research*, 12 (3): 268-279.

Morgan, D. L. 2017. *Integrating qualitative and quantitative methods a pragmatic approach*. London: Sage Publications.

Morgan, D. L. 2014. Pragmatism as a paradigm for social research. *Qualitative Inquiry*, 20 (8): 1045-1053.

Morse, J. M. 1991. Approaches to qualitative-quantitative methodological triangulation. *Nursing Research*, 40 (2): 120-123.

Mouton, J. 2017. *Understanding social research*. Pretoria: Van Schaik.

Muktiarni, M. 2021. Integration of the SAMR learning model in vocational education. *Media Pendidikan, Gizi, dan Kuliner*, 10 (1).

Mullen, C. A. 2020. Does modality matter? A comparison of aspiring leaders' learning online and face-to-face. *Journal of Further and Higher Education*, 44 (5): 670-688.

Mumtaz, S. 2022. Should practical usefulness be considered for theory building in HRD? Traditional versus pragmatism approach. *Quality & Quantity*, 56 (3): 1245-1259.

Murdock, J. 1995. Re-engineering bibliographic instruction: The real task of information literacy. *Bulletin of the American Society for Information Science*, 21 (3): 26.

Naicker, K. 2016. An assessment of the integration of information literacy education into the first year programmes in the Faculty of Management Sciences at the Durban University of Technology-Durban campus. M.A. (Information Studies), University of KwaZulu Natal.

Naidoo, S. 2011. The impact of the digital divide on information literacy training of extended curriculum programme students at the Durban University of Technology. M.Tech. (Library and Information Studies), Durban University of Technology.

Nair, R. S. and Chuan, T. C. 2021. Integrating technology that uses modified SAMR Model as a pedagogical framework in evaluating learning performance of undergraduates. *The Educational Review, USA*, 5 (10): 373-384.

Nanjundaswamy, C., Baskaran, S. and Leela, M. 2021. Digital pedagogy for sustainable learning. *Shanlax International Journal of Education*, 9 (3): 179-185.

Nayak, M. and Narayan, K. 2019. Strengths and weaknesses of online surveys. *Technology*, 6 (7): 31-38.

Ndongfack, M. N. 2015. TPACK Constructs: A Sustainable Pathway for Teachers Professional Development on Technology Adoption. *Creative Education*, 06 (16): 1697-1709.

Neuendorf, K. A. 2018. Content analysis and thematic analysis. In: *Advanced research methods for applied psychology*. Routledge, 211-223.

Neuman, W. L. 2020. *Social research methods: qualitative and quantitative approaches*. 8th ed. Boston: Pearson.

Neuman, W. L. 2011. *Social research methods: qualitative and quantitative approaches*. 7th ed. Boston: Pearson.

Neuman, W. L. and Robson, K. 2014. *Basics of social research: qualitative and quantitative approaches*. 3rd ed. Harlow: Pearson.

Newman, S. and Latifi, A. 2021. Vygotsky, education, and teacher education. *Journal of Education for Teaching*, 47 (1): 4-17.

Ngulube, P. 2019. Mapping methodological issues in knowledge management research, 2009–2014. *International Journal of Knowledge Management (IJKM)*, 15 (1): 85-100.

Ngulube, P. 2015. Trends in research methodological procedures used in knowledge management studies. *African Journal of Library, Archives and Information Science*, 25 (2): 125-143.

Ngulube, P. 2010. Mapping mixed methods research in library and information science journals in Sub-Saharan Africa 2004–2008. *International Information & Library Review*, 42 (4): 252-261.

Nirmalan, P. K. 2021. Design and development of objective questionnaires. *Kerala Journal of Ophthalmology*, 33 (2): 1391-141.

Noor, S., Isa, F. M. and Mazhar, F. F. 2020. Online teaching practices during the COVID-19 pandemic. *Educational Process: International Journal*, 9 (3): 169-184.

Novick, G. 2008. Is there a bias against telephone interviews in qualitative research? *Research in Nursing & Health*, 31 (4): 391-398.

Ocholla, D. N. and Ocholla, L. 2020. Readiness of academic libraries in South Africa to research, teaching and learning support in the Fourth Industrial Revolution. *Library Management*, 41 (6/7): 355-368.

Ödalen, J., Brommesson, D., Erlingsson, G. Ó., Schaffer, J. K. and Fogelgren, M. 2019. Teaching university teachers to become better teachers: the effects of pedagogical training courses at six Swedish universities. *Higher Education Research & Development*, 38 (2): 339-353.

Odede, I. O. 2018. Information literacy self-efficacy in the use of electronic information resources by library and information science postgraduate students in South South Nigeria. Ph.D. (Information Studies), University of KwaZulu Natal.

Oducado, R. M. 2020. Faculty perception toward online education in a state college in the Philippines during the coronavirus disease 19 (COVID-19) pandemic. *Universal Journal of Educational Research*, 8 (10): 4736-4742.

Oke, A. and Fernandes, F.A.P. 2020. Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). *Journal of Open Innovation : Technology, Market, and Complexity*, 6 (2): 31.

Omar, A. 2018. Combining classroom and workplace teaching to deliver physical examination teaching: A theoretical approach. *MedEdPublish*, 8 (228): 1-11.

Omar Saib, M., Rajkoomar, M., Naicker, N. and Olugbara, C. T. 2022. Digital pedagogies for librarians in higher education: a systematic review of the literature. *Information Discovery and Delivery*, 1-13.

Omarsaib, M., Rajkoomar, M. and Naicker, N. 2022. Digital pedagogies of academic librarians in the Fourth Industrial Revolution. In: *Innovative Technologies for Enhancing Knowledge Access in Academic Libraries*. IGI Global, 247-270.

O'Neil, F. and Pegrum, M. 2018. Keeping up the momentum: A longitudinal evaluation of professional development in digital technologies for academic librarians at an Australian university. *Journal of Academic Librarianship*, 44 (4): 439-445.

Oommen, P. G. 2020. Learning theories–taking a critical look at current learning theories and the ideas proposed by their authors. *Asian Journal of Research in Education and Social Sciences*, 2 (1): 27-32.

Onwuegbuzie, A. J. and Johnson, R. B. 2006. The validity issue in mixed research. *Research in the Schools*, 13 (1): 48-63.

Onyancha, O. B. 2020. Knowledge visualization and mapping of information literacy, 1975–2018. *IFLA Journal*, 46 (2): 107-123.

Oyelude, A. A. 2022. Technologies changing in the post pandemic era. *Library Hi Tech News*, 39 (1): 1- 4.

Pandey, P. and Pandey, M. M. 2021. *Research methodology tools and techniques*. Buzua: Bridge Center.

Padilla-Rivera, A., do Carmo, B. B. T., Arcese, G. and Merveille, N. 2021. Social circular economy indicators: Selection through fuzzy delphi method. *Sustainable Production and Consumption*, 26: 101-110.

Pande, M. and Bharathi, S. V. 2020. Theoretical foundations of design thinking – A constructivism learning approach to design thinking. *Thinking Skills and Creativity*, 36: 1-17.

Parameshwara, N. 2019. Issues in scoial sciences and ethical values- an overview. *Research Explorer-A Blind Review & Refereed Quarterly International Journal*, 23: 38-42.

Park, Y. S., Konge, L. and Artino, A. R. 2020. The positivism paradigm of research. *Academic Medicine*, 95 (5): 690-694.

Parker, L. D. 2020. The COVID-19 office in transition: cost, efficiency and the social responsibility business case. *Accounting, Auditing & Accountability Journal*, 1943-1967.

Parramore, S. 2019. Online active-learning: information literacy instruction for graduate students. *Reference Services Review*, 47 (4): 476-486.

Paul, J. and Criado, A. R. 2020. The art of writing literature review: What do we know and what do we need to know? *International Business Review*, 29 (4): 101717.

Peräkylä, A. and Ruusuvuori, J. 2008. Analyzing talk and text. In: Denzin, N. K. and Lincoln, Y. S. eds. *The Sage handbook of qualitative research*. California: Sage Publications.

Phaladi, M. P. 2021. Framework for integrating knowledge management and human resource management for the reduction of organisational knowledge loss in selected South African state-owned enterprises. UNISA.

Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S. and Zhu, C. 2019. Improving teacher professional development for online and blended learning: A systematic meta-aggregative review. *Educational Technology Research and Development*, 67 (5): 1-29.

Picciano, A. G. 2021. Theories and Frameworks for Online Education: seeking an integrated model. In: Cifuentes, L. ed. *A guide to administering distance learning*. Brill, 79-103. Available: https://dx.doi.org/10.1163/9789004471382_005 (Accessed 02 July 2022).

Picciano, A. G. 2017. Theories and frameworks for online education: Seeking an integrated model. *Online Learning*, 21 (3): 166-190.

Plano Clark, V. L. and Ivankova, N. V. 2016. *Mixed methods research: a guide to the field*. Los Angeles: SAGE.

Poggenpoel, M. and Myburgh, C. 2003. The researcher as research instrument in educational research: A possible threat to trustworthiness?(A: research_instrument). *Education*, 124 (2): 418-423.

Polkinghorne, S. and Julien, H. 2018. Treading Water: Results from the Longitudinal Study of Information Literacy Instruction in Canadian Academic Libraries, 1995–2017/Comment faire du surplace: résultats de l'étude longitudinale sur la formation à la maîtrise informationnelle

dans les bibliothèques universitaires canadiennes, 1995–2017. *Canadian Journal of Information and Library Science*, 42 (1): 69-93.

Polly, D. and Byker, E. 2020. Considering the role of zone of proximal development and constructivism in supporting teachers' TPACK and effective use of technology. *Revista de Educación a Distancia (RED)*, 20 (64).

Pongsakdi, N., Kortelainen, A. and Veermans, M. 2021. The impact of digital pedagogy training on in-service teachers' attitudes towards digital technologies. *Education and Information Technologies*, 26 (5): 5041-5054.

Prosek, E. A. and Gibson, D. M. 2021. Promoting Rigorous Research by Examining Lived Experiences: A Review of Four Qualitative Traditions. *Journal of Counseling & Development*, 99 (2): 167-177.

Puentedura, R. R. 2013. *SAMR: Getting to transformation*. Available: http://hippasus.com/rrpweblog/ (Accessed 22 February 2022).

Punch, K. F. 2014. *Introduction to social research: Quantitative and qualitative approaches*. 3rd ed. California: Sage Publications.

Quintão, C., Andrade, P. and Almeida, F. 2020. How to improve the validity and reliability of a case study approach? *Journal of Interdisciplinary Studies in Education*, 9 (2): 264-275.

Rafi, M., Jianming, Z. and Ahmad, K. 2019. Technology integration for students' information and digital literacy education in academic libraries. *Information Discovery and Delivery*, 47 (4): 203-217.

Rahman, M. S. 2017. The advantages and disadvantages of using qualitative and quantitative approaches and methods in language "testing and assessment" research: A literature review. *Journal of Education and Learning,* 6 (1): 102-112.

Rajkoomar, M. 2015. The development of a framework for blended learning in the delivery of Library and Information Science curricula at South African universities. Ph.D. (Library and Information Sciences), Durban University of Technology.

Raju, J. 2017. To teach or not to teach? The question of the academic librarian & pedagogical competencies in the digital age. *South African Journal of Higher Education*, 31 (2): 251-269.

Ramos Eclevia, M. 2022. Librarians' competencies in teaching information literacy in the online environment. *Journal of Library & Information Services in Distance Learning*, 16 (1): 2-19.

Raqib, C. 2019. Embarking on research in the social sciences: Understanding the foundational concepts. *VNU Journal of Foreign Studies*, 35 (1): 99-112.

Ratneswary, R., Kaur, H. and Guptan, V. 2020. Business continuity plan in the higher education industry: university students' perceptions of the effectiveness of academic continuity plans during Covid-19 pandemic. *Applied System Innovation*, 3 (4): 51.

Reich, A., Rooney, D. and Lizier, A. L. 2021. Using technology integration frameworks in vocational education and training. *International Journal of Training Research*, 19 (2): 93-106.

Remler, D. K. and Ryzin, G. G. 2022. *Research methods in practice: strategies for description and causation*. 3rd ed. Los Angeles: Sage Publications.

Riemens, J., Lemieux, A.-A., Lamouri, S. and Garnier, L. 2021. A Delphi-Régnier study addressing the challenges of textile recycling in Europe for the fashion and apparel industry. *Sustainability*, 13 (21): 1-30.

Roetzel, P. G. 2019. Information overload in the information age: a review of the literature from business administration, business psychology, and related disciplines with a bibliometric approach and framework development. *Business Research*, 12 (2): 479-522.

Rotatori, D., Lee, E. J. and Sleeva, S. 2021. The evolution of the workforce during the fourth industrial revolution. *Human Resource Development International*, 24 (1): 92-103.

Rylander Eklund, A., Navarro Aguiar, U. and Amacker, A. 2022. Design thinking as sensemaking: Developing a pragmatist theory of practice to (re)introduce sensibility. *Journal of Product Innovation Management*, 39 (1): 24-43.

Sadiku, M., Omotoso, A. and Musa, S. 2019. Digital Pedagogy. *International Journal of Trend in Scientific Research and Development*, 3 (2): 881-882.

Saiyad, S., Virk, A., Mahajan, R. and Singh, T. 2020. Online teaching in medical training: Establishing good online teaching practices from cumulative experience. *International Journal of Applied and Basic Medical Research*, 10 (3): 149-155.

Salony, M. F. 1995. The history of bibliographic instruction: Changing trends from books to the electronic world. *Reference Librarian*, 24 (51-52): 31-51.

Sample, A. 2020. Historical development of definitions of information literacy: A literature review of selected resources. *The Journal of Academic Librarianship*, 46 (2): 2-8.

Sanches, T. 2018. Changing roles for research and information skills development: librarians as teachers, researchers as learners. In: Proceedings of *European Conference on Information Literacy*. Springer, 462-471.

Sandelowski, M. 2014. Unmixing Mixed-Methods Research. *Research in Nursing &Health*, 37 (1): 3-8.

Sappington, J. and Bedford, D. A. 2017. Assessment of intellectual capital of library and information professionals. *Proceedings of the Association for Information Science and Technology*, 54 (1): 798-799.

Sarantakos, S. 2013. *Social research*. 4th ed. New York: Bloomsbury.

Saunders, M. N., Lewis, P. and Thornhill, A. 2021. *Research methods for business students*. 8th ed. Harlow: Pearson.

Scharp, K. M. and Sanders, M. L. 2019. What is a theme? Teaching thematic analysis in qualitative communication research methods. *Communication Teacher*, 33 (2): 117-121.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J. and Shin, T. S. 2009. Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of research on Technology in Education*, 42 (2): 123-149.

Schofield, W. 2006. Survey sampling. In: Sapsford, R. and Jupp, V. eds. *Data collection and analysis*. 2nd ed. London: Sage Publications.

Schwartzman, R. 2020. Performing pandemic pedagogy. *Communication Education*, 69 (4): 502-517.

School, P. 2021. *SAMR Model: A practical guide for K-12 classroom technology integration*. Available:https://www.powerschool.com/resources/blog/samr-model-a-practical-guide-for-k-12-classroom-technology-integration/ (Accessed 17 February 2021).

Sekaran, U. and Bougie, R. 2016. *Research methods for business: a skill building approach*. 7th ed. New York: Wiley.

Sekaran, U. and Bougie, R. 2010. *Research methods for business: a skill-building approach*. 5th ed. New York: Wiley.

Shah, N. A., Khan, A., Ahmad, P. and Arshad, M. 2020. The use of empiricism, rationalism and positivism in library and information science research. *Library Philosophy and Practice*, 1-14.

Shah, S. S., Shah, A. A. and Khaskhelly, N. 2019. Pragmatism research paradigm: a philosophical framework of advocating methodological pluralism in social science research. *Grassroots*, 52 (1): 90-101.

Shank, J. D., Bell, S. and Zabel, D. 2011. Blended librarianship: [Re] envisioning the role of librarian as educator in the digital information age. *Reference and User Services Quarterly*, 51 (2): 105-110.

Sharkey, M. and Gash, H. 2020. Teachers' constructivist and ethical beliefs. *Behavioral Sciences*, 10 (6): 1-13.

Shorten, A. and Moorley, C. 2014. Selecting the sample. *Evidence-Based Nursing*, 17 (2): 32-33.

Shulman, L. S. 1986. Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15 (2): 4-14.

Siegel, A. A., Zarb, M., Alshaigy, B., Blanchard, J., Crick, T., Glassey, R., Hott, J. R., Latulipe, C., Riedesel, C. and Senapathi, M. 2021. Educational landscapes during and after COVID-19. In: Proceedings of *Proceedings of the 26th ACM Conference on Innovation and Technology in Computer Science Education V. 2*. 597-598.

Sin, Y. C. and Rosli, R. 2020. Validity and reliability of the survey of attitudes toward Statistics (SATS) Instrument. *Malaysian Journal of Education* 45: 17-24.

Singh, J., Evans, E., Reed, A., Karch, L., Qualey, K., Singh, L. and Wiersma, H. 2022. Online, hybrid, and face-to-face learning through the eyes of faculty, students, administrators, and instructional designers: lessons learned and directions for the post-vaccine and post-pandemic/COVID-19 world. *Journal of Educational Technology Systems*, 50 (3): 301-326.

Singh, A. S. and Masuku, M. B. 2014. Sampling techniques & determination of sample size in applied statistics research: An overview. *International Journal of Economics, Commerce and Management*, 2 (11): 1-22.

Singh, S. and Sagar, R. 2021. A critical look at online survey or questionnaire-based research studies during COVID-19. *Asian Journal of Psychiatry*, 65: 1-3.

Smith, E. 2019. *Management business research*. 6th ed. London: Sage Publications.

Snyder, H. 2019. Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104: 333-339.

Sobel, K. and Grotti, M. G. 2013. Using the TPACK Framework to Facilitate Decision Making on Instructional Technologies. *Journal of Electronic Resources Librarianship*, 25 (4): 255-262.

Stewart, M. 2021. Understanding learning: Theories and critique. In: Hunt, L. and Chalmers, D. eds. *University teaching in focus*. Routledge, 3-28.

Story, D. A. and Tait, A. R. 2019. Survey research. *Anesthesiology*, 130 (2): 192-202.

Straits, B. C. S. and Royce A. 2018. *Social research: approaches and fundamentals*. 6th ed. New York: Oxford University Press.

Subedi, D. 2016. Explanatory sequential mixed method design as the third research community of knowledge claim. *American Journal of Educational Research*, 4 (7): 570-577.

Sukula, S. K., Thapa, N., Kumar, M. and Awasthi, S. 2020. Reinventing academic libraries and Learning-Post-COVID (19) in the perspective of collaboration among key stake-holders in higher education: a brief assessment and futuristic approach. *International Journal of Research in Library Science (IJRLS)*, 6 (1): 77-92.

Sulistyowati, T. 2019. Bottom-up and top-down listening processes within cognitive constructivist learning theory. *Prominent Journal*, 2 (1): 92-100.

Sürücü, L. and Maslakci, A. 2020. Validity and reliability in quantitative research. *Business & Management Studies: An International Journal*, 8 (3): 2694-2726.

Swan, K., Garrison, D. and Richardson, J. C. 2009. A constructivist approach to online learning: The community of inquiry framework. In: *Information technology and constructivism in higher education: Progressive learning frameworks*. IGI global, 43-57.

Taber, K. S. 2020. Mediated learning leading development—the social development theory of Lev Vygotsky. In: *Science education in theory and practice*. Springer, 277-291.

Tashakkori, A. and Teddlie, C. 2021. *Sage handbook of mixed methods in social & behavioral research*. Sage Publications.

Taguchi, N. 2018. Description and explanation of pragmatic development: Quantitative, qualitative, and mixed methods research. *System*, 75: 23-32.

Tashakkori, A. and Teddlie, C. 2010. *Handbook of mixed methods in social and behavioral research*. California: Sage Publications.

Tashakkori, A. and Creswell, J. W. 2008. Editorial: Mixed methodology across disciplines. *Journal of Mixed Methods Research,* 2 (1): 3-6.

Tavera Romero, C. A., Castro, D. F., Ortiz, J. H., Khalaf, O. I. and Vargas, M. A. 2021. Synergy between circular economy and industry 4.0: A literature review. *Sustainability*, 13 (8): 2-18.

Teddlie, C. and Tashakkori, A. 2006. A general typology of research designs featuring mixed methods. *Research in the Schools*, 13 (1): 12-28.

Tella, A., Quardri, F., Bamidele, S. S. and Ajiboye, O. O. 2021. Resource Sharing: Vehicle for Effective Library Information Dissemination and Services in the Digital Age. In: *Research Anthology on Architectures, Frameworks, and Integration Strategies for Distributed and Cloud Computing*. IGI Global, 1481-1503.

Theofanidis, D. and Fountouki, A. 2018. Limitations and delimitations in the research process. *Perioperative Nursing*, 7 (3): 155-163.

Thompson Burdine, J., Thorne, S. and Sandhu, G. 2021. Interpretive description: A flexible qualitative methodology for medical education research. *Medical Education*, 55 (3): 336-343.

Thornberg, R., Forsberg, C., Chiriac, E. H. and Bjereld, Y. 2020. Teacher–student relationship quality and student engagement: A sequential explanatory mixed-methods study. *Research Papers in Education*, 1-20.

Thunberg, S. and Arnell, L. 2021. Pioneering the use of technologies in qualitative research–A research review of the use of digital interviews. *International Journal of Social Research Methodology*, 24: 1-12.

Tomlinson, S. 1997. Edward Lee Thorndike and John Dewey on the Science of Education. *Oxford Review of Education*, 23 (3): 365-383.

Trembach, S. and Deng, L. 2018. Understanding millennial learning in academic libraries: Learning styles, emerging technologies, and the efficacy of information literacy instruction. *College & Undergraduate Libraries*, 25 (3): 297-315.

Thomson, M. M., Huggins, E., Carrier, S. J. and Gray, D. 2022. Developmental trajectories for novice teachers: teaching efficacy, instructional beliefs, and domain knowledge. *International Journal of Science Education*, 1-22.

Tshuma, T. and Chigada, J. 2018. Analysing information literacy practices at selected academic libraries in Zimbabwe. *South African Journal of Information Management*, 20 (1): 1-7.

Tunga, S. K. 2021. Library services in digital environment: challenges and strategies in Covid-19 pandemic situation. *Journal of Advances in Library and Information Science*, 10 (2): 94-101.

Ugwu, C. I., Ekere, J. N. and Onoh, C. 2021. Research paradigms and methodological choices in the research process. *Journal of Applied Information Science and Technology*, 14 (2): 116-124.

Uzwyshyn, R. 2018. Academic libraries and technology: an environmental scan towards future possibility. In: Holbrook, G. J. ed. *Academic and digital libraries: emerging directions and trends.* New York: Nova Publishers, 63-86.

Väätäjä, J. O. and Ruokamo, H. 2021. Conceptualizing dimensions and a model for digital pedagogy. *Journal of Pacific Rim Psychology*, 15: 1-12.

Van Der Lee, C., Gatt, A., Van Miltenburg, E., Wubben, S. and Krahmer, E. 2019. Best practices for the human evaluation of automatically generated text. In: Proceedings of *the 12th International Conference on Natural Language Generation*. 355-368.

van Laar, E., van Deursen, A. J., van Dijk, J. A. and de Haan, J. 2020. Determinants of 21st-century skills and 21st-century digital skills for workers: A systematic literature review. *Sage Open*, 10 (1): 1-14.

Van Teijlingen, E. and Hundley, V. 2002. The importance of pilot studies. *Nursing Standard (through 2013)*, 16 (40): 33-36.

Varga, N., Morton, N. and Preston, A. 2022. Memory Distortion, inference, and prediction. In: Tulving, E. and Craik, F. I. M. eds. *Oxford handbook of human memory*. Oxford: Oxford University Press, 1-50.

Vassilakaki, E. and Moniarou-Papaconstantinou, V. 2015. A systematic literature review informing library and information professionals' emerging roles. *New Library World*, 116 (1/2): 37-37-66.

Vasileiou, K., Barnett, J., Thorpe, S. and Young, T. 2018. Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, 18 (1).

Venkatesh, A. 2021. Facilitation of design students' tacit knowledge construction: interpretive research in interior design studios. Ph.D., Hong Kong Polytechnic University.

Valverde-Berrocoso, J., Fernández-Sánchez, M. R., Revuelta Dominguez, F. I. and Sosa-Díaz, M. J. 2021. The educational integration of digital technologies preCovid-19: Lessons for teacher education. *PLOS ONE*, 16 (8): 1-22.

Vilma, Z. 2018. Implementing ethical principles in social research: challenges, possibilities and limitations. *Vocational Education: Research & Reality*, 29 (1): 19-43.

Volkova, L. V., Lizunova, L. R. and Komarova, I. A. 2021. Digital pedagogy: problems and solutions. *Revista on line de Política e Gestão Educacional*, 1-12.

Vygotsky, L. S. and Cole, M. 1978. *Mind in society: Development of higher psychological processes*. Harvard University Press.

Welman, J. C., Kruger, F., Bruce, M. and Huysamen, G. K. 2005. *Research methodology*. Cape Town; Oxford: Oxford University Press.

Urcia, I. A. 2021. Comparisons of adaptations in grounded theory and phenomenology: selecting the specific qualitative research methodology. *International Journal of Qualitative Methods*, 20: 1-14.

Uzwyshyn, R. 2018. Academic libraries and technology: an environmental scan towards future possibility. In: Holbrook, G. J. ed. *Academic and digital libraries: emerging directions and trends.* New York: Nova Publishers, 63-86.

Wagner, C., Kawulich, B. B. and Garner, M. 2013. *Doing social research: a global context*. Berkshire: McGraw-Hill Higher Education.

Watson, J. H. and Rockinson-Szapkiw, A. 2021. Predicting preservice teachers' intention to use technology-enabled learning. *Computers & Education*, 168: 104207.

Webb, E. T., Webb, E. J., Campbell, D. T., Schwartz, R. D., Sechrest, L. and Grove, J. B. 1981. *Nonreactive measures in the social sciences*. Houghton Mifflin School.

Welman, J. C., Kruger, F., Bruce, M. and Huysamen, G. K. 2005. *Research methodology*. Cape Town: Oxford University Press.

Whalen, J. 2020. Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education*, 28 (2): 189-199.

Wheeler, E. and McKinney, P. 2015. Are librarians teachers? Investigating academic librarians' perceptions of their own teaching skills. *Journal of Information Literacy*, 9 (2): 111.

Weideman, M. and Hofmeyr, K. B. 2021. Corrigendum: The influence of flexible work arrangements on employee engagement: An exploratory study. *South African Journal of Human Resource Management*, 19 (3): 60-64.

Wieland, N. and Kollias, L. 2020. Online Learning Before, During and After COVID-19: Observations Over 20 Years. *International Journal of Advanced Corporate Learning*, 13 (2): 84-92.

Wisker, G., Robinson, G. D. and Leibowitz, B. 2019. The purpose and impact of postgraduate knowledge. *Studies in Graduate and Postdoctoral Education*, 160-172.

Withorn, T. and Willenborg, A. 2020. A foot in both worlds: Current roles and challenges of academic online learning librarians. *Journal of Library & Information Services in Distance Learning*, 1-17.

Xu, M., David, J. M. and Kim, S. H. 2018. The fourth industrial revolution: Opportunities and challenges. *International Journal of Financial Research*, 9 (2): 90-95.

Yeh, Y. F., Hsu, Y. S., Wu, H. K., Hwang, F. K. and Lin, T. C. 2014. Developing and validating technological pedagogical content knowledge-practical (TPACK-practical) through the Delphi survey technique. *British Journal of Educational Technology*, 45 (4): 707-722.

Yevelson-Shorsher, A. and Bronstein, J. 2018. Three perspectives on information literacy in academia: Talking to librarians, faculty, and students. *College & Research Libraries*, 79 (4): 535-553.

Younus, A. M. and Zaidan, M. N. 2022. The influence of quantitative research in business & information technology: an appropriate research methodology philosophical reflection. *American Journal of Interdisciplinary Research and Development*, 4: 61-79.

Yu, P. Y., Lam, E. T. H. and Chiu, D. K. W. 2022. Operation management of academic libraries in Hong Kong under COVID-19. *Library Hi Tech*, ahead-of-print (ahead-of-print): 1-22.

Yürekli Kaynardağ, A. 2019. Pedagogy in HE: does it matter? *Studies in Higher Education*, 44 (1):111-119.

Zanin-Yost, A. 2018. Academic collaborations: Linking the role of the liaison/embedded librarian to teaching and learning. *College & Undergraduate Libraries*, 25 (2): 150-163.

Zakharov, W. and Maybee, C. 2019. Bridging the gap: information literacy and learning in online undergraduate courses. *Journal of Library & Information Services in Distance Learning*, 13 (1-2): 215-225.

Zhang, L. and Liu, Z. 2018. Ethical issues in research processes: Informed consent, the role of the researcher, access to research sites and research subjects. In: Proceedings of *2nd International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2018)*. Atlantis Press, 505-508.

ANNEXURES

Annexure A: Research Project Plan

Activity	Timeframe
Literature review/Theoretical framework – Write up Chapters 1-3	March – Ongoing
Design of questionnaire	July 2021
Pilot questionnaire	August 2021
Revisions to questionnaire	September 2021
Notification to academic librarians at UoT's and administration of questionnaire	September – October 2021
Analysis of data from questionnaire	September – October 2021
Pilot semi-structured interviews schedule	November – December 2021
Revisions to semi-structured interviews schedule	January2022
Notification/scheduling semi-structured interviews with academic librarians at UoTs	February – April 2022
Analysis of data from semi-structured interviews	May-July 2022
Research design/Findings write up Chapters 4-5	August - November 2022
Recommendations/Main findings write up Chapter 6	December 2023 – February 2023
Submission	March 2023

Annexure B: Turnitin Report

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

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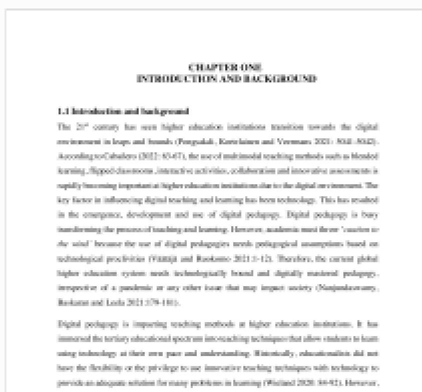
CHAPTER ONE
INTRODUCTION AND BACKGROUND

1.1 Introduction and background

Annexure C: Letter of Information and Informed Consent Form for Academic Librarians

LETTER OF INFORMATION

Title of the Research Study: Developing a training model on digital pedagogies for academic librarians at Universities of Technology (UoTs) in South Africa

Principal Investigator/s/researcher: M Omarsaib

Co-Investigator/s/supervisor/s: Dr M Rajkoomar (PHD), Dr N Naicker (PHD)

Dear Research Participant

Good day. How are you? Thank you for showing an interest in the above study.

My name is Mousin Omarsaib. I am a PHD student at DUT in the Department of Information Systems. I am currently undertaking a study in digital pedagogies for academic librarians at University of Technologies (UoTs) in South Africa. I would like to invite you to participate in the research.

Brief Introduction and Purpose of the Study

Globally, there has been a tsunami of change in the teaching role of the academic librarian at higher education institutions. The teaching role of the academic librarian has been synchronised in relation to the understanding of pedagogies and technologies. The challenging nature of higher education institutions in the 21st century intersecting with the influence of technology on pedagogy demands academic librarians to engage seamlessly within an online learning environment. The purpose of this study is to explore and probe the pedagogical and technological preparedness of academic librarians at University of Technologies (UoTs) in South Africa for the digital environment.

Outline of the Procedures:

Academic librarians who have an online teaching role at UoT's will be invited to participate in an online survey questionnaire to ascertain their online pedagogical experience, digital skills and their presence when engaging with students in a digital environment at UoT's in South Africa. The responsibility of you is to spend approximately 25 minutes providing an honest answer to each of 38 multiple-choice questions on ones online teaching experience as an academic librarian. You will be provided a link via email and WhatsApp to access the survey questionnaire. This study will include follow up interviews after the online survey questionnaire with selected participants. You may be contacted and requested to participate in the interview.

Risks or Discomforts to the Participant:

There is no potential known risks, discomfort, or disrespect to this study.

Reason/s why the Participant May Be Withdrawn from the Study:

You may decide to withdraw from this study at any time without any negative or adverse consequences by advising the researcher that s/he no longer wishes to participate.

Benefits:

The study aims to design an online training model in pedagogical and digital skills required for the Library and Information Science environment in South Africa. The study also aims to produce at least two publications in an internationally accredited journal.

Remuneration:

There will be no incentives on this study.

Costs of the Study:

As a participant, you will not be liable for any costs for this study nor will you receive any monetary compensation or any other remuneration.

Confidentiality:

Although the respondents email accounts will be used to circulate the questionnaire, the identities of participants will be kept confidential during the data analysis phase as well as in the reporting phase of the study. The participant's responses cannot be linked back to him/ her, as their details are not stored on the system.

Storage of all electronic and hard copies including tape recordings:

Data will be stored in a safe space only accessible to the supervisor, co-supervisor and researcher. The data will be stored for five years. Thereafter, the print will be shred and the online copies will be deleted.

Persons to contact in the Event of Any Problems or Queries:

Participants are kindly advised to contact the researcher on 072 603 4954, my supervisor 031 3735546 or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can

be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.

General:

Participants are assured that participation is voluntary for each of the 75 academic librarians who will be invited to participate in this study. An information letter will be emailed to each participant after which a consent form will need to be read, signed and submitted to the researcher prior to participation. The information letter and consent form will also be available in isiZulu.

CONSENT

Full Title of the Study: Developing a training model on digital pedagogies for academic librarians at University of Technology (UOTs) in South Africa

Names of Researcher/s: Mousin Omarsaib

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Mousin Omarsaib about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number:
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, Mousin Omarsaib herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

~~Full Name of Researcher~~ **~~Date~~** **Signature** _____

~~Full Name of Witness~~ (If applicable) **~~Date~~** **Signature** _____

~~Full Name of Legal Guardian~~ (If applicable) **~~Date~~** **Signature** _____

Annexure D: Institutional Ethical Clearance

Cape Peninsula University of Technology

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FACULTY OF

On the 21st of October 2021 the Chairperson of the Faculty of Education Ethics Committee of the CapePeninsula University of Technology granted ethics approval **(EFEC 2-10/2021)** to M Omarsaib for research activities related to a research project.

Title:	Developing a training model on digital pedagogies for academic librarianat University of Technology (UoTs) in South Africa

Comments:

The EFEC unconditionally grants ethical clearance for this study. This clearance is valid until 31st December 2024. Permission is granted to conduct research within the CPUT library only. Research activities are restricted to those details in the research project as outlined by the Ethics application. Any changes wrought to the described study must be reported to the Ethics committee immediately.

Date: 21st October 2021

Dr Candice Livingston
Research coordinator (Wellington) and Chair of the Education Faculty Ethics committeeFaculty of Education

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732946

28th July 2021
Mr Mousin Omarsaib
c/o Department of Information Systems
Faculty of Accounting and Informatics
Durban University of Technology

Dear Mr Omarsaib

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Gatekeeper Permission** for you to conduct your research "A digital pedagogies training model for academic librarians in South African Universities of Technology" at the Durban University of Technology. **Kindly note that this letter must be issued to the IREC for approval before you commence data collection.**

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

_____
DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

WSU
Walter Sisulu University
In pursuit of excellence

DIVISION OF ACADEMIC AFFAIRS AND RESEARCH
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Tel: + 43 708 5444
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14 October 2021

Mr Mousin Omar Saib
Durban University of Technology
Steve Biko Campus
DURBAN
4000

Dear Mr Saib

Gatekeepers Permission Letter to conduct research at Walter Sisulu University

Institution: Walter Sisulu University

A Gatekeeper Letter is hereby granted for the study "**Developing a training model on digital pedagogies for academic librarians at University of Technology (UOTs) in South Africa**" provided that copies of your completed study will be submitted to the Campus Rector of the campus in which the study will be conducted and the Directorate of the Research & Innovation.

All data pertaining to Walter Sisulu University will be treated confidentially and you are required to abide by ethical principles at all times. It is your responsibility to seek consent from participants.

Kind regards

Prof W Akpan
Senior Director: Research & Innovation

Annexure E: Letter to the Gatekeeper

Durban University of Technology
PO Box 1334
Durban
4000

Cape Peninsula University of Technology
Belville
Cape Town
7530

Request for Permission to Conduct Research

Dear Chairperson of Faculty Research Ethics Committee (FREC: FAI)

My name is Mousin Omarsaib, a PHD student at the Durban University of Technology. The research I wish to conduct for my PHD thesis involves developing a training model on digital pedagogies for academic librarians at University of Technology (UoTs) in South Africa.

I am hereby seeking your consent to administer a survey questionnaire to the academic librarians who have an online teaching role at the University.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Faculty Research Ethics Committee (FREC).

If you require any further information, please do not hesitate to contact me on 072 603 4954 or email me at mousino@dut.ac.za. Thank you for your time and consideration in this matter.

Yours sincerely,

Mousin Omarsaib
Subject Librarian: Library
Durban University of Technology

Annexure F: Permission to Conduct Study

Faculty Research Office
Durban University of Technology
12 August 2021

Student: Mousin Omarsaib
Student Number: 19853099
Degree: Doctor of Philosophy in Library and Information Science
Email: 19853099@dut4life.ac.za
Supervisor: Dr M. Rajkoomar
Supervisor email: mogier@dut.ac.za

Dear Mr Omarsaib

ETHICAL APPROVAL: LEVEL 2

Developing a training model on digital pedagogies for academic librarians at University of Technology (UOTs) in South Africa.

The Faculty Research Ethics Committee acknowledges receipt of your notification regarding the piloting of your data collection tool. Kindly ensure that participants used for the pilot study are not part of the main study. In addition, the FREC acknowledges receipt of your gatekeeper permission letter.

Please note that **FULL APPROVAL** is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the FREC according to the FREC SOP's. Please note that any deviations from the approved proposal require the approval of the FREC as outlined in the FREC SOP's

Yours sincerely

Dr Trisha Ramsurai
FREC Deputy Chair
Faculty of Accounting and Informatics
Durban University of Technology
Ritson Campus
Durban, South Africa, 4001

Annexure G: Ethics Certificate

TRREE

Zertifikat

Certificado

Certificat

Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants

Clinical Trials Centre
The University of Hong Kong

Certificat de formation - Training Certificate

Ce document atteste que - this document certifies that

Mousin Omarsaib

a complété avec succès - has successfully completed

Introduction to Research Ethics

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

Release Date: 2021/05/12

CID : Ycdz9EpXdV

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

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(REV : 20170310)

Annexure H: Survey Questionnaire

Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology (UoTs) in South Africa

Hello,

You are invited to participate in this survey for my PhD study on the topic - **Developing a training model on digital pedagogies for academic librarians at Universites of Technology (UoTs) in South Africa.**

Traditionally, academic librarians at higher education institutions taught library instruction in a face-to-face environment i.e., in a classroom. This has largely evolved over the past decade to a digital mode of instruction using online tools such as MS Teams and Zoom. Globally, the influence of technology on pedagogy (teaching) demands academic librarians to teach using technology and engage seamlessly in a digital environment. The knowledge, understanding and use of learning management systems such as Moodle and Blackboard has also become synonymous for academic librarians when teaching in a digital environment. Largely, technology has been the driver of change in pedagogical (teaching) practices and influential in the online teaching role of the academic librarian at higher education institutions.

Recent studies in developed knowledge economies such as Australia, America, Canada, and the United Kingdom reveal the limitations in the understanding of pedagogies and applying of relevant technologies within the digital environment to enhance online teaching by academic librarians. Similarly, the purpose of this study is to explore and identify the influence of technology on pedagogies in a digital environment through the lens of the academic librarian at University of Technologies (UoTs) in South Africa.

In this survey, approximately 100 people will be asked to participate. It will take approximately 25 minutes to complete the questionnaire. Your participation in this study is completely voluntary. There are no foreseeable risks associated with this research. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn your opinions.

Your survey responses will be strictly confidential and data from this research will be

reported only in the aggregate. Your information will be coded and will remain confidential. If you have questions at any time about the survey or the procedures, you may **contact Mousin Omarsaib at 0726034954 or by email at the email address - mousino@dut.ac.za.** Thank you very much for your time and support.

It will take approximately 25 minutes to complete the questionnaire. Please answer all questions as completely as possible and where necessary indicate your option by placing a cross (X) in the box provided. Confidentiality is assured.

SECTION A: BIOGRAPHICAL INFORMATION

1. Please indicate the name of your institution

No	Biographical Information: Name of institution	(X)
1	Cape Peninsula University of Technology	
2	Cape University of Technology	
3	Durban University of Technology	
4	Mangosuthu University of Technology	
5	Tshwane University of Technology	
6	Vaal University of Technology	
7	Walter Sisulu University of Technology	

2. Please indicate your current designation (for statistical reasons):

No	Biographical Information: Job Title	(X)
1	Faculty Librarian	
2	Information Librarian	
3	Information specialist	
4	Postgraduate Librarian	
5	Research Librarian	
6	Subject Librarian	
7	Training librarian	
8	Other (Please specify)	

3. How long have you been in your current role?

No	Biographical Information: Work experience	(X)
1	0-11 months	
2	1-5 years	
3	6-10 years	
4	11-20 years	
5	21-30 years	
6	31 years and above	

4. How many years of teaching experience do you have as an academic librarian?

No	Biographical Information: Work experience	(X)
1	0-11 months	
2	1-5 years	
3	6-10 years	
4	11-20 years	
5	21-30 years	
6	31 years and above	

5. What is your highest academic qualification?

No	Biographical Information: Academic qualification	(X)
1	PhD	
2	Masters	
3	Honours	
4	Undergraduate Degree	
5	Diploma	
6	Certificate	
7	Other (Please specify)	

6. What field/s have you obtained your qualifications? You may select more than one answer.

No	Biographical Information: Academic qualification	(X)
1	Information Science	
2	Library and Information Science	
3	Library and Information Studies	
4	Education	
5	Other (Please specify)	

SECTION B: PEDAGOGICAL KNOWLEDGE FOR ONLINE INSTRUCTION

This section asks about teaching strategies and which knowledge you identify as important to your online educational role as an academic librarian. Cross all that may apply.

7. Indicate which instructional strategies you use in your online teaching practice. Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Pedagogical Knowledge for Online Instruction – Instructional strategies						
PKFOI1	I use collaborative learning as an instructional strategy to teach online					
PKFOI2	I use demonstration as an instructional strategy to teach online					
PKFOI3	I use direct instruction as an instructional strategy to teach online					
PKFOI4	I use small group work as an instructional strategy to teach online					
PKFOI5	I use discussions as an instructional strategy to teach online					
PKFOI6	I use self-directed learning as an instructional strategy to teach online					
PKFOI7	I use active learning as an instructional strategy to teach online					
PKFOI8	I use passive learning as an instructional strategy to teach online					
PKFOI9	I use critical reflection as an instructional strategy to teach online					

8. Rate how long it took to apply and integrate your teaching methods in an online environment. Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Unprepared =1; Somewhat prepared =2; Prepared =3; Very prepared =4; Expert =5.

No	Statement	1	2	3	4	5
Pedagogical Knowledge for Online Instruction – Teaching in an online environment						
PKFOI1	It took me 0 – 6 months to apply and integrate my teaching methods in an online environment					
PKFOI2	It took me 6 months – 1 year to apply and integrate my teaching methods in an online environment					
PKFOI3	It took me 2 – 5 years to apply and integrate my teaching methods in an online environment					
PKFOI4	It took me 6 – 10 years to apply and integrate my teaching methods in an online environment					
PKFOI5	It took me 11 – 20 years to apply and integrate my teaching methods in an online environment					
PKFOI6	It took me 20 plus years to apply and integrate my teaching methods in an online environment					

9. Which of the following best describes where you obtained the pedagogical knowledge required for your online teaching role? Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Strongly Agree =1; Agree =2; Undecided =3; Disagree =4; Strongly Disagree =5.

No	Statement	1	2	3	4	5
Pedagogical Knowledge for Online Instruction – Qualification for online teaching						
PKFOI1	I acquired knowledge for online teaching through a Library and Information Science qualification					
PKFOI2	I acquired knowledge for online teaching through work related professional development					
PKFOI3	I acquired knowledge for online teaching through independent professional development (personally funded)					
PKFOI4	I acquired knowledge for online teaching through in a previous library position through practice					
PKFOI5	I acquired knowledge for online teaching through a formal teaching certificate, diploma, or degree					
PKFOI6	I acquired knowledge for online teaching through work colleagues					

10. Did you take a course that focused on online curriculum design, teaching with technology, digital skills and 21st century oriented pedagogical theories as part of your professional development in academic librarianship? The weight-scoring are: No, not a priority =1; No, low priority =2; Medium priority =3; Yes, high priority =4; Yes, essential =5.

No	Statement	1	2	3	4	5
Pedagogical Knowledge for Online Instruction - Professional development						
PKFOI1	I did take a course on the impact of emerging technologies on learning and teaching theories as part of my professional development in academic librarianship					
PKFOI2	I did take a course in transforming online curriculum design for teaching as part of my professional development in academic librarianship					
PKFOI3	I did take a course on transforming teaching with technology using diagnostic tools as part of my professional development in academic librarianship					
PKFOI4	I did take a course in integrating online assessments to support teaching and learning as part of my professional development in academic librarianship					
PKFOI5	I did take a course on the impact of 21st century pedagogical theories on academic librarianship as part of my professional development in academic librarianship					
PKFOI6	I did take a course on digital skills and teaching as part of my professional development in academic librarianship					

SECTION C: ONLINE INSTRUCTION ROLE:

This section asks about the content, teaching resources and your role as a teacher that you identify with in a digital environment.

11. What topics do you teach when providing online library instruction? Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Library instruction curriculum						
OIR1	I do teach topic analysis as part of my online library instruction					
OIR2	I do teach searching strategies when using a discovery tool/catalogue as part of my online library instruction					
OIR3	I do teach searching strategies when using Google in as part of my online library instruction					
OIR4	I do teach searching strategies when using online information sources e.g., databases, eBooks, eJournals, online repositories etc. as part of my online library instruction					
OIR5	I do teach how to evaluate information as part of my online library instruction					
OIR6	I do teach referencing as part of my online library instruction					
OIR7	I do teach the ethical use of information e.g., plagiarism as part of my online library instruction					
OIR8	I do teach how to use bibliographic management systems e.g., EndNote, Mendeley etc. as part of my online library instruction					
OIR9	I do teach fake news as part of my online library instruction					

12. If the topics you teach are not listed in Question 11 above then type the areas you teach in the row provided below or indicate as Non-Applicable (N/A).

…….

13. To whom do you provide online library instruction? Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Customers of online library instruction						
OIR1	I provide online library instruction to undergraduate students					
OIR2	I provide online library instruction to postgraduate students					
OIR3	I provide online library instruction to faculty members					
OIR4	I provide online library instruction to administrative staff					
OIR5	I provide online library instruction to other online teaching librarians					
OIR6	I provide online library instruction to librarians in any role					

14. Has your job always included some form of online instructor role using platforms such as MS Teams and Zoom? The weight-scoring are: Strongly Agree =1; Agree =2; Undecided =3; Disagree =4; Strongly Disagree =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Online applications to teach e.g., MS Teams, Zoom						
OIR1	I did teach online library instruction using applications such as MS Teams and Zoom before the COVID 19 pandemic					
OIR2	My first exposure to using applications such as MS Teams and Zoom for online library instruction was during the COVID 19 pandemic					
OIR3	My online library instruction using applications such as MS Teams and Zoom increased during the COVID 19 pandemic					

15. In what learning environments have you been providing library instruction? Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Learning environments						
OIR1	I have been providing library instruction in a completely online learning environment					
OIR2	I have been providing library instruction in a blended environment					
OIR3	I have been providing library instruction in a hybrid environment					
OIR4	I have been providing library instruction in a face-to-face environment i.e., in a physical environment					

16. What is your primary mode of online library instruction? Please on the scale 1-5, read each statement and provide your feedback. The weight-scoring are: Strongly Agree =1; Agree =2; Undecided =3; Disagree =4; Strongly Disagree =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Mode of online library instruction						
OIR1	My primary mode of online library instruction is asynchronous only (e.g., creating learning objects for students to access in their own time such as discussion forums)					
OIR2	My primary mode of online library instruction is synchronous only (live instruction using video conferencing software such as MS Teams or Zoom)					
OIR3	My primary mode of online library instruction is both asynchronous and synchronous					
OIR4	My primary mode of online library instruction is neither asynchronous nor synchronous					

17. What proportion of your time is allocated to preparing material for online instruction? The weight-scoring are: Strongly Agree =1; Agree =2; Undecided =3; Disagree =4; Strongly Disagree =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Preparing library material for teaching online						
OIR1	I spend 0% of my time preparing material for online library instruction					
OIR2	I spend 1-25% of my time preparing material for online library instruction					
OIR3	I spend 25-50% of my time preparing material for online library instruction					
OIR4	I spend 51-75% of my time preparing material for online library instruction					
OIR5	I spend more than 75% of my time preparing material for online library instruction					

18. What proportion of your time is allocated to teaching online? The weight-scoring are: Strongly Agree =1; Agree =2; Undecided =3; Disagree =4; Strongly Disagree =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Teaching online						
OIR1	I spend 0% of my time teaching online library instruction					
OIR2	I spend 1-25% of my time teaching online library instruction					
OIR3	I spend 25-50% of my time teaching online library instruction					
OIR4	I spend 51-75% of my time teaching online library instruction					
OIR5	I spend more than 75% of my time teaching online library instruction					

19. Which of the following teaching methods do you use in online library instruction? The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
	Online Instruction Role - Online teaching methods					
OIR1	I do use class discussions as my online teaching method					
OIR2	I do use cooperative learning as my online teaching method					
OIR3	I do use break away sessions as my online teaching method					
OIR4	I do use flipped classroom as my online teaching method					
OIR5	I do use game-based learning as my online teaching method					
OIR6	I do use inquiry-based learning as my online teaching method					
OIR7	I do use problem-based learning as my online teaching method					
OIR8	I do use project-based learning as my online teaching method					
OIR9	I do use a student centered approach as my online teaching method					

20. Which of the following digital tools do you use in online library instruction? The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Digital tools to teach						
OIR1	I do use video tutorials to teach online library instruction					
OIR2	I use Microsoft Office applications to teach online library instruction					
OIR3	I do use movie maker applications to teach online library instruction					
OIR4	I do use online library guides to teach online library instruction					
OIR5	I do use mobile technologies e.g., tablet and cell phone applications to teach online library instruction					
OIR6	I do use social media to teach online library instruction					
OIR7	I do use learning objects to teach online library instruction					
OIR8	I do use instant messaging to teach online library instruction					
OIR9	I do use web-based modules to teach online library instruction					

21. What is your role in the learning management system at your institution as an online instructor? The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Learning management system						
OIR1	I am embedded in all the courses that I teach as an online instructor in the learning management system at my institution					
OIR2	I have a role as an online instructor as a teaching partner for various modules in the learning management system at my institution					
OIR3	I have a role as an online instructor within a specific module in the learning management system at my institution					
OIR4	I have a role as an online instructor to teach a section/aspect of a module within a specific course in the learning management system at my institution					
OIR5	I have designed and I am an online instructor in my own library module in the learning management system at my institution					

22. Do you identify as having an educational technology or eLearning leadership role at your institution? The weight-scoring are: Definitely=1; Probably =2; Possibly =3; Probably not =4; Definitely not =5.

No	Statement	1	2	3	4	5
Online Instruction Role – Leadership						
OIR1	I do identify as having a leadership role as an educational technologist at my institution					
OIR2	I do identify as having a leadership role in eLearning at my institution					

SECTION D: TECHNOLOGY FOR ONLINE INSTRUCTION

This section asks about the type of educational tools used in the digital environment when teaching library instruction. This can increase productivity associated with library instructional materials, tasks, assessments, and better utilisation of teaching time in the digital environment.

23. What production tools do you use to create content for online instruction? The weight-scoring are: The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Technology for Online Instruction – Production tools						
TFOI1	I do use presentation software e.g., Sway, Whiteboard to create content for online library instruction					
TFOI2	I do use video production e.g., SDC video editor software to create content for online library instruction					
TFOI3	I do use screen capturing software e.g., Camtasia, Droplr etc. to create content for online library instruction					

24. What web authoring tools do you use in your online instructional practice? The weight-scoring are: The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Technology for Online Instruction – Web authoring tools						
TFOI1	I do use eLearning authoring tools e.g., Articulate, Storyline, Adobe Captivate in my online instructional practice					
TFOI2	I do use web development and authoring tools e.g., Content Management Systems, LibGuides etc. in my online instructional practice					

25. What online educational tools do you use to connect learners to content you teach in a digital environment? The weight-scoring are: Always=1; Very Often=2; Sometimes =3; Rarely =4; Never =5.

No	Statement	1	2	3	4	5
Technology for Online Instruction – Educational tools						
TFOI1	I do use learning management systems e.g., Blackboard, Moodle, Canvas etc. to connect learners to content that I teach in a digital environment					
TFOI2	I do use learning technologies e.g., Socrative, Animoto, Google Docs, Quiz Makers etc. to connect learners to content that I teach in a digital environment					
TFOI3	I do use video conferencing e.g., MS Teams, Zoom, Skype to connect learners to content that I teach in a digital environment					
TFO14	I do use games e.g., Kahoots, Peardeck, EdPuzzle etc. to connect learners to content that I teach in a digital environment					

Should there be any queries please contact the researcher on: mousino@dut.ac.za

Annexure I: Interview Schedule

Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology (UoTs) in South Africa

1. Describe your role as an online teacher in the digital environment?
2. Does your role focus on other online modules besides library instruction, and if so, indicate the areas of online teaching and responsibilities?
3. The digital environment has repositioned the way we teach compared to face-to-face instruction. Drawing from your experience teaching in a face-to-face environment, how have your teaching practices changed in the digital environment?
4. What are some of the teaching methods you use for online library instruction?
5. Currently, knowledge of active learning is guiding online teaching. Some of these active learning styles include problem, inquiry, and activity-based learning. Do you agree that these learning styles are important to online teaching? If, so, please explain?
   5.1. Do you apply any of these learning styles in your online teaching, and if so, how
   5.2. Why are you using these learning styles in your online teaching methods?
6. It is important for students to think critically and apply their knowledge to concepts learned in a digital environment. How do you promote and facilitate activities/exercises related to the above in your teaching practice?
7. It is important to have an online teacher presence when supporting learning in the digital environment. How do you provide support to students whilst they are involved in their online library exercises, class activities and assessments synchronously/asynchronously?
8. An online social presence is key when actively engaging with students as a facilitator/teacher in the digital environment. How do you promote and enable this type of support to students?
9. Did you receive any formal training in using technology to teach in a digital environment?
10. How do you use technology within the digital environment to support your teaching practices and methods?
11. In your opinion, what digital skills do current and future academic librarians need training on to teach online?

12. Do you have the necessary digital skills aligned to online teaching for the digital environment, please explain?
13. Foundational knowledge of teaching methods and practices is important for an individual transferring knowledge and skills to students involved in learning. Do you have the necessary knowledge to teach in an online environment, please elaborate?
14. A formal educational qualification and appropriate understanding of how to use technology to teach online can be useful for academic librarians. However, do you believe there is a need for a formal qualification, or a sustainable training programme suited to the needs of academic librarians when teaching with technology in the current digital environment, please elaborate?
15. It is normal to face challenges when teaching in a digital environment. Are you facing any challenges teaching in an online learning environment as an academic librarian, if so, please elaborate?

Annexure J: Sample of Interview Response

Question	Participant number	Theme
1. Describe your role as an online teacher in the digital environment?	5	Digital skills and online teaching Teaching with technology
2. Does your role focus on other online modules besides library instruction, and if so, indicate the areas of online teaching and responsibilities?	8	Library instruction only
3. The digital environment has repositioned the way we teach compared to face-to-face instruction. Drawing from your experience teaching in a face-to-face environment, how have your teaching practices changed in the digital environment?	3	Digital skills Digital pedagogies Teaching with technology
4. What are some of the teaching methods you use for online library instruction?	6	Pedagogical skills Digital pedagogies
5. Currently, knowledge of active learning is guiding online teaching. Some of these active learning styles include problem, inquiry, and activity-based learning. Do you agree that these learning styles are important to online teaching? If, so, please explain?	2	Active engagement Cognitive presence Teaching presence Social presence
5.1. Do you apply any of these learning styles in your online teaching, and if so, how?	10	Pedagogical skills
5.2. Why are you using these learning styles in your online teaching methods?	1	Pedagogical skills
6. It is important for students to think critically and apply their knowledge to concepts learned in a digital environment. How do you promote and facilitate	4	Cognitive presence Social presence Teaching presence

activities/exercises related to the above in your teaching practice?		
7. It is important to have an online teacher presence when supporting learning in the digital environment. How do you provide support to students whilst they are involved in their online library exercises, class activities, and assessments synchronously/asynchronously?	3	Social presence Teaching presence
8. An online social presence is key when actively engaging with students as a facilitator/teacher in the digital environment. How do you promote and enable this type of support to students?	9	Social presence Teaching presence
9. Did you receive any formal training in using technology to teach in a digital environment?	7	Digital skills Pedagogical skills Teaching with technology
10. How do you use technology within the digital environment to support your teaching practices and methods?	5	Digital skills Pedagogical skills Teaching with technology
11. In your opinion, what digital skills do current and future academic librarians need training on to teach online?	11	Digital skills Technological knowledge
12. Do you have the necessary digital skills aligned to online teaching for the digital environment, please explain?	6	Digital skills Pedagogical skills Technological knowledge
13. Foundational knowledge of teaching methods and practices is important for an individual transferring knowledge and skills to students involved in learning. Do you have the necessary knowledge to teach in an online environment, please elaborate?	10	Pedagogical knowledge
14. A formal educational qualification and appropriate understanding of how to use technology to teach online can be useful for academic librarians. However, do you believe there is a need for a formal	5	Pedagogical knowledge Technological knowledge

qualification, or a sustainable training programme/model suited to the needs of academic librarians when teaching with technology in the current digital environment, please elaborate?		
15. It is normal to face challenges when teaching in a digital environment. Are you facing any challenges teaching in an online learning environment as an academic librarian, if so, please elaborate?	6	Digital skills Pedagogical skills Technological knowledge

Annexure K: Delphi Methods

TITLE: Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa
AIM: The aim of this study is to explore the emerging role of academic librarians in relation to digital pedagogies within UoTs in South Africa
DELPHI method: Round 1 – open ended questions
Research Objectives
[RO1]: *Ascertain the digital pedagogies of academic librarians in the current digital environment at UoTs in South Africa* [RO2]: *Explore the pedagogical and digital skills of academic librarians within a digital environment at UoTs in South Africa* [RO3]: *Establish the online teaching presence of academic librarians when engaging with students in a digital environment at UoTs in South Africa* [RO4]: *Design an online training model in pedagogical and digital skills required for the current LIS environment*
1.What pedagogical knowledge do academic librarians need to have to develop a lesson for online library instruction? 2. How can academic librarians integrate technology with pedagogy when designing lessons, activities, or assessments in online library instruction? 3. How can academic librarians examine relevant digital tools to stimulate learning for students in a digital environment? 4.Do you think academic librarians must test the digital tool with the teaching methods and learning activity before using it a digital classroom. If yes, please explain? 5.How can academic librarians determine if the digital pedagogy worked in the digital classroom?

TITLE: Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa

AIM: The aim of this study is to explore the emerging role of academic librarians in relation to digital pedagogies within UoTs in South Africa

DELPHI method: Round 2 – Questionnaire – statements

Strongly disagree	Somewhat disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

Please circle statement that you find most appropriate. You may only choose one option per statement.

Number	Statement	Rating				
1.	Learning theories are important to understand how students learn	1	2	3	4	5
2.	Teaching methods are important as it helps facilitators achieve learning outcomes	1	2	3	4	5
3.	Instructional strategies are key for facilitators to assist students learn course material	1	2	3	4	5
4.	Lessons plans guide facilitators and helps students to understand the purpose of the module	1	2	3	4	5
5.	Digital tools can stimulate students to collaborate and improve critical thinking skills when learning in a digital environment	1	2	3	4	5
6.	Facilitators should integrate learning activities and digital tools to promote active learning in a digital environment	1	2	3	4	5
7.	Pedagogical knowledge must underpin the use of digital tools to enhance teaching and learning in a digital environment	1	2	3	4	5
8.	It is important to test a digital tool with the learning activity and teaching method before implementing a digital classroom	1	2	3	4	5
9.	Testing a digital tool before using it for online teaching and learning will provide facilitators with an opportunity to either modify or discard the technology	1	2	3	4	5
10.	Evaluating and reflecting upon the usefulness of a digital tool for online teaching and learning is important for the facilitator including students	1	2	3	4	5

TITLE: Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa
AIM: The aim of this study is to explore the emerging role of academic librarians in relation to digital pedagogies within UoTs in South Africa
DELPHI method: Round 3 – Revised Questionnaire - statements

Strongly disagree	Somewhat disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

Please circle statement that you find most appropriate. You may only choose one option per statement.

Number	Statement	Rating				
1.	Learning theories are important to understand how students learn	1	2	3	4	5
2.	Digital tools can stimulate students to collaborate and improve critical thinking skills when learning in a digital environment	1	2	3	4	5
3.	Facilitators should integrate learning activities and digital tools to promote active learning in a digital environment	1	2	3	4	5
4.	Pedagogical knowledge must underpin the use of digital tools to enhance teaching and learning in a digital environment	1	2	3	4	5
5.	It is important to test a digital tool with the learning activity and teaching method before implementing a digital classroom	1	2	3	4	5
6.	Testing a digital tool before using it for online teaching and learning will provide facilitators with an opportunity to either modify or discard the technology	1	2	3	4	5
7.	Evaluating and reflecting upon the usefulness of a digital tool for online teaching and learning is important for the facilitator including students	1	2	3	4	5

Annexure L: Alignment of the Research

TITLE: Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa			
AIM: The aim of this study is to explore the emerging role of academic librarians in relation to digital pedagogies within UoTs in South Africa			
Research Objectives	**Theoretical Framework**	**Data Collection Methods/Data Sources**	**Data Analysis/Results**
[RO 1]: *Ascertain the digital pedagogies of academic librarians in the current digital environment at UoTs in South Africa*	TPACK COI ***Chapter Two***	Literature Review ***Chapter Three*** Online Survey Questionnaire ***Chapter Four, Annexure H*** Semi-Structured Interviews ***Chapter Four, Annexure I***	Conceptualising Digital Pedagogies ***Chapter Three*** Descriptive, inferential statistics, regression tables and correlations using SPSS ***Chapter 5*** Coding, thematic analysis, word frequency and word tree themes using NVivo ***Chapter 5***
[RO 2]: *Explore the pedagogical and digital skills of academic librarians within a digital environment at UoTs in South Africa*	TPACK COI ***Chapter Two***	Literature Review ***Chapter Three*** Online Survey Questionnaire ***Chapter Four, Annexure H*** Semi-Structured Interviews ***Chapter Four, Annexure I***	 Descriptive, inferential statistics, regression tables and correlations using SPSS ***Chapter 5*** Coding, thematic analysis, word frequency and word tree themes using NVivo ***Chapter 5***
[RO 3]: *Establish the online teaching presence of academic librarians when engaging with students in a digital environment at UoTs in South Africa*	TPACK COI ***Chapter Two***	Literature Review ***Chapter Three*** Online Survey Questionnaire ***Chapter Four, Annexure H***	 Descriptive, inferential statistics, regression tables and correlations using SPSS ***Chapter 5***

		Semi-Structured Interviews ***Chapter Four, Annexure I***	Coding, interpretations, thematic analysis, word frequency and word tree themes using NVivo ***Chapter 5***
[RO 4]: *Design an online training model in pedagogical and digital skills required for the current LIS environment*	TPACK COI ***Chapter Two***	Literature Review ***Chapter Three***	
		Online Survey Questionnaire ***Chapter Four, Annexure H***	Descriptive, inferential statistics, regression tables and correlations using SPSS ***Chapter 5***
		Semi-Structured Interviews ***Chapter Four, Annexure I***	Coding, thematic analysis, word frequency and word tree themes using NVivo ***Chapter 5***
Consolidation of Research Summary of research findings, Discussion of Findings, Conclusions in the study, Recommendations of the study, Implications of the study, Summary, and conclusion ***Chapter 6***			

Annexure M: Research Path Table

Research Objective	Critical Questions	Data Source	Data collection instruments
RESEARCH OBJECTIVE 1 To ascertain the digital pedagogies of academic librarians in the current digital environment in South Africa towards developing an online training model	What are the digital pedagogies needed by academic librarians in the current digital environment in South Africa?	**Literature Academic librarians at UOT's**	**Questionnaire and Interviews with academic librarians**
RESEARCH OBJECTIVE 2 To explore the pedagogical and digital skills needed by academic librarians within a digital environment at UOT's in South Africa	What pedagogical skills do academic librarians within a digital environment at UOT's in South Africa need?	**Literature Academic librarians at UOT's**	**Questionnaire and Interviews with academic librarians**
RESEARCH OBJECTIVE 3 To explore the pedagogical and digital skills needed by academic librarians within a digital environment at UOT's in South Africa	What digital skills do academic librarians within a digital environment at UOT's in South Africa need?	**Literature Academic librarians at UOT's**	**Questionnaire and Interviews with academic librarians**
RESEARCH OBJECTIVE 4 To establish the type of online presence of academic librarians when engaging with students in a digital environment at UOT's in South Africa	What type of online presence is needed by academic librarians when engaging with students in a digital environment in South Africa?	**Literature Academic librarians at UOT's**	**Questionnaire and Interviews with academic librarians**
RESEARCH OBJECTIVE 5 To design an online training model in pedagogical and digital sills required for the current LIS environment in South Africa	What effective design can be developed for an online training model?	**Literature Academic librarians at UOT's**	**Questionnaire and Interviews with academic librarians**

Annexure N: Certificate of Language Editing

EDITING LETTER

696 Clare Road

Clare Estate

Durban

4091

5 December 2022

To: Whom it may concern

Editing of PhD thesis: Mousin Omarsaib

Development of a Training Model on Digital Pedagogies for Academic Librarians at Universities of Technology in South Africa

This letter serves as confirmation that the aforementioned thesis has been language edited. Requisite academic writing conventions have been adhered to.

Any queries may be directed to the author of this letter.

Regards

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