Multimodal Teaching of Accounting at the Durban University of Technology

by

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DECLARATION

I declare that this dissertation is my original work. All sources used have been duly acknowledged in the text and in the list of references. This study has not been previously submitted in any form to the Durban University of Technology nor to any other university for assessment.

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ABSTRACT

The advancement and innovation of technology has made available a diversified array of modes to promote meaningful and engaging teaching in higher education in the discipline of accounting. A multimodal teaching approach recognises that teaching and learning occur through a range of modes that facilitate the uptake of a diversified portfolio of semiotic resources for meaning making. Students make meaning through a combination of modal resources, the selection of which is determined by individual learning styles. Disruptions to higher education globally can be mitigated through the adoption of multimodal pedagogy, a student-centred, flexible teaching approach, that enables the continuity of creative teaching practices in times of crisis.

This study was undertaken to explore multimodal teaching of accounting in higher education, with Durban University of Technology as the case under study. The accounting discipline, being number intensive and technical, creates the perception that it is difficult to teach, more so digitally. The philosophical worldview underpinning this research study was pragmatism. The research design adopted was explanatory sequential mixed methods in two phases. The findings from data collected in the quantitative first phase, was used to inform the sampling and the type of semi-structured questions to be asked in the qualitative second phase of the study. The target population encompassed all the academics in the accounting cluster within the Faculty of Accounting and Informatics. Quantitative data analysis was conducted using the Statistical Package for Social Sciences (SPSS), version 25 and included the use of descriptive and inferential statistics, while qualitative data analysis software, NVIVO was used to analyse qualitative data.

The findings of this study revealed that general technological knowledge is very important for successful multimodal teaching of accounting, especially, understanding the technological infrastructure of the institution. Most academics considered knowledge on creating and uploading course content as essential for using Moodle. When using MS Teams, significance was accorded to being skilled at using complex applications and having knowledge on set up, conduct, and control of a digital lecture. Most accounting academics agreed that the accounting curriculum needed to be adapted to a moderate extent to facilitate curriculum realignment for multimodal teaching of accounting. Findings further revealed that the digital pedagogical skills of

designing a digital learning environment, adapting pedagogy to digital channels, and creating a digital learning experience, were very necessary for teaching accounting using multiple modes.

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LIST OF ABBREVIATIONS

DUT – Durban University of Technology

LMS – Learning management system

MS TEAMS – Microsoft Teams

TPACK – Technological pedagogical content knowledge

UNESCO – United Nations Educational, Scientific and Cultural Organization

TERMINOLOGY

Academic staff

For this study, the term ‘academic staff’ is presented as synonymous with the terms ‘lecturer’ and ‘teacher’. The South African Department of Higher Education and Training (DHET 2021: 15) define the term academic staff as “any person appointed to teach or to do research at a public higher education institution and any other employee designated as such by the council of that institution”. DHET further qualifies the definition to include instruction and research staff who spend more than 50% of their official time on instruction and/or research activities. In this research study, academic staff refers to university staff who spend more than 50% of their time on instruction activities.

Student

This study presents the term ‘student’ as synonymous with the term ‘learner’. The South African Department of Higher Education and Training (DHET 2021: 135) define the term student as “a person registered and/or attending at a PSET institution, whether part-time, full-time or distance”.

CHAPTER 1: AN OVERVIEW OF THE STUDY

1.1 Introduction

The impact of the knowledge society (Tewari and Ilesanmi 2020) and the innovation of new technologies is rapidly transforming higher education globally. Technology's ability to transform traditional teaching and learning can remove barriers to education forced by space and time and provide access to life-long learning. This, together with a rapidly expanding global business world, is compelling higher education to adopt new technologies for teaching (Baldwin, R.G. 2022).

The higher education sector in South Africa, integral to the socioeconomic development of the country, is instrumental in advancing the development of skills to increase productivity and support economic growth through innovation (Foko 2015: 1). In an effort to mitigate the skills shortage, the DHET has formulated one of its objectives as being to "increase the rate at which the key skills necessary for economic growth and social development are delivered" (DHET 2019: 1). Furthermore, the onset of the fourth industrial revolution has altered the nature of work where new occupations require higher order cognitive and soft skills (self-awareness or metacognition, motivation, curiosity, teamwork, grit, resilience, and adaptability). Innovative teaching methods and new modes of delivery, driven by technology, have the potential to address the issue of 21st century skills (Ra *et al.* 2019: 26-32).

Digital technologies have expanded the semiotic landscape and brought about an array of hybridized modes for teaching (Zhang and O'Halloran 2019: 1). Multimodal pedagogy is therefore, in essence, about combining different teaching approaches and strategies, with the aid of technologies, to provide students with different types of resources for meaningful learning suitable to their individual learning style (Papageorgiou and Lameras 2017: 133).

1.2 Background to the study

The onset of the corona virus pandemic in early 2020 adversely affected many sectors around the world, from healthcare to economies, and affected people's lives in the most fundamental of ways (Ademola *et al*. 2020: 2).

The higher education sector, globally, was unimaginably upended. Almost all countries instituted a sudden national lockdown which resulted in an immediate shutdown of all universities to contain the spread of the virus (Sarea, Alhadrami and Taufiq-Hail 2021). Most university managements around the world had no previous experience with such a natural disaster, and therefore had no contingency plans. Appropriate institutional responses had to be devised to deal with this challenge, to ensure the continuity of teaching and learning (Sangster, Stoner and Flood 2020: 431- 435). Accounting education was faced with a crisis – the daunting task of having to change teaching strategies and approaches almost instantly (Sarea, Alhadrami and Taufiq-Hail 2021). An emergent concern of digital teaching of accounting, was that revenue generation, through increased student intake (made possible by digital teaching), must not take precedence over pedagogy, the occurrence of which may cast aspersions on the purpose of accounting, particularly because of its inherent technical nature. (Sangster, Stoner and Flood 2020: 437).

South Africa went into a national lockdown at the end of March 2020. Universities were faced with the short-term crisis of ensuring the continuity of the academic year. The inequality fault-lines in higher education reached breaking point due to the pandemic and addressing this required new strategies and political interventions (Mtshweni 2022: 234-247). COVID-19 highlighted the need to re-imagine the South African university as a social institution. The migration to emergency remote digital teaching by universities was hampered by a lack of technology infrastructure, inadequate expertise for digital teaching and an inability to provide digital resources like data and computers to students. There was a call for a multimodal teaching strategy that not only addresses the South African reality but also enhances the affordances of multiple modes of delivery, resulting in excellence in pedagogy. (Wangenge-Ouma and Kupe 2020). In South Africa, academics at contact universities have little experience and training with digital teaching, therefore, to ensure continuity of teaching during the pandemic, academics had to rapidly upskill and familiarise themselves with technology (Jansen van Vuuren *et al*. 2020: 1).

The Durban University of Technology (DUT) shut down all on-campus activities. Staff were instructed to move to emergency remote digital teaching. Prior to the lockdown, accounting lectures were conducted face-face, on campus. Accounting is a technical number intensive discipline, which requires careful planning, preparation, and delivery

of lectures. Moving to new, unknown, untested pedagogical approaches with little or no digital training can only be described as challenging for the accounting faculty. The nature of the discipline does not allow for the straightforward transfer of “notes to slides” when delivery modes change. However, due to the emergency situation, DUT moved to multimodal teaching (DUT management team: 2020). This decision was supported by the Minister of Higher Education, Science and Technology of South Africa, who stated that multimodal teaching, learning, and assessment was a necessity and not an option to ensure continuity in teaching amidst the COVID-19 crisis. (Nzimande 2020).

According to the South African Institute of Chartered Accountants (2021: 12-36), it is anticipated that the accounting professional landscape will change due to the impact of the coronavirus pandemic which has highlighted the importance of future-proofed skills that will transform professional accountants into strategic leaders. The International Federation of Accountants (2020) extends this view, stating that there is a need to transform the academic and the accountancy professions’ infrastructure through dynamic curricula and learning models appropriate for a hybrid world. Furthermore, Susana, Helena, and Valeria (2021: 2403) states that it is imperative that teaching methods are improved in the accounting discipline due to the rapid developments in the profession.

1.3 Research problem

Accounting academics at DUT have been engaged in the delivery of accounting lectures through the ‘contact’ mode. COVID-19 has propelled accounting education into an emergency remote digital teaching situation. Both academics and students had to transition into new ways of teaching and learning (Green, Burrow and Carvalho 2020: 907). Accounting is a technical, practical, and number intensive discipline which makes it particularly challenging to teach digitally. The situation was further aggravated by the rapid and immediate transformation and transition of pedagogic and assessment practice in the context of a crisis (Cutri, Mena and Whiting 2020: 523). To transcend these challenges, accounting academics had to adopt a multimodal teaching approach which required rapid upskilling digitally.

In education, a mode is the mechanism through which learners acquire information; a mode is a semiotic resource, the tools for academics and students to convey meaning

(Olivier 2020a: 120). The existing literature on semiotic technology focuses on social media (Zappavigna 2016), and some researchers have looked at software applications like Microsoft Powerpoint and Word (Kvåle 2016; Zhao, Djonov and van Leeuwen 2014). There is not much research in educational contexts, where semiotic technologies are not considered as an everyday occurrence and are not normally situated in classrooms, as was the case in South Africa. Multimodal research has been conducted in various disciplines in education, including the professional disciplines like medicine (Weiss 2014), engineering (Simpson 2016) and accounting (Alyousef and Mickan 2016; Alyousef and Alsharif 2019), mainly from the perspective of students. Within these professional disciplines, scant attention has been paid to research on multimodal teaching, with a focus on technology, pedagogy, and curriculum (Simpson and Archer 2019).

According to Teviotdale (2019), in-depth exploratory research of "what actually happens in accounting education classroom in terms of modalities and embodied interaction are scarce, if any exist at all". Literature on digital remote teaching of accounting with a focus on multiple modalities is limited and much of it focuses on students. There is very little in-depth, full-scale research available, emphasizing the effect of such teaching on accounting academia. Therefore, this study focuses on multimodal teaching.

1.4 Aim of the study

This study sought to explore the teaching of accounting at the Durban University of Technology using a multimodal approach.

1.5 Objectives of the study

The above aim was addressed through the following objectives:

- To ascertain the technological knowledge needed by academics for multimodal teaching of accounting.
- To determine the extent of the alignment of the accounting curriculum for multimodal teaching.
- To explore the digital pedagogical skills needed for multimodal teaching of accounting.

1.6 Research questions

The following research questions addressed the objectives of the study:

1. What technological knowledge do academics need to have to teach accounting using a multimodal approach?
2. To what extent is the current accounting curriculum aligned for multimodal teaching?
3. Which digital pedagogical skills are needed by academics to enable them to employ multimodal teaching in accounting?

1.7 Rationale and significance of the study

Academics around the world were not well prepared for the sudden shift from traditional teaching (face-to-face) to digital remote teaching due to COVID-19. A unique skill set comprising pedagogical, technological, and content knowledge is required for multimodal teaching (Susana, Helena, and Valeria 2021: 2403). This research study was motivated by the researcher's, unpreparedness for this new form of delivery and the challenges experienced due to insufficient technological knowledge and in designing a new pedagogical approach. Furthermore, such a study as this has not been conducted with accounting academics at DUT.

Due to the globalisation of business and technological innovations, the accounting profession require universities to transform teaching approaches to one that develop in students the requisite skills that align with the future of the profession (Susana, Helena and Valeria 2021: 2404). The accounting profession has been calling for digital teaching of accounting for many years (Blankley, Kerr and Wiggins 2019). Teaching with technology will not only enhance teaching and learning through collaboration, scaffolding and problem-based learning, but will provide students with the opportunity to become familiar with technologies by learning "with and through" the technology (Susana, Helena and Valeria 2021: 2403). In addition, a multimodal pedagogy may better facilitate accounting students' acquisition of 21st century skills. Teaching with a variety of modes provide students with learning techniques best suited to their individual learning styles (Linder 2017: 12). This may strengthen students' understanding of the accounting curriculum, thereby improving pass rates.

According to Linder (2017: 15), the intention of multimodal teaching is to enhance the quality of teaching, thereby improving student engagement and learning. Sutisna and Vonti (2020: 103) cite improved quality and quantity of lectures as an advantage of multimodal teaching because of lecturer-student interaction across space and time. The findings of this research study may inform and enhance pedagogical practices of accounting academics and other stakeholders in higher education by providing insight into the technological knowledge and digital pedagogical competencies required to engage in multimodal teaching of accounting.

1.8 Research methodology

Research is a way of thinking, a process to collect data, then analyse and interpret it to answer the research questions (Kumar 2019) to understand the phenomenon of interest. Research methodology is the general approach a researcher takes to carry out the research study (Leedy, Ormrod and Johnson 2021). The research methodology followed for this study is presented in Figure 1.1.

1.8.1 Research design

According to Creswell (2009: 3), “Research designs are the plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis”. It provides the structure for the procedure the researcher follows, the data that is collected and data analysis (Leedy, Ormrod and Johnson 2021: 106).

This study adopted the mixed methods explanatory sequential design approach to understand the phenomenon of multimodal teaching at a more detailed level. This design type involves the gathering of quantitative data first and follows up with a qualitative phase to collect qualitative data to provide more depth to quantitative results (Creswell and Clark 2018). Quantitative research procedures are structured and pre-planned, giving numerical strength to the views of the respondents. Qualitative research focuses on descriptions and narrations, perceptions and experiences and is more descriptive in nature (Kumar 2019).

The researcher gathered quantitative data first, using closed questions in an online survey questionnaire. The analysed results were used to plan phase two of the study which was qualitative. Participants for the qualitative part of the study were purposely

selected based on the quantitative results. The type of qualitative questions, asked of the participants in the semi-structured online synchronous interviews with the accounting academics, were determined by the findings from the online survey and the literature review (chapter 2). Data from the different data sources (survey questionnaire with accounting academics, semi-structured online synchronous interviews with accounting academics, literature review information and theoretical framework) were integrated during the data analysis and interpretation stage of the study.

Among the many research strategies available (survey, action research, grounded theory, experiment, cross- sectional studies, longitudinal studies, ethnography, archival research, and participative enquiry), this study used the case study. The Durban University of Technology served as the case study for this research initiative.

According to Yin (2009:18), case study research involves an in-depth multi-faceted investigation of phenomena within its real-life context. It involves the use of multiple methods to collect data (Sekaran and Bougie 2016: 98)

1.8.2 Research Paradigm

A research paradigm refers to the philosophical assumptions that underpins a research study. It dictates what research methods are suitable for a given study.

The philosophical framework selected for this research study is pragmatism. The decision to choose pragmatism as the epistemological lens, was informed by the objectives of the study, the research questions, and the research context. According to Denscombe (2008: 280) pragmatism is the philosophy of practicality rather than ideology. It is a ‘matter of fact’ approach, judging research by whether it has answered the researcher’s questions. Cohen, Manion and Morrison (2018:36) agree with this, stating that pragmatism is a “what works” approach to answer research questions.

1.8.3 Target population

The target population is the group of respondents that meet a particular set of criteria (Ampofo 2020: 29).

The target population for this study is 52 academics in the accounting cluster within the Faculty of Accounting and Informatics who have been involved in multimodal teaching at the Durban University of Technology.

1.8.4 Sampling method

Data was gathered in two phases for this mixed methods study. In phase one, a census of the target population of fifty-two (52) academics in the accounting cluster was conducted to collect quantitative data to answer the research questions and to address the study's objectives. A census is when the entire target population is surveyed. (Cohen, Mannion and Morrison 2018: 339).

According to Sekaran and Bougie (2016: 240) the two main sampling methods are random (probability) sampling and purposive (non- random/non- probability) sampling. In random sampling, each element has a known chance of being included in the sample. In non-probability (non- random) sampling, an element is deliberately (purposely) included in the sample.

Purposive (non-random) sampling was used to collect qualitative data in phase two of this study. The sample size of twelve (12) participants was determined after the quantitative data had been analyzed. Participants for the interview process were chosen purposefully, in accordance with the extent of use of multimodality in teaching Accounting.

1.8.5 Data collection

Measuring instruments are tools designed to collect reliable data from respondents. These include questionnaires, interviews, observations, focus group discussion and experiments (Sekaran and Bougie 2016: 97). Quantitative data was collected using an online survey questionnaire with closed ended questions, which was distributed to all, fifty-two academics in the accounting cluster in the Faculty of Accounting and Informatics (FAI). A questionnaire was selected because it is cost effective and it allowed for detailed explanatory data to be collected on the technological knowledge base, extent of curriculum alignment and pedagogical skills to establish the effectiveness of multimodal teaching in Accounting.

Brinkmann (2013: 151) describes an interview as an exchange of views between two people, on a topic of mutual interest. Semi-structured online interviews were

conducted, on MS Teams, with academics who have been engaged with multimodal teaching of accounting, to enhance the conclusions of the quantitative study. Interviews proved to be an effective and versatile way of collecting data as it allowed the researcher to clarify vague and incomplete responses.

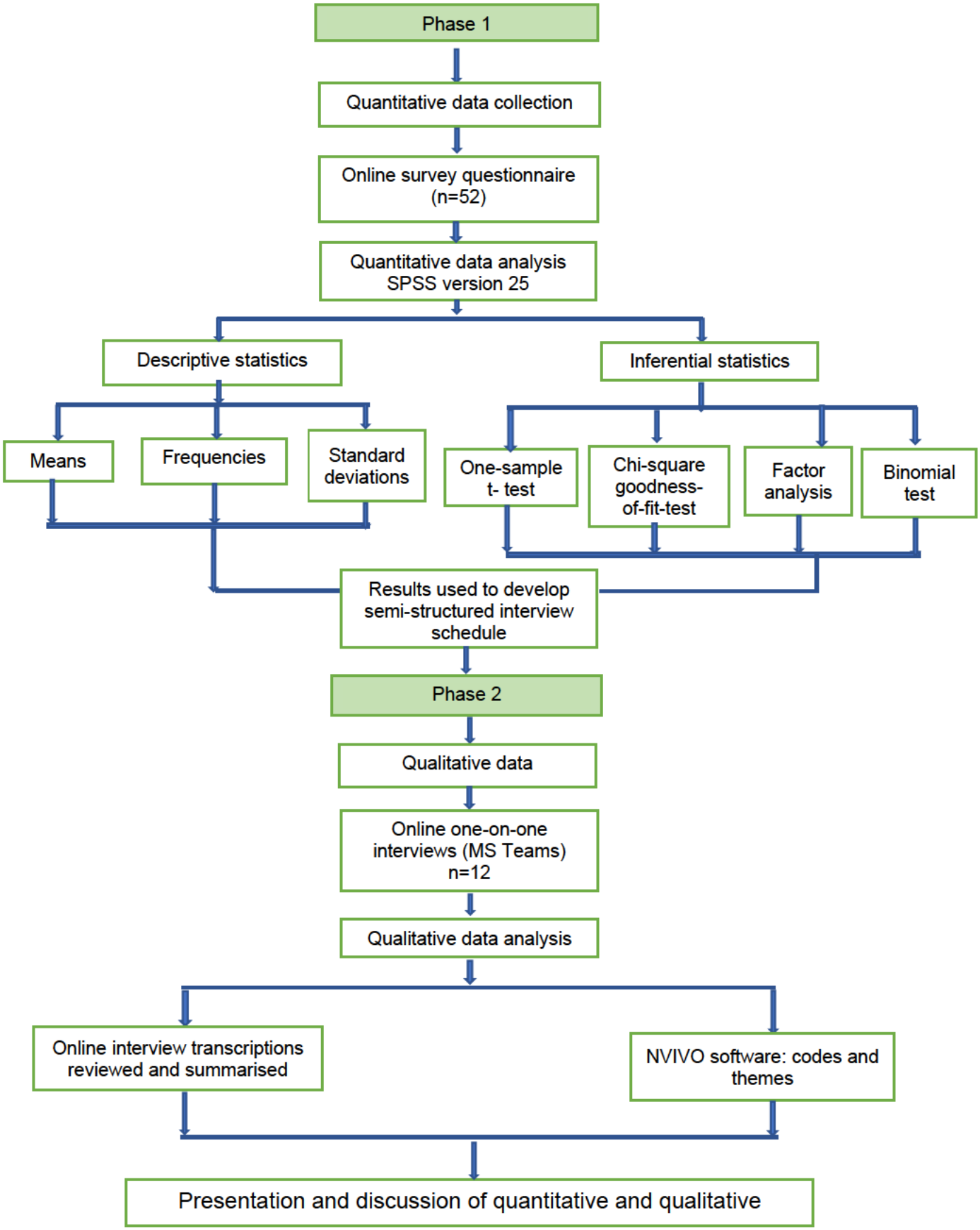
Due to the restrictions surrounding the COVID-19 pandemic, the choice of an online survey questionnaire and online synchronous semi-structured interviews were most appropriate.

1.8.6 Data Analysis

Quantitative data was analysed using the Statistical Package for Social Sciences (SPSS). This software is comprehensive, flexible, and can be used with almost any type of data file. It is useful for analysing large-scale survey data (Crossman 2019: para 8: line 16).

The data gathered from the semi-structured interviews was analysed using qualitative data analysis software (NVvivo). The advantages of using Qualitative Data Analysis Software are that it saves time, allows for the processing of a large volume of data, increases flexibility and improves the validity and auditability of qualitative research (*Top 14 qualitative data analysis software* 2021: para 7 line 28),

Figure 1.1: Diagrammatic representation of the research methodology



1.9 Pre-testing

It is important to pre-test the questionnaire to ensure that there is no ambiguity or problems with the measurement and that respondents understand the questions (Sekaran and Bougie 2016: 155).

Ten academics from the Informatics cluster in the Faculty of Accounting and Informatics (FAI) were selected to pre-test the questionnaire. Pre-testing highlighted possible flaws in the instruments' design and thereby assisted in improving the quality of the questions. The responses were read and analysed. These respondents were excluded from the main study.

One academic from the Informatics cluster in the Faculty of Accounting and Informatics (FAI) was selected to test the questions in the semi-structured interviews. This allowed for the questions to be refined and for the researcher to gain experience in conducting in-depth interviews. This participant was excluded from the full-scale study.

1.10 Limitations and delimitations

This study was limited to one University, DUT, situated in Durban, KwaZulu-Natal, South Africa. The academics included in this study were limited to the accounting cluster within the Faculty of Accounting and Informatics, located on the Durban and Pietermaritzburg campuses. Time and resource constraints have dictated that the study includes only accounting academics. The online systems used at DUT for teaching purposes, are MS Teams and Moodle.

This study was conducted with all accounting academics (quantitative) in the Faculty of Accounting and Informatics at DUT and through purposive sampling (qualitative). The results of this study are, therefore, influenced by the views and experiences of these accounting academics. Extending the study to include accounting academics from other tertiary institutions in South Africa, thereby allowing for a larger, more diversified sample size, may produce more nuanced results.

The study's findings cannot be generalised to other disciplines due to the small-scale nature of this study. The findings may be used to provide insight into how accounting academics experience multimodal teaching and learning in the context presented in this study.

1.11 Ethical considerations

Creswell and Creswell (2018) states that it is important that participants and the research site are respected; there must be no deception regarding the purpose of the study; and respondents must not be put at risk or harmed in any way. Ethical clearance was obtained from the DUT Faculty Research Ethics Committee (Annexure C) prior to the commencement of the study. Letters of Information providing details of the study were emailed to the respondents, together with the link to the online survey questionnaire. Participants were made aware that their participation was completely voluntary (Leedy and Ormrod 2015: 121). Written permission to conduct the study was obtained from the institution (Annexure F).

Participants were informed that their views would be anonymous. Respondents' and participants' identities were not disclosed, and no names were recorded. Respondents were assured of anonymity and confidentiality on the questionnaire. Respondents were asked to read and accept the online consent letter prior to answering the survey questionnaire. Participants were assured of confidentiality with regards to the safeguarding of answers to semi-structured interview questions.

All information on identity and data collected have been safely stored and will be made available only to the supervisor upon request.

1.12 Outline of the study

This study is arranged in five chapters. An overview of each chapter is presented.

Chapter 1 – Introduction

This introductory chapter provides a summary of the research study. It explains the rationale for the study by presenting the background to the study, its significance, the research problem as well as the objectives. A brief description of the research methodology is provided.

Chapter 2 – Literature review

The focus of Chapter 2 is on the review of literature relating to multimodal teaching of accounting in higher education. The theoretical framework chosen for this study is included in this chapter.

Chapter 3 – Research methodology

Chapter 3 elucidates on the research design and methodology that will be used to gather data. The choice of research instruments, data collection process and the data analysis methods are also explained. The ethical considerations for this study is presented in this chapter.

Chapter 4 – Results and discussion of findings

This chapter presents the analysis of the results and discusses the findings.

Chapter 5 – Conclusions and recommendations

Chapter 5 concludes the research study and submits recommendations arising from the findings. It includes a brief discussion on the limitations of the study together with suggestions for further research on multimodal teaching of accounting in higher education.

1.13 Summary

This introductory chapter is a synopsis of the entire research study. It includes a brief discussion on the background to the study, the research problem identified, the aims, objectives and research questions, the research methodology adopted to gather data, and ethical considerations. Chapter 2 provides an in-depth review of the literature pertaining to teaching accounting using multiple modalities in higher education.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 1 explained the framework of this study and it foregrounded the research problem, research objectives and the methodology selected for this study. This chapter discusses the literature pertinent to the topic and commences with a discussion on the theoretical framework guiding the study, followed by expounding on literature relevant to the research objectives which are as follows:

- To ascertain the technological knowledge needed by academics for multimodal teaching of accounting.
- To determine the extent of the alignment of the accounting curriculum for multimodal teaching.
- To explore the digital pedagogical skills needed for multimodal teaching of accounting.

Much of the available literature on multimodal teaching focuses on students, not on academics. There is limited literature on pedagogy, technologies, and curriculum aspects of multimodal teaching and this is further limited with respect to the accounting discipline. Drawing from insights in multidisciplinary multimodal research across educational contexts, this study explores the teaching of accounting using a multimodal teaching approach.

2.2 Theoretical framework

The theoretical framework underpinning this study is the technological pedagogical content knowledge (TPACK) framework which epitomises the interdependency between instructors' technology (T), pedagogy (P), and content (C) knowledge (K) that encompasses effective teaching practices.

2.2.1 Background to the TPACK framework

Shulman's (1986) pedagogical content knowledge (PCK) framework was extended by Mishra and Koehler to incorporate the description of teachers' interrelated knowledge of technology, pedagogy and content that is required for effective instruction (Mishra and Koehler 2006:1017).

Shulman's investigations into teacher tests in the areas of subject matter and pedagogy over the last century, revealed that those who teach must demonstrate knowledge of the content taught, together with knowledge transformation into content instruction (pedagogy) (Shulman 1986: 6). Shulman considered the highest form of scholarship and knowing to be teaching, a belief shared with Aristotle as documented in his work, Metaphysics (Shulman 1986: 7). Shulman's research studies aimed to understand teachers' comprehension of the subject areas, how this knowledge develops, and how teachers understand and respond to curriculum, reconfiguring it so that students understand (Johnson 2012).

2.2.2 Shulman's pedagogical content knowledge (PCK) framework

As the complexities of teacher knowledge became apparent, Shulman (1986: 4-14) recognised the need for a coherent theoretical framework. Shulman identified three types (domains/categories) of knowledge:

a) Content knowledge

   This refers to the amount of subject matter knowledge and how it is organised in the mind of the teacher.

b) Pedagogical knowledge

   The ways in which the teacher represents and constructs the subject content so that it is understandable to others. This could include analogies, illustrations, examples, explanations and demonstrations.

c) Curricular knowledge

   The curriculum encompasses a variety of programmes designed for the teaching of specific subjects, the diverse instructional materials related to those programmes, and the set of characteristics for the use of programme materials in particular circumstances (Shulman 1986: 9).

Shulman also proposed three forms of knowledge which are not separate from the above three domains of knowledge, but which contain the above categories of knowledge:

a) Propositional knowledge

   This is knowledge that we propose teachers do, like planning lessons and organizing reading groups (Shulman 1986: 10).

Propositional knowledge was further categorised into principles (emerges from empirical research), maxims (from practical experience and cannot be tested), and norms (justice, equity and fairness) (Johnson 2012).

b) Case knowledge

Knowledge of particular events that are elaborately described. Understanding a case means to first understand the factual information and then the theoretical aspects that explain why things happened the way they did (Shulman 1986: 11).

c) Strategic knowledge

Knowledge that is put into practice. When a teacher is confronted with contradictory situations, the ability to weigh alternatives, the ability to reason and then act. (Shulman: 1986: 13).

Shulman asserts that the true test of teachers' understanding was the ability to transform one's knowledge into teaching. "Those who can, do. Those who understand, teach" (Shulman 1986: 14).

2.2.3 Technological pedagogical content knowledge framework

The dynamic nature of learning, continuously being reshaped by time and teachers, imply that teachers' instructional competencies, must be mastered for effective knowledge transfer and skill acquisition (Santos and Castro 2021: 1).

Shulman's 1986 PCK framework shows the convergence of specific knowledge teachers must possess about the subject that they are teaching (content knowledge) and knowledge about how to teach including specific teaching methods (pedagogical knowledge) (McGraw-Hill 2019).

Understanding the influence of rapid advancement in information technology, the need to acquire 21st century skills, and the shift towards digital pedagogies in higher education (Goradia 2018: 44), Mishra and Koehler (2006:1017) extended Shulman's (1986) PCK framework to incorporate the description of teachers' interconnected knowledge of technology, pedagogy and content that is required for effective instruction. The extended framework is presented in Figure 2.1 below.

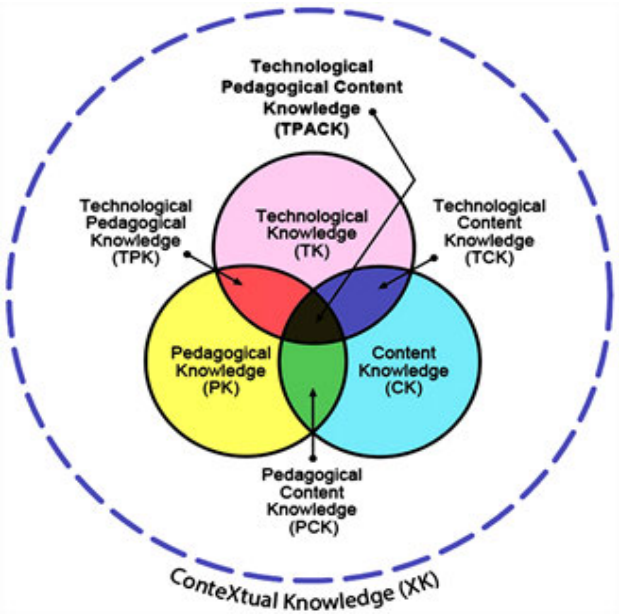


Figure 2.1: TPACK image
M Koehler. 2011. Reproduced by permission of tpack.org. The source of the image is attributed as http://tpack.org

The TPACK framework consists of three overlapping circles, with each circle depicting a particular type of teachers' professional knowledge. The interlinking of the various knowledge types engenders seven possible forms of teacher knowledge, with TPACK occupying the centre of these intersecting circles. The different forms of teacher knowledge are bordered by the context within which teachers acquire and express knowledge (Phillips 2016: 556).

According to the TPACK theory, successful teaching and learning with technology is not wholly dependent on technological knowledge, but rather on the new knowledge that is created when technological knowledge is interfaced with content knowledge and pedagogical knowledge (Saubern *et al.* 2020: 6).

Teachers' situated knowledge (classroom practices) is a complex body of knowledge formed by the interaction of a teacher' epistemological beliefs, classroom experiences, their knowledge of technology and school expectations which influences their instructional designs (Angeli and Valanides 2009: 159). Goradia (2018: 58) believes that the TPACK framework can be used by teachers to review and reflect upon their teaching practices and to make adjustments to promote a conducive learning environment.

According to the Department of Basic education (2018), quality teaching is a process of transforming and transferring content in a way that makes it intellectually available to students. The TPACK framework, an important part of the Department of Basic Education's 2018 *Professional Development Framework for digital learning,* specifies skills, competencies and knowledge that nudges teachers to go beyond their knowledge of pedagogical techniques, technology, and knowledge of their particular discipline (Department of Basic Education: 2018). This specialised knowledge is described by TPACK as a deep, pragmatic and nuanced understanding of content, technology and pedagogy (Mishra and Koehler 2009: 14).

Mishra and Koehler's TPACK framework constitutes three main areas of teacher knowledge that is the core of exemplary teaching. These are as follows:

1. Pedagogical knowledge (PK) is the deep knowledge to do with methods and processes of teaching (Pereira *et al.* 2018:4).
2. Technological knowledge (TK) refers to knowledge on various technologies that facilitates teaching and may include technology such as pencil, paper, white board, pens and digital technologies such as computers, laptops, scanners, Internet, etc. (Santos and Castro 2021: 2).
3. Content knowledge (CK) is the body of knowledge and information that teachers transfer to their students pertaining to a given subject area. It is about the teachers grasp on the subject matter being taught (Goradia 2018: 46).

The complex interactions among the above three areas of knowledge results in an additional four categories of knowledge:

1. Pedagogical content knowledge (PCK) is the unification of subject matter and teaching approach/processes knowledge. This involves teaching methods to convey specific content (Goradia 2018: 46).
2. Technological pedagogical knowledge (TPK) refers to understanding how various technologies can be used to plan and deliver lessons. This knowledge involves using technology to enhance teaching and learning (Goradia 2018: 46).
3. Technological content knowledge (TCK) refers to how specific content can be expressed in different ways through technology. Incorporating technology in teaching, a teacher can change the way a student understands concepts in a specific content area (Santos and Castro 2021: 2).

4. Technological pedagogical content knowledge (TPACK) is the knowledge teachers require to integrate technology in their teaching. Teachers TPACK embodies an instinctive and subtle understanding of the intricate and multifarious interplay between the various types of knowledge (PK/TK/CK). (Santos and Castro 2021: 2).

While 20th century teachers fused content knowledge with pedagogical knowledge (PCK) to transform and deliver subject matter to learner specified contexts (Hashweh 2013: 118-120), the availability of technology in the 21st century affords academics the opportunity to access and process content knowledge in innovative ways, and to transform their pedagogical approach to engage learners in new and fresh ways. The TPACK of a teacher embodies an expertise that enables the teacher to link subject matter with pedagogy and digital technology in very creative ways (Goradia 2018: 44-47). The availability and advancement of technology benefits teachers as a means to enhance education and make it more authentic for students (Ruggiero and Mong 2015: 173).

Technology presents its own challenges for teachers, such as acquiring knowledge about technology and how to integrate it with content, teaching and learning in specific situations (Swallow and Olofson 2017: 228). Mishra and Koehler (2006: 1024-1032) agree that keeping technology separate from teaching and learning may lead to difficulty in keeping up to date with all the latest developments due to rapid changes in digital technology and, because software is designed for business not education, students may spend time learning about how to use a program and not focusing on the content of the class (McGraw Hill 2019).

According to Schmid (2019: 3) the practical application of the TPACK framework activates the interactions between the constructs of content, pedagogy, and technology. Applying TPACK in daily teaching means incorporating it into the planning process by selecting the learning outcomes for that lesson, which is the content, followed by choosing an activity type, which is the pedagogy, and, lastly, choosing technologies that will be supportive of the activity type and will assist students in learning (McGraw Hill 2019).

2.2.4 TPACK in higher education

The TPACK framework has increased in popularity in the educational field due to the increased integration of innovative technologies in education especially after the COVID-19 pandemic (Adipat 2021: 6461). Tondeur *et al*. (2017a) explains that education should not resist the necessity of integrating technology in the lessons but should focus on how to successfully harness the benefits of technology for teaching so that the learning environment is transformed. According to Ponce *et al.* (2021) and Pimmer, Mateescu and Gröhbiel (2016), turning information into knowledge, facilitating relationships between academics and students, improving methods of communication, and bringing about relevant learning can be achieved by introducing technology in education. Digital teaching and learning have been embraced in higher education because of its versatility and easy accessibility to information from anywhere and in expanding teaching and learning resources (Kuo 2015: 1).

TPACK is very useful in guiding the development of digital teaching in higher education from the theoretical, methodological, and practical perspectives (Ouyang and Scharber 2018). Mujallid (2021: 136) concurs that due to rapid growth in digital teaching, higher education institutions require academics to possess teaching expertise which is inclusive of strategies, skills and competencies that facilitate technological integration into learning environments.

Ponce *et al.* (2021: 190) observe that TPACK's advantage as a model of technology integration is that it requires the ICT domain to be specified and the design of curriculum content and didactic methodologies must be aligned. Soomro *et al*. (2018: 203-205) agree that an academics' content knowledge, pedagogical approaches, and how to balance technology with content and pedagogy, influences their knowledge of how to teach digitally.

According to Mujallid (2021: 139), age does not impact an academic's TPACK level. Teaching experience assists academics in acquiring TPACK skills; however, this does not help the academic's ability to incorporate technology in teaching and learning. Jang and Chang's (2016) investigation into academics' TPACK level, students' perception of academics' TPACK, and assessing academics' TPACK according to gender, qualifications, and teaching experience, revealed that gender and academic

degree were not statistically significant but teaching experience did statistically influence an academic's TPACK.

Reyes *et al.*'s (2017: 17) TPACK based inquiry into the use of and the teaching of ICT of TPACK amongst academics at an Australian university found that there is a disconnect of varying degrees between using digital technology and teaching of digital technology, and between the knowledge and practice of TPACK. A further disconnect at a deeper level between the conception of the 21st century academic related to the TPACK theoretical framework and the actual integration of TPACK by academics who were supposed to be engaged with the technology.

2.2.5 The importance of context in TPACK

According to Rosenberg and Koehler (2015), context is an essential, inherent aspect of the TPACK framework. Knowledge must be acquired and expressed in specific contexts which makes measuring TPACK challenging, as explained by Mishra and Koehler (2006: 1029). There is no single technological solution that can be applied to every teaching context. However, by developing an understanding of the complex, yet subtle, interplay between technology, content, and pedagogy, and applying this understanding to develop strategies for specific teaching contexts, teaching quality can be enhanced (Phillips 2016: 557).

Technology use is characterised by complex, conflicting, and shifting interactions between technological, pedagogical, and content requirements mediated by situational social contexts that constrain classroom practice (Phillips 2016: 555). Heitink *et al.* (2016: 71) argue that learning is not influenced by an isolated learning activity, but by the way learning activities are structured in the learning environment; the role and use of technology, student interaction, curriculum articulation and classroom management practices characterise the learning environment.

Reyes *et al*. (2017: 17) call for a nuanced approach to TPACK where academics must consider the appropriateness of TPACK for their context (teaching environment), and whether the different elements of TPACK have been fully integrated into their teaching. Angeli and Valanides (2013) describe TPACK as transformative knowledge which considers learners and context as integral parts of teachers' TPACK. This transformative nature facilitates the integration of advanced digital tools by an academic into instruction (Asif, Sheeraz and Sacco 2022: 273).

Teaching experience, teacher's beliefs system and views on teaching with technology are context related factors that influence the teacher's design of instruction (Angeli and Valanides 2013). Mishra (2019: 2) argues that a lack of contextual knowledge restricts the usefulness of a teacher's TPACK and limits technology integration while accentuating the constraints of individual teacher's working circumstances.

Ifinedo and Kankaanranta (2021), provide an alternate view of context as an explicit part of the TPACK framework, which operates within two knowledge constructs: scope (macro, mezzo and micro contexts) and actor (teacher/learner). Macro context refers to the social, political, technological, and economic conditions at a global level that influences a teacher's TPACK, while mezzo context is the social, cultural, political, organisational, and economic conditions which prevail in and around the educational institution. Lastly, the micro context is the teaching environment that teachers work in which is the classroom conditions/ambience for learning. While pedagogy and content drive the technology choices of teachers, context determines the extent of success of technology integration (MacKinnon 2017: 5-6). The interaction of teacher, students and environment creates a variety of varying contextual situations within which teacher's knowledge shifts to design a learning environment conducive to that particular context (McGraw-Hill 2019).

2.2.6 Use of TPACK in accounting

Transformation in education requires an effective theoretical framework that supports technology integration into the education process. TPACK is supportive in this transformation because it allows for the acquiring and mastering of important technological skills required for technology use in teaching (Pereira *et al.* 2018: 1). The adoption and integration of technology in accounting education, though on the increase in recent times (Blankley, Kerr and Wiggins 2019: 82), has been plagued by accounting academic resistance. Reasons include time, lack of resources and technical support, inadequate institutional support, an unwillingness to change teaching style, and a lack of interest (Thomas and Chukhlomin 2020). A study at Australian universities concluded that academics are uncomfortable using new technologies because they lack the competencies for such use (Watty, McKay and Ngo 2016: 11). Teacher competence comprises cognitive (discipline-specific)

professional knowledge and non-cognitive aspects of professional competence, such as belief systems, self-efficacy, and self-regulation (Thomas and Chukhlomin 2020).

TPACK, is designed to encapsulate and organize a teacher's body of professional knowledge which then allows for the effective integration of technology (Thomas and Chukhlomin 2020). A study conducted by Pereira *et al.* (2018: 6) through a comprehensive literature review, found that TPACK has significant implications for business education, which includes accounting, and is able to gauge a teacher's competencies and profile which can be matched to a student's learning styles to promote a more interactive teaching environment and, to serve as a framework for course design that offers quality instruction. The study concluded that TPACK had a positive effect on designing courses and facilitating technology integration in business education (Pereira *et al.* 2018: 13).

2.2.7 TPACK and multimodality

The proliferation and advancement of digital technology which has provided students with accessibility to a multitude of modes for daily communication, includes but is not limited to blogs, wikis, social media, videos, audios, allowing students more situated and relevant opportunities to configure messages (So *et al.* 2019: 1). Given the myriad of affordances of modes, it is imperative that teachers understand the differences underlying each mode and how to use multiple modes in combination for lesson design and delivery. As teaching becomes more learner-centred, designing innovative pedagogy becomes a significant competency where teachers' roles shift from delivering curriculum to designing new learning environments (So *et al*. 2019: 2).

Schmidt (2019: 2) suggests that teachers may possess technological knowledge and be equipped with digital tools to engage in multimodal teaching, but difficulties in using technology effectively may arise because of a lack of multimodal literacy and/or a view that multimodal genres have no relation to the relevant discipline (Howell, Reinking and Kaminski 2015: 20). According to Koehler, Mishra and Yahya (2007: 742), the effective use of technology requires recognising and understanding the complexity of the relationship between artefacts, users, tools, and practices, which implies that teachers must have a contextual understanding of the dynamic interplay between the three knowledge domains, namely, technology, content, and pedagogy.

The TPACK framework has been used to assess digital tools, for designing courses and for drawing conclusions between a teacher's beliefs relating to multimodal feedback and teachers' pedagogical knowledge (Schmidt 2019: 5). Drajati *et al.* (2021: 126) argue that the TPACK framework's bounded nature facilitates the acquiring of skills that are limited to content, pedagogy and technology, as evidenced by the recent COVID-19 pandemic, where teachers had to switch to emergency remote digital teaching which then challenged teachers to select study materials, plan learning activities, implement teaching and conduct student assessment using multiple modes.

Mathew, Mathew and Peechattu (2017: 126) consider teaching to possess an intricate and complex nature, requiring teachers to reflect on their professional practice and technology integration (Avci, O'Dwyer and Lawson 2020; Burger 2019). Kaya and Adiguzel (2021:15) note that a technology integrated multimodal teaching environment allow academics to self-reflect through multiple modes, thereby, improving the effectiveness and quality of their teaching.

Since technological pedagogical content knowledge (TPACK) is a model that explains the intersection of teachers' professional knowledge and expertise, this study has selected TPACK as the overarching framework to explore the technological knowledge and skills that academics require to teach accounting, using a multimodal approach.

2.3 What is multimodal teaching?

In an era where learning is increasingly occurring through digital environments due to the influence of the fourth industrial revolution, the need for equal access to learning within higher education is on the rise, therefore, the role of multimodality has significantly increased (Olivier 2020b). Multimodal pedagogy creates meaning through combining teaching approaches with technologies that cater to students' differing learning styles (Papageorgiou and Lameras 2017: 133). New technologies provide opportunities to invigorate teaching and learning by providing an array of digital tools that improve construction and sharing of knowledge. Digital teaching requires academics to develop an understanding of technology and to acquire digital skills to design a dynamic student-centred learning environment (Paz 2017: 63).

Over the last two decades, the term multimodality has evolved to encompass the many diverse resources used to facilitate communication. A mode is a social semiotic resource, embedded with specific affordances (derived from its materiality and social

use) to make meaning. Understanding communication involves understanding the role of each mode and the relationship amongst the different modes (Adami 2016). Multimodality is about communicating, using a social semiotic approach, where the process of making meaning is explored in relation to multiple modes (Jewitt and Leder Mackley 2019: 94). According to Bezemer and Jewitt (2018), a mode is a collection of resources with unique affordances, used for meaning making and is influenced by culture and society. An example of a mode would be a teacher using a pen to point at an area on a whiteboard. Even though the pen is not designed for use as a pointing instrument, it offers the potential to communicate.

Jewitt, Bezemer and O'Halloran (2016) agree that the term mode is used in social semiotics to refer to resources to make meaning, citing speech, images, writing, illustrations, clothing, liquids, computer screens as examples. Multimodality refers to a combination of modes to communicate. Bezemer and Kress (2016) declare that signs created in one mode vary from signs created in other modes because of the different meaning making potential of each mode. According to Poulsen and Kvåle (2018: 703) semiotic resources are the objects we use or measures we take to communicate, for example pen, ink and paper, computer hardware and software. A very distinct relationship exists between multimodal communication and social semiotic theory. From the perspective of multimodality, the development and proliferation of digital technologies and new media have introduced new learning conditions by creating new semiotic resources for the production and uptake of representations of knowledge. These semiotic resources are the tools that academics use to teach (Nouri 2019: 686). Wong (2019: 2) states that social semiotics is a social theory of meaning and communication wherein semiotic resources with differing meaning potentials are selected by sign-makers based on their particular social context and is underpinned by the assumption that meaning making is always multimodal.

Multimodality, according to Rodrigues (2017: 175), is the employment of a cluster of modes to improve the reception of an idea or concept. Roderiques (2017: 175) further elaborates that multimodality extends beyond the mixing of multiple technologies, extending to the construction of meaning by combining many resources where the form that the message is represented in (written, spoken, visual or other semiotic form) is integral to meaning making. Shridhar, Pandey and Karmani (2019: 305) interpret

the term multimodal in the context of teaching as the merging of different classroom activities and content through the use of different technologies – for example role playing, group discussions, videos, podcasts. In its simplest meaning, multimodal refers to communication using different modes (Smith and Kennet 2017: 88). When teaching and learning occurs through a range of modes, it is called multimodal pedagogy (Archer and Newfield 2014). Stein's (2008: 121) view on multimodal pedagogy is that the term encompasses curriculum, pedagogy, and assessment practices where the mode is the defining feature of communication in the learning environment. Multimodal teaching refers to the mixing or the use of different modes to present and deliver lessons in education with the purpose of achieving multimodal learning (Olivier 2020a: 119). Redelinghuys (2017: 59) explains multimodal teaching as the adoption of multiple teaching approaches to fulfil student needs of comfortable learning.

The above discussion on multimodal teaching presents many different definitions and views by various authors on multimodal pedagogy. For this study, the researcher has adopted the definition by Olivier (2020a). In this instance, multimodal teaching encompasses the various teaching modes termed as hybrid, digital, online, e-learning, and face-to-face.

2.4 Multimodality in South Africa

Over the last fifteen years, multimodality as a research area and pedagogy has grown steadily, with interest being shown by many researchers from different disciplines like engineering (Simpson 2016), medicine (Weiss 2014), Accounting (Alyousef and Mickan 2016; Alyousef and Alsharif 2019), social media (Zappavigna 2016), software applications (Kvåle 2016; Zhao, Djonov and van Leeuwen 2014) architecture (Lymer, Lindwall, and Ivarsson: 2011) and in linguistics, communication, health sciences and information technology (Archer and Newfield 2014).

The South African higher education sector is a culturally diverse, multilingual landscape, wherein unequal access to education still persists despite an educational policy designed to redress the situation (Archer and Newfield 2014). Research on, and implementations of multimodality must therefore acknowledge the semiotic resources of South African students to enable access to curricular and disciplinary content, better communication, metacognitive understanding, confident semiotic dispositions, and a

more confident self-awareness in a world both local and global (Archer and Newfield 2014). Hunma (2012: 233) points out that a multimodal teaching approach can assist in mitigating issues of social relations, access, equity, and participation in relation to knowledge and learning. There has been a notable rise in multimodal teaching and learning in South Africa, despite the sharp contrast in access to technologies (digital divide) (Olivier 2018: 15).

Teaching involves communicating through multiple modes and by employing a range of communicative resources, academics can design an interactive multimodal teaching and learning environment with the participation of students (Olivier 2020a: 121). All forms of pedagogy – contact, hybrid, distance and with the specific inclusion of technologies (online, blended, e-learning) are termed as multimodal (Olivier 2020a: 122).

The North West University signed an agreement with the United Nations Educational, Scientific and Cultural Organization (UNESCO) on 15 April 2019 to promote multimodality and subsequently incorporated it in its teaching and learning strategy with a view to develop multimodal expertise among staff (Olivier 2021). Their commitment to advance multimodal teaching and learning has resulted in the publishing of a book series entitled Self-Directed Learning, with a fifth book entitled Self-Directed Multimodal Learning (Olivier 2020b).

2.5 Technological knowledge for multimodal teaching

Technological knowledge refers to the application of knowledge in relation to virtual environments and digital resources (Ferreira *et al*. 2018: 2097). Santos and Castro (2021: 22) describe technological knowledge as knowledge about low-tech technologies (pencil and paper) and digital technologies (desktop computer, internet, laptop, television, printer, tablets, cell phones etc.). Technological knowledge means having the understanding to employ digital technologies in the teaching and learning process (Akram *et al.* 2021: 7). According to Ilomäki *et al*. (2016: 671), the term digital competence, akin to technological knowledge, encompass the skills and practices necessary to use technology in a purposeful way and it includes the following aspects:

1. Technical skills and practices to use technology.
2. The ability to employ and apply technology with an emphasis on knowledge related skills.

3. The ability to understand digital technologies holistically.
4. Possessing the interest to participate in the digital world.

Tshuma (2016: 4) contends that the turbulent South African higher education environment that is grappling with transforming an oppressive education system, must transcend the use of technology by academics gaining an understanding of the affordances and limitations of technology in terms of content and the identification of teaching approaches. The traditional mode of communication which was limited to a read and write scenario has been drastically changed by digital technologies to multiliteracies whereby knowledge construction is through dynamic texts supported by multimodalities. Meaning making by modern day literacies include visual, audio and technological modes (Ryu and Boggs 2016).

Digital technology refers to a broad set of technology which encompasses*, inter alia*, streaming video, digital photography, internet search engines, hardware, software, digital video recording, social media, laptops, desktops, multimedia, and mobile phones. (Rambrij 2018: 24). Effective teaching implies learning how to use technology, a task which is considered to be time consuming by teachers. Teaching with technology requires a special type of technological knowledge grounded in teaching which requires a comprehensive technical understanding of technology and complex skills (Forssell 2011: 7). An academic must therefore gain a deep understanding of teaching and learning technologies by interacting with and adopting technology in the teaching activity, understanding that its use is for fostering learning (Ferreira *et al*. 2018: 2099). Furthermore, they must be able to identify the type of technology to use and when to use it, since all technologies are not suitable for teaching and learning (Mujallid 2021: 141).

Digital technologies have altered our social interactions. Students have access to a range of technology and to new multimodal means which influence their social construction and communication of knowledge (Johnson 2011: 36-37). Leas (2015: 55) states that because students have different learning styles, an academic who is knowledgeable in a myriad of technological tools will be able to not only provide students with access to a range of learning resources but with individualised instruction as well. Marshall (2017: 145) on the other hand, argues that it is not necessary for teachers to acquire vast technological knowledge to integrate

technology into teaching as students possess digital knowledge which serves as a valuable resource for teachers. Spiteri and Rundgren (2020: 116) agree, stating that teachers can learn from technologically savvy students and in this way can enhance their digital knowledge for technology integration and pedagogy.

UNESCO (2018) classifies digital knowledge for teachers into three levels:

1. Knowledge acquisition level - basic digital literacy skills and knowledge of a range of digital tools and technological resources.
2. Knowledge deepening level - identify how best to use technology to support learning. Expand and enhance digital knowledge by collaborating with colleagues and connecting with experts.
3. Knowledge creation level - support students to think critically and create knowledge communities for students. Teachers are able to design technology-based learning resources and environments.

The objective for acquiring technological knowledge is to develop competence in teaching, that is to use knowledge and skills to create actions that offer a quality response (Ponce *et al*. 2021: 196). Academics must have the desire to acquire technical knowledge, to become digitally literate and to improve their knowledge of technology (Pionke 2018). Mardiana's (2020) study into academics' adaptability to technological change and its impact on the learning process found that academics' technological knowledge and the ability to transform that knowledge into skills by practice made it easier for academics to adapt to teaching with technology.

Teachers must reflect and assess current proficiencies and where necessary update digital knowledge to be able to respond to a changing educational environment (Falloon 2020: 2460). The nature of technology is that it is in a constant state of change. Employing a multimodal teaching approach requires academics to adopt the skill of learning throughout life, which involves self-directing learning of new methods. (Ferreira *et al*. 2018: 2099). In this regard, Spiteri and Rundgren's research study (2020) indicates that differences exist between how teachers and students use technology, and this may prompt teachers to consider using multiple modes to teach as the various affordances of different modes may assist the teacher to prepare lessons that appeal to students different learning styles. Zhang and O'Halloran's (2019) research study found that it is essential for academics to acquire knowledge on

the semiotic potential of technological platforms for effective multimodal teaching. A study by Göçen, Eral and Bücük (2020), which investigated the perceptions of teachers with respect to the necessary technological knowledge and digital pedagogy required for a futuristic learning classroom, revealed that teachers believed that there is a need for a new type of classroom that facilitates technology integration and digital pedagogy. The findings of this study are depicted in in Figure 2.2 below.

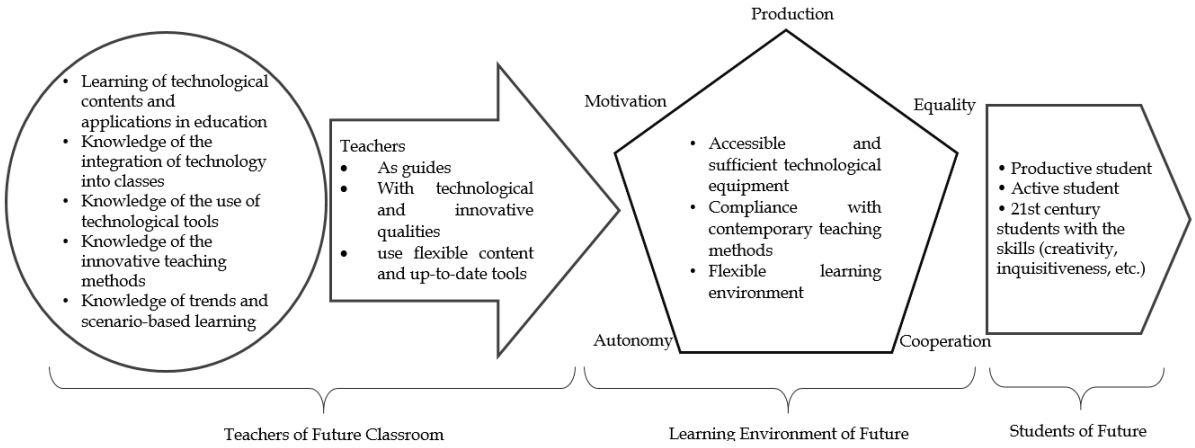


Figure 2.2: Teacher perceptions of a 21st century classroom
Source: Göçen, Eral & Bücük. 2020: 96)

According to figure 2.2, it is anticipated that teachers will need to possess content knowledge suitable for a technological enhanced multidimensional classroom and how to apply this in education, knowledge on technological tools and its application in teaching, teachers must know how to integrate technology into teaching, be knowledgeable on innovative pedagogy and keep abreast of educational trends. Teachers will act as guides to develop active students who possess 21st century skills (Göçen, Eral and Bücük 2020: 94-96).

2.5.1 Learning management system (LMS) – Moodle

The impact of technology on teaching and learning has motivated higher education institutions to implement virtual learning environments called learning management systems which support active learning (Cabero-Almenara, Arancibia and del Prete 2019: 25). An LMS connects traditional teaching with digital resources, thereby creating a digital learning environment (Aljawarneh 2020: 57). Digital environments have expanded since the onset of the COVID-19 pandemic which restricted contact classes for many higher educational institutions, globally (Dias *et al.* 2020: 1). According to Kerimbayev *et al.* (2017) Moodle, an internationally popular LMS,

operates as a set of modules, allowing for the easy addition and deletion of elements at any time.

Research shows that teachers' perception of Moodle is that its use improves teaching practices by promoting the cognitive and social presence of teachers (Ndlovu and Mostert 2017:147). Cabero-Almenara, Arancibia and del Prete (2019: 25-31), state that, although the use of LMS has increased, teachers use it mainly to communicate by uploading course materials and requesting and collecting homework, rather than for knowledge development and creation, i.e., Moodle is used mainly as a repository. For students, Moodle, with its easy-to-use functionality, provides a collaborative learning environment where students are encouraged to develop competencies and knowledge through didactic activities designed by teachers (Cabero-Almenara, Arancibia and del Prete 2019).

Moodle's design allows for the easy embedding of external tools like videos and virtual tours into its system, and teachers are enabled to develop course-specific materials for students while students are benefitted through improved performance and increased student engagement (Gamage, Ayres and Behrend 2022: 20). At the School of Education at an Australian university, the primary technology of use for teaching and learning is Moodle, where delivery of content, communication between students and academics and assessments are conducted, irrespective of the mode of teaching. This heavy reliance on Moodle is possible because Moodle is a learning environment that is flexible (Reyes *et al.* 2017: 4). Ersoy-Babula and Babula (2018) argue that Moodle can facilitate students' engagement effectively only if academics devise ways to focus students' attention; using Moodle mainly as an archive for learning materials does not promote active student learning which requires academic digital/online support. Hebron (2020: 29) found that academics who displayed a negative attitude towards the use of Moodle were not knowledgeable about Moodle.

2.5.2 Microsoft Teams – a teaching and learning platform

Vygotsky's (1978) social constructivist theories of learning and Dewey's (1938) concept of student driven learning through engagement, collaboration, and active learning, form the basis of much research on digital teaching, specifically online teaching and learning (Jan, Vlachopoulos and Parsell 2019). Microsoft Teams has made a digital teaching and learning environment possible (Bsharat and Puteh-Behak

2021: 103), which many higher education institutions were forced to adopt because of the COVID-19 pandemic (Olugbade and Olurinola 2021: 278) and is a representation of Vygotsky's idea of socially co-constructed knowledge (Martin and Tap 2019: 59).

Microsoft Teams is a cloud app, a digital configuration that brings together conversations, meetings, files, and apps, in a single teaching and learning virtual arena, designed to facilitate quick and easy movement around the platform, from conversations to content creation. When a new team is created, a General channel is automatically added to the new Team, while allowing for new channels to be created within the new Team (Microsoft 2021).

According to Rojabi (2020: 171), lessons delivered using Microsoft Teams provide a favourable learning environment for students, and students have an optimistic attitude towards Microsoft Teams (Wea and Kuki 2021: 5). Mohmad *et al.* (2021) state that the application creates an interactive teaching and learning environment that promotes student-student interaction and student-teacher interaction, thus promoting student engagement. Microsoft Teams is ideally suited for remote digital teaching as its built-in tools make for a smooth and innovative teaching experience and it allows for the recording of students' attendance and to view students' opinions and status regarding teaching and learning (Azizan 2021: 328). Ravi (2020: 123) comments that the performance of basic functions is straight forward, whereas uploading files as a source and downloading attendance requires a modification for effective teaching. The application is user-friendly and has a highly adaptable platform, with the capacity for formal and informal communication as its key feature. However, Basu (2020: 180) noted that there are some difficulties with its usage, like adding a non-institutional member to a team and some unhappiness with the way Microsoft Teams operates when the internet speed is compromised. Despite these shortcomings, Basu (2020) describes the teaching and learning experience on Microsoft teams as avant-guarde.

Accounting academics at many contact universities worldwide had not adopted digital teaching at the time of the COVID-19 pandemic (Sarea, Alhadrami and Taufiq-Hail 2021). The need to gain technological knowledge rapidly motivated academics to teach themselves, especially at universities that underinvested in technological training for their staff (Sangster, Stoner and Flood 2020: 443). A study by Hargreaves, Clarke and Lester (2022) into the effectiveness of Microsoft Teams on team

performance amidst Covid-19, showed that Microsoft Teams made a positive impact on the team working under clinical pressure in unfamiliar environments.

2.6 Curriculum

According to UNESCO (2020), themes and problems that foster a peaceful existence must factor into the design, development, and integration of curricula. A working world, where change is perpetual and rapid, impacts the educational landscape in its ability to provide relevant, high quality career aligned learning experiences (Gul and Khilji 2021: 1-2). The COVID-19 pandemic presented massive challenges for higher education, globally, to transform teaching from monomodal to multimodal, that is, from face-to-face to emergency remote digital teaching (du Plessis *et al*. 2022). It therefore becomes imperative for higher education institutions to prepare students to be able to flourish in a world where knowledge and dynamic interactions are crucial for success, by developing curricula that are adaptable to the continuous transformations in society (Gul and Khilji 2021: 2).

2.6.1 Curriculum defined

According to the seminal curriculum development model, curriculum is a plan comprising the elements of goal, content, approach, and evaluation (Cahapay 2020: 1). Huggett, Smith and Conrad (2022) describe a curriculum as an academic plan, detailing the planned progression of instruction that frame a student's experiences in the higher educational sphere. According to Harden (2001: 123) curriculum comprises a mix of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment and the individual students' learning style, and programme of work.

2.6.2 Curriculum alignment

In the article, *What is curriculum alignment and why does it matter?* (All In 2021), curriculum alignment is described as the formal process of evaluating an educational program to address changing student and industry requirements. This process allows for reviewing of curriculum to identify gaps in the knowledge content and to modify courses accordingly to align with either changing industry requirements and/or institutional transformations. In recent years, higher education has transformed from a traditional instructional paradigm, where the lecturer disseminates content, to a

learning paradigm, where the student is no more a passive recipient of knowledge but an active participant in the learning experience. In this environment of active learning, students must be empowered to construct knowledge for themselves. To facilitate this, curricula must be appropriately aligned so that learning outcomes can be optimally achieved (Alfauzan and Tarchouna 2017: 84). UNESCO (2023) defines curriculum alignment as a process that ensures cohesion between the stipulated learning outcomes and pedagogy, assessments and learning activities. Synonymous with curriculum alignment, is the concept of curriculum adaptation which is, the deliberate effort to transform existing materials to align with new perspectives. (Debarger *et al*. 2017: 67). Zhang *et al*. (2014: 253) view curriculum adaptation as the adjusting of curriculum content and/or execution of curriculum to create vibrant interactions among teachers, learners, content, and settings.

2.6.3 Responsive curriculum

The recent challenges, brought on by COVID-19, in teaching and learning which pressurised universities to transition to remote digital teaching (Ngoasong 2021: 2), coupled with the rapid developments in digital technology (Jensen, Price and Roxa 2020), have highlighted the need for curriculum to be proactive and responsive, possessing an insightful, restorative self-renewal capability (Gul and Khilji 2021).
According to Moll (2004: 5), curriculum responsiveness is an indication of higher education's teaching and learning's capability to meets the changing needs of industry. Within this definition is disciplinary responsiveness which refers to curriculum's ability to react to changes in its knowledge discipline by regulating the relationship between methods of knowledge creation and methods of student education and training in that discipline. A broader understanding of curriculum responsiveness extends to higher education programmes reacting to policy, to disciplinary practices and epistemic needs of students (Ogude, Nel and Oosthuizen 2005: 3). This view is supported by the National Commission on Higher Education (1996: 4) which states that a responsive curriculum considers the different views and opinions of industry, society, and student body for inclusion in universities' teaching, and research priorities and governance structures.

Gul and Khilji (2021: 2) explain that flexible course content and multiple delivery modes ensures versatility in curriculum. Cahapay (2020: 1-2) agrees that the relevance,

suitability, and responsiveness of curriculum must be contemplated if curriculum is to remain applicable in shifting circumstances. The purpose of a curriculum is to guide student learning experiences by reconstructing knowledge and expertise (Zimu-Biyela 2019). Curricula can be structured to address changing industry conditions by adjusting to real world scenarios to address issues of employability, cultural diversity and learning in a discipline, through its flexibility (Gul and Khilji 2021: 6).

According to Ngoasong (2021: 4), curriculum adjustment is an intervening strategy by tertiary institutions to expand learning technologies to promote accessibility and engagement in learning. When teaching circumstances change, even though a learning trajectory is already present in the curriculum, it becomes necessary to assess curriculum alignment and make adjustments to ensure learning outcomes are achieved (Meij and Merx 2018: 225). Drayton *et al.* (2020: 985) suggest that curriculum adaptation may take the shape of modifying the content, selecting and interpreting learning materials, changing learning activities and redesigning assessments, with consideration of the learning environment.

According to Ogude, Nel and Oosthuizen (2005) principles for good teaching practice are as follows:

- The purpose and intended outcomes of the learning task must be made clear to students.
- Learning outcomes, content, and teaching assessment methods are aligned.
- Learning must be made meaningful to students by developing a relevant motivational context.
- Creating a space for students to test and reflect on their ideas.
- Constructing learning environments that promote student interaction.

<u>Characteristics of an effective curriculum</u>

Human-Hendriks and Meier (2020: 88-89) have identified the following pre-requisites for an effective curriculum:

- Determine industry and other stakeholder requirements.
- Identify the learning outcomes to be attained by students and assess alignment of those outcomes with industry needs.
- Broadly develop the requirements for student education to ensure students achieve the outcomes for their courses.

- Continuous assessments must be carried out to measure student achievement of learning outcomes.
- Create an environment conducive to learning by providing enriching learning experiences for students.
- Stay abreast of changing industry and stakeholder requirements.
- Conduct regular curriculum reviews to update learning outcomes to align with industry needs and adapt curriculum content as required.

2.6.4 Curriculum for accounting

A curriculum must meet the dictates of its knowledge discipline by aligning knowledge production to the way in which students are educated in that discipline (Human-Hendriks and Meier 2020: 87). The rapid digitisation in industry and the subsequent changes in reporting requirements together with the emergence of new regulations has catapulted the accounting profession into equally rapid transformation (Mahambo 2020: 15). Smith (2018: 4-5) states that, amidst the expansion and proliferation of standards and technology, the fundamentals of accounting, (double entry) for measuring and benchmarking business performance, has remained the same since its birth over 500 years ago. Technology has, however, impacted the way in which these basics are enacted in business, and that learning outcomes, delivery methods and assessments of curricula must also change (Mahambo 2020). Islam's (2017) concern is that universities' accounting curricula have not been appropriately overhauled to align with the globalisation of business, which requires sustainable solutions to deal with the complexities of integrating financial, social, and environmental performance. Moreover, Islam suggests that higher education incorporate new learning outcomes into the curriculum, followed by an adjustment to curriculum content and relevant learning activities.

Dellaportas (2019: 122) states that curriculum reforms must occur through accounting professionals' contemporary ideas, professionals whose education was grounded in curriculum that focused on developing students' interpersonal skills for working in a business environment by factoring in work integrated learning activities related to changing industry requirements. Furthermore, Dellaportas (2019: 121-125) cautions about the consequences of not aligning accounting curriculum to changes in industry:

- Graduates will have limited global exposure.

- Graduates' exposure to technology and ethics will be limited.
- Graduates will not be worker-ready and will lack communication skills and the ability to apply financial knowledge.
- Curriculum will be structured for memorising and will not be outcomes based.
- Lack of strategic decision-making skills in the workplace.
- Content based curriculum instead of promoting active learning.

Bayerlein's (2015: 673-674) view is that accounting curriculum designs are focused on developing students' technical skills and knowledge to enter the workforce whereas employers need well-educated work-ready graduates with well-contextualised soft-skills integrated with technical knowledge. Curricula are not designed to allow for a student's acquired technical knowledge to be applied within a real-world context. To overcome this gap in curricula, Bayerlein suggests the creation of a virtual workplace model which will allow students to acquire the soft skills required without sacrificing educational outcomes over vocational training.

2.6.5 Importance of curriculum adaptation for multimodal teaching

Gao (2020: 4) states that adopting multiple modes of teaching is dependent on the level of flexibility that can be achieved and delivered in relation to curriculum content, time, student learning styles, assessment, course delivery and instructional approach. Nouri (2019: 686) explains that modes shape the curriculum content and how that curriculum is to be learnt. Digital technologies, having redesigned the learning environment through the advent of new semiotic resources for knowledge construction, have altered how learning is conceived. Selander (2016: 97-110) agrees that students in the technological era construct and consume knowledge by employing the affordances of multiple modes.

In contrast, Cavanaugh, Giappon and Golden (2016:374) have raised the concern that, according to cognitive neuroscience literature, teaching exclusively with digital technology may enhance certain student cognitive skills but may harm students' deep thinking capabilities by altering the neural circuitry of the brain. Cavanaugh, Giapponi and Golden advocate that academia reflect on adopting a multimodal learning environment, where curriculum content, course delivery and student learning are considered.

2.6.6 Constructive curriculum alignment

Students learning strategy and approach to the curriculum is influenced by their rationale for learning, as is evidenced by the interactions between a student's module content and the context (Human-Hendriks and Meier 2020: 87). The quality of teaching can be substantially enhanced if there is constructive coherence between teaching, learning and assessment which will further ensure that learning objectives translate to learning outcomes (Meij and Merx 2018:221). Johnson, Peters-Burton and Moore (2016: 167) state that learning objectives that are clearly defined tell us how we want students to demonstrate their learning and what content we want students to learn.

When students make meaning and construct knowledge of new experiences as it relates to already acquired knowledge, it is termed constructive, and alignment refers to ensuring that all elements of the curriculum are inter-related (Bovil and Woolmer 2019: 411). According to Biggs (2014: 5), constructive alignment is an outcomes-based approach to teaching, wherein learning outcomes are defined before teaching takes place. Lesson planning then involves how best to achieve the defined learning outcomes with the focus being on student learning. Bovil and Woolmer's (2018: 411) view is that learning outcomes allow universities to state and track, through appropriately aligned assessment, the knowledge, and skills that students must attain by the end of the course.

In a digital learning environment, constructive alignment allows for the design of learning activities that allow individual students to problem solve and to collaborate with other students to better understand what they have learnt, thereby optimising learning (Gardner 2020: para 3).

2.6.7 Measuring/monitoring curriculum alignment

Kulasegaram *et al.* (2018: 443) explain that curriculum alignment is a process that requires continuous monitoring after implementation to ensure that instruction, content, assessment and programme evaluation continue to align with curriculum objectives. Monitoring curriculum alignment can be realised using curriculum mapping which is used to develop, review, measure and improve curriculum through the various stages of planning, implementation, and evaluation of learning outcomes (Khoerunnisa *et al*. 2018: 1-2). Curriculum mapping is a design strategy that is effective for curriculum redesign and is used to assess instructional techniques,

students test scores and assessment materials, thereby improving student engagement and collaboration among academics (Jacobsen *et al*. 2018: 84).

Botha and Adefolalu (2021: 1) support the use of curriculum mapping for its ability to decrease duplications, disclose gaps and redundancies in the content, and align programme outcomes throughout the curriculum. The challenge of aligning curriculum objectives (knowledge, skills) with content, assessments and learning outcomes can be mitigated using curriculum mapping which provides an overview of learning outcomes, curriculum content or subject matter, assessment and learning opportunities by exposing misalignments, overlapping, and inconsistencies through its transparency feature (Treadwell, Ahlers and Botha 2019: 27).

Al-Eyd *et al*. (2018: 1) explain that attributes of transparency and communicability, integral to curriculum, and essential for clarifying the what, when and how of teaching and learning and the form of assessment, are both present in curriculum mapping. Al-Eyd *et al*. (2018: 2) differentiate between the declared curriculum (what students are expected to learn), the delivered curriculum (what is taught) and the tested curriculum (content that is tested) and attributes the inconsistencies among these aspects to challenging learning objectives and outcomes, content selection and integration, pedagogy, learning style differences, timing, and assessment plan.

Multimodal digital teaching practices require the making of decisions and choices about the planned curriculum and its enactment, where selection, sequencing and pacing of content must be aligned to learning outcomes. The process involves a review of module learning outcomes, identifying content to be modified and developing learning activities to achieve adjusted learning outcomes (DUT remote teaching quick guide: 2020: 2-3). Multimodal teaching may pose a challenge that requires the development of new teaching materials and activities (Mujallid 2021:146).

Adopting a multimodal teaching approach by integrating digital technology to deliver the accounting curriculum, a subject that is technical, involving complex concepts and skills with minute details, requires a review of the curriculum to ensure that learning outcomes are achieved by enhancing teaching and learning (Sangster, Stoner and Flood 2020: 463).

2.7 Digital pedagogy

“If you’re using the same pedagogy with a stick and sand as you are using with a high-speed computer network, you really don't understand teaching and learning” (Downes 2011: 1).

To meet the demands of changes in society and changes in the global economy, it becomes necessary for education to promote new learning environments that facilitate the acquisition of twenty-first century digital skills in students, by expanding the use of digital technologies for teaching and learning (Pongsakdi, Kortelainen and Veermans 2021: 2). A rethink of pedagogical practices, influenced by evolving technology and new learning expectations, providing interactive learning experiences through design and innovative teaching strategies, becomes necessary (Sailin and Mahmor 2018: 146-147).

According to the literature review by Kirkwood and Price (2014), the integration of technology in higher education pivots around augmenting existing teaching. Jääskelä, Hakkinen and Rasku-Puttonen (2017:198) call for research studies to be conducted on teacher’s pedagogical thinking and the interrelated views on teaching, learning, and integrating technology in the relevant subject.

2.7.1 Conceptualisation of digital pedagogy

In the article, A d*igital pedagogy* (2016), digital pedagogy is the use of contemporary digital technologies to enhance the learning experience of students. Howell (2012: 5) states that digital pedagogy is about the study and the use of digital technologies in teaching. Howell further describes digital pedagogy as having an attitude that motivates academics to engage with technology, to embed it meaningfully into their pedagogical practices and to develop the aptitude to integrate pedagogical expertise with digital technologies. Kivunja (2013: 131) characterises digital pedagogy as the embedding of digital technology into teaching practices to enhance teaching, learning, curriculum, and assessment. Digital pedagogy involves integrating technology into teaching practice in a meaningful way (Sailin and Mahmor 2018: 146).

2.7.2 Dimensions of digital pedagogy

According to Väätäjä and Ruokamom (2021: 2), digital pedagogy comprises three aspects, pedagogical orientation, pedagogical practices, and pedagogical competencies (Figure 2.3).

2.7.2.1 Digital pedagogical orientation

In the current era it has become essential for teachers to know when and how to use technology in the classroom to support learning (UNESCO 2018). Teachers' perception of the learning process, student learning styles and the teaching approach to be adopted, characterise pedagogical orientation which is dependent on teacher's and student's role in teaching and learning respectively to attain curriculum goals (Väätäjä and Ruokamom (2021: 2). According to Tondeur *et al*. (2017b: 556), teachers' pedagogical beliefs underpin pedagogical orientation which informs the selection and integration of technology into their teaching. Butler, Leahy and Hallissy (2017: 232) concur that teachers' beliefs, values and understanding of twenty-first century skill requirements impact the selection and use of technology. Sondlo and Ramnarain (2019: 342) refer to teacher orientation as the knowledge and beliefs that teachers have about the goals of teaching. A research study by Ding *et al*. (2019) into understanding teachers' content-specific pedagogical beliefs revealed that correlation exists between teachers' content-specific pedagogical beliefs and their technological integration practices. Teachers' pedagogical belief systems are a web of complex related beliefs (Ertmer and Ottenbreit-Leftwich 2010). Jääskelä, Hakkinen and Rasku-Puttonen (2017: 199) state that pedagogical beliefs comprise multiple belief systems, around knowledge construction, learning and teaching.

According to Prestridge (2017: 369) understanding the process of belief formation provides an insight into the shaping of teachers' pedagogical orientation for technology use. The position of a belief within the central peripheral dimension (long held beliefs) is not susceptible to change, whereas beliefs situated peripherally (newer beliefs) may change due to experiences and influences. Beliefs determine how a teacher sifts information, how that information is used to perceive a situation, and how to act in that particular situation (Bice 2021: 42).

Butler, Leahy and Hallissy's (2017) investigation into developing a framework for teacher professional learning challenged the traditional assumptions, beliefs, and

classroom practices of the participating teachers. The increased integration of technology motivated the teachers to develop contemporary approaches to student learning which resulted in teachers designing student focused learning environments through the employment of a range of pedagogical strategies and digital tools. The change in teacher pedagogical orientation improved student participation and students felt more empowered to take control of their learning. Chand, Deshmukh and Shukla (2020: 2755) observed that technology-rich learning experiences can transform pedagogical beliefs into student-centred beliefs, and that it is more probable for teachers with a student-centred belief to adopt technology for student-centred teaching. Han, Byun and Shin (2018) found that South Korean teachers were unable to manifest a constructivist pedagogy belief into student-centred teaching when compared to United States teachers.

Technology-enabled learning is reflective of the technology-pedagogy relationship that supports student learning by focusing on the learning process and student-centred pedagogy (Prestridge 2017: 368). Research has shown that classroom practices are influenced by teachers' pedagogical beliefs. Teacher-centred beliefs focus on knowledge transfer while student-centred pedagogical beliefs encourage active learning and support knowledge construction through collaboration (Fives and Gill 2015; Meirink *et al.* 2009, Kagan 1992; Pajares 1992).

Kim *et al*. (2013) found that teachers with complex epistemology adopted a student-centred approach, and the related technology uptake was to support learning outcomes, rather than making technology integration the end goal. Huang, Wang and Teng (2021:195) disagree, stating that teachers with sophisticated epistemology do not necessarily make use of more constructivist teaching approaches. Pajares (1992), however, considers pedagogical beliefs difficult to change. Scott (2016: 595) concludes that changes in pedagogical beliefs may occur following discussions with peers to assess alternative beliefs and engaging in critical reflection of one's pedagogical beliefs.

2.7.2.2 Digital pedagogical practices

Digital pedagogy is an umbrella term that describes teaching and learning through multiple digital modes (Coovadia and Ackerman 2021). Technology, by itself, does not possess any intrinsic instructional value, which makes the teacher essential for

planning, and facilitating learning with technology, as any enhancement in teaching and learning needs to be designed into the instruction (Tshuma 2016: 5). The employment of technology in teaching in higher education poses both a pedagogical challenge in the form of too much information and cognitive overload, and an opportunity for advancing learning that supports individual thinking and collaborative knowledge construction (Jääskelä, Hakkinen and Rasku-Puttonen 2017: 198). Butler, Leahy and Hallissy (2017: 231) state that an understanding of 21st century teaching and learning goals (problem solving, using technology to impact lifelong learning, persistence, and teamwork) have become the norm, and these compel teachers to move away from the traditional teaching practice of mere technology integration and change pedagogical orientation to embrace transformative pedagogy that allows for the exploitation of pedagogical affordances of new technologies.

UNESCO (2018) encourages teachers to adopt a knowledge deepening approach, where technology is employed to support an enquiry-based learning process so that students are enabled to solve complex, real-world problems. This student-centred approach enables teachers to act as facilitators, structuring tasks and providing guidance, and participating in team building and exploratory activities. Sondlo and Ramnarain (2019: 345) are supportive of the use of a guided inquiry orientation, a student-centred approach where planned learning activities encourage students to explore a phenomenon, guided by the teacher.

Väätäjä and Ruokamo (2021: 2) identify four factors of digital pedagogy. The first factor, Foundational ICT Practice, refers to teachers' contemplating introducing technology into teaching, and planning how to achieve this. The second factor is Developing ICT Practices, which indicates that teachers are thinking about the curriculum implications of technology. The third factor, Skill-based ICT Practices, is the stage where teachers focus on digital skills rather than using technology to enhance learning. Factor four is Digital Pedagogical Practices, the stage where teachers understand that technology is a tool to teach and not the focus of the lesson, a view shared by Roe, Wojniusz and Bjerke (2022: 3) who state that technology is not pedagogy.

Hsu (2016: 31) suggests that pedagogical practices can be classified as constructivists or traditionalist. Constructivist pedagogical practices, supportive of learning with

technology, focus on student-centred activities that promote active learning, collaboration and inquiry and reflection. A traditional pedagogy, being teacher-centred, involves direct instruction, as the belief is that teachers are the knowledge experts and technology use is limited to low level learning. Lee, Morrone and Siering (2018: 97) support the constructivist view, stating that academics must plan and deliver lessons using instructional approaches that actively engage students through collaboration and discussion instead of students being passive recipients of information.

Recent research into pedagogical practices in higher education (Lillejord *et al.* 2018: 43) found that academics adapt new technologies to align with traditional teaching methods, resulting in a lack of innovative teaching practices that foster student active learning characterised by continuous student participation. For example, a study by Barak (2017) found that academics use learning management systems as a communication platform and to primarily distribute learning materials. Sinclair and Aho (2018) found similar results, indicating that when academics use a learning management system, pedagogical practices are not advanced because the creative functionality of the learning management system is not explored. Børte, Nesje and Lillejord (2020: 12) believe that teaching with technology requires academics to engage with a variety of pedagogical approaches.

Various studies have noted that digital pedagogy enhances the learning experience (McKnight *et al.* 2016) by facilitating debates and discussions (Duţă and Martinez-Rivera 2015). Sawang, O'Connor and Ali (2017) found that the use of KeyPads in teaching improved the interactive relationship between academics and students. Investigations into the benefit of flipped classroom practices observed that the student-centred nature of flipped classrooms promoted active learning (Baytiyeh, 2017), and allowing knowledge transfer outside the classroom promoted teamwork (Foldnes 2016).

In the discipline of accounting education, even though the effective integration of technology into teaching practices is on the rise, it was perceived as lagging (Dai 2019: 41) prior to the COVID-19 pandemic (Sangster, Stoner and Flood 2020). A study conducted by Paz (2017) revealed that accounting students who received lessons through technology performed better than those students who were taught without technology. Coovadia and Ackerman (2021) found similar results, that is, improved

exam performance, in a study at a South African university involving the integration of technology into the complete student learning lifecycle. As the accounting profession becomes more digitised, similar changes need to be mirrored in accounting education, otherwise the lack of updated learning goals, content, learning activities and teaching practices will lead to irrelevant curricula (Coovadia and Ackerman 2021: 45).

A research study by Rust (2019: 125) involving academics found that the varying affordances of digital tools enabled academics to adopt a multimodal student-centred pedagogical approach. Rust (2019: 127) further explains that all learning is hybrid, since we continually go back and forth between screens to communicate, to make meaning, and gather knowledge.

Morris (2017) concludes as follows:

> The digital isn't magic. It isn't mysterious. It's regular human communication astride a new medium. Let me say that again: It's regular human communication astride a new medium. There's no need to make it more than it is. What is needed, what has always been needed—since the early days of videotaped lectures to the primordial ooze of the invention of the LMS (Learning management system)—is an effective digital pedagogy that lets us span the interface, cross the digital, and find one another where we are.

2.7.2.3 Digital pedagogical competence

According to From (2017: 43), digitisation in higher education has introduced a new dimension to academics' pedagogical skills and competencies, which has challenged academics to provide high quality instruction and to adapt to an increasingly tech-savvy student population. To meet this challenge, academics' pedagogical skills and competencies must extend to incorporate digital abilities for teaching. From (2017: 43) defines digital pedagogical competence as the ability to apply knowledge and skill to plan and conduct technologically supported teaching on a consistent basis.

Mezentceva *et al*. (2020: 90) agree with this definition, stating that digital pedagogical competence is the interwoven intricacies of knowledge, skills and attitudes that allow an instructor to select and apply digital tools and teaching strategies that improve the learning process. Alarcón, del Pilar Jimenez and de Vincente-Yague (2020: 2408) observe that digital pedagogical competence is underpinned by a basic level of digital

skills of using technology. Väätäjä and Ruokamo (2021: 2) refer to digital pedagogical competencies as the skills required by teachers to integrate technology into teaching, which encompasses attitude, knowledge, ability, adapting to the situation, perseverance, and continuous development. Attitude refers to a teachers' pedagogical disposition that allows for the development of practices that advance student learning. Knowledge entails discipline knowledge and knowledge on pedagogical processes and approaches. Ability is the skill of planning and organizing activities and to make information available to students in a meaningful way. The competency of adapting to the situation, is a teacher's ability to adjust to various situations to enhance learning. Perseverance alludes to a teacher's tenacity in teaching and maintaining quality teaching standards. Continuous development is making ongoing improvements in teacher's competencies (Väätäjä and Ruokamo 2021: 3).

Ilomäki *et al*. (2016: 671) describe digital competence as comprising four elements: technical skills and practices to use digital technology; the ability to use and apply digital technology in various situations; the ability to critically assess digital technologies around ethical issues, challenges and limitations; and the willingness to participate in the digital culture. This allows digital technologies to be employed ubiquitously in teaching and learning through a didactic teaching approach and is acquired through practice of complex activities in a learning environment where the use of technological tools are integrated.

Børte, Nesje and Lillejord (2020: 12) state that a barrier to a student active teaching approach can be attributed to academics' digital competence which must be strengthened to be able to use technology interactively. According to Green (2005: 59), digital tools are a supplement to the regular curriculum in teaching, not a substitute. Johnson (2011: 43) agrees that effective pedagogical strategies are required to implement technological tools to support teaching and learning. These tools are not a replacement for effective teaching. A digital teaching approach requires teachers to demonstrate technical skills in using digital technologies and digital competence in their pedagogical practices (Sumardi, Rohman and Wahyudiati 2020: 360). Technical skills, considered as generic digital skills and a pre-requisite for digital instruction, relate to the general ability to use a computer (Hämäläinen *et al.* 2021: 2). Mena, Singh and Clarke (2018: 588) explain that, by itself, technical proficiency in technology does not guarantee changes in instructional design.

A teacher's digital pedagogical skills must be viewed holistically, with a focus on the technical, creative, critical thinking, problem-solving, information management, communication, and collaboration dimensions (van Laar *et al.* 2017: 583). Teachers must be able to source, evaluate, select, and apply appropriate digital tools and technology that best suit students learning needs (Alarcón, del Pilar Jimenez and de Vincente-Yague 2020: 2415) and such selection must be compatible with the intended pedagogical approach (Reyes and Enrique 2021).

A study by Podorova *et al.* (2019) found that teachers use digital tools to collaborate and communicate and prefer to self-teach or consult with peers for assistance in developing their digital pedagogical skills. This finding correlates with the study by Montoro, Hinojo and Sánchez (2015) who found that teachers prefer self-learning and learn through trial and error in the use of technology. Guillén-Gámez, Mayorga-Fernández, and Ramos (2021) research study revealed that there was a high usage level of digital tools in teachers' pedagogy, in contrast to findings by Amhag, Hellstrom and Stigmar (2019) who state that teachers do not use technology naturally in teaching and require substantial pedagogical support to design quality lessons using technology.

Mezentceva *et al*. (2020: 92) developed a digital pedagogical model that comprises the basic skill set that instructors must possess to engage in teaching with technology. This model divides digital skills into three dimensions (in order of importance).

1. **<u>Technical dimension</u>**

- *Instrumental competence* - an instructor must possess structural and functionality knowledge of a digital tool and be able to explain to students how to use such a tool.
- *Contextual competence* - understanding the appropriateness of a digital tool in each teaching situation, e.g., the chat feature is for quick conversations whereas the discussion board is for deeper, longer conversations.
- *Content competence* - this skill is about creating content commensurate with the features and functions of a tool, simultaneously having an awareness of the ethical and legal issues surrounding content design.
- *Strategic competence* - troubleshooting skills related to technology use in the learning environment, being aware of security issues in using the digital tool.

- *Differentiation competence* - adapting the teaching approach to meet the different learning styles of students.

2. **Pedagogical dimension**

   Possessing knowledge on educational technology and the range of digital tools suitable for a specific discipline. Being able to appraise digital tools for use within specific teaching contexts. The ability to select and apply digital tools that are appropriate for the teaching method employed. The ability to use multiple modes and scaffolding strategies to encourage independent learning.

3. **General dimension**

- *Social competence* - Instructors must be able to engage with students and colleagues in the digital environment and display a positive attitude towards the employment of digital teaching.
- *Study competence* - The competency to design scaffolding techniques to accelerate the learning of new technology for teaching and learning. The ability to participate in professional communities with a view to developing new digital skills.

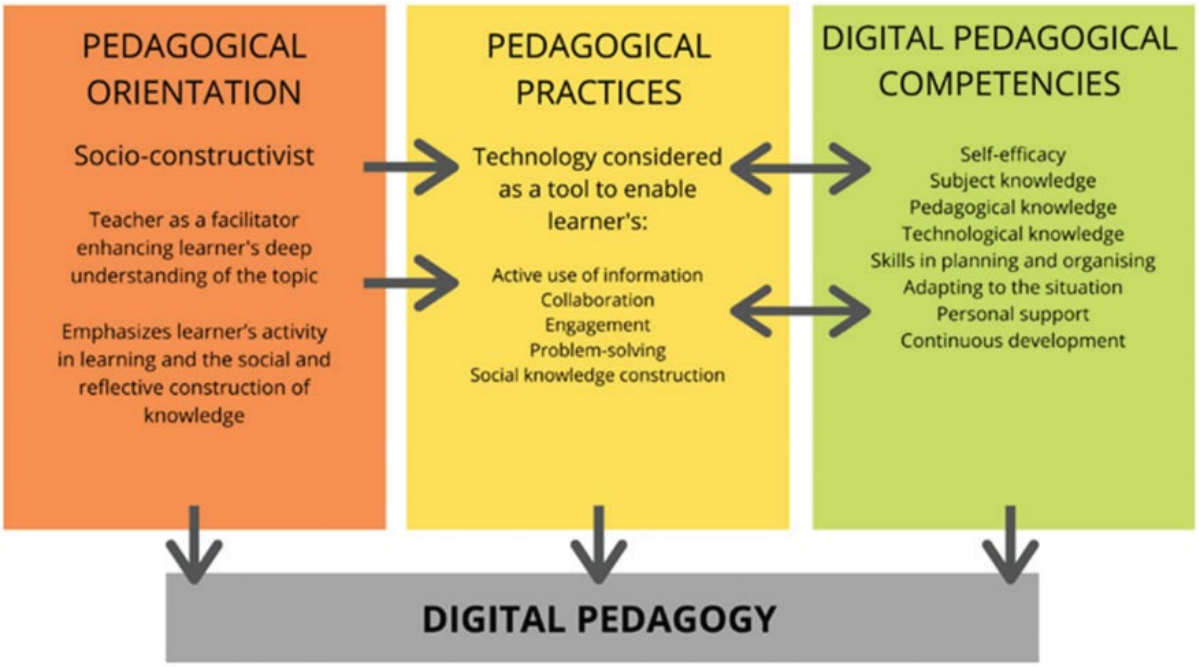


Figure 2.3: Conceptualisation of dimensions and a model for digital pedagogy
Source: Väätäjä, J. O. and Ruokamo H. (2021)

2.7.3 Designing a digital learning environment

The restrictions of a physical classroom can be mitigated by designing a digital learning environment where students can work in groups as in project-based learning, and collaboration among students can be fostered in a flexible domain where students' creativity and innovation can be promoted (Göçen, Eral and Bücük 2020: 86). Although multimodality has always been part of learning environments, digital learning environments present very different experiences for teachers and students when compared to face-to-face (contact) teaching (O'Halloran *et al.* 2018: 95). Students require intricate knowledge to be able to perform constructively and dynamically in a digital learning environment. A blended understanding of pedagogical, content, and technological knowledge may advance the incorporation of digital resources into teaching and learning to ensure learning outcomes are achieved (Falloon 2020: 2449). Göçen, Eral and Bücük (2020:86) state that a digital classroom, dependant on technology integration can only be successful if supported by the appropriate pedagogy (Figure 2.4).

In a digital learning environment, the academic, while fulfilling the role of a facilitator, must ensure that teacher presence is maintained, and be available and accessible to students, engage with students and ensure that scaffolding occurs throughout the course (Holland 2019; Lee *et al.* 2017). Additionally, Bosch (2017) remarks that when facilitators integrate technology into the learning environment, it must promote reflection and collaboration among students so that 21st century skills (problem-solving, higher order thinking, social interaction, and communication) are encouraged and enhanced. Vaughan *et al.* (2017) shares this view, arguing that facilitators must work with instructional designers to customise courses so that outcomes, learning contexts and the modes of delivery are specified for a particular course.

Empowering 21st century students with 21st century vocational skills require teachers to be equipped with the necessary digital skills. Lesson planning must consider how the student is to acquire the relevant skill. Delivering the lesson by employing multiple modalities, which include verbal instructions, demonstrations, videos, diagrams and digital technologies, are an effective way to ensure students develop such skills (Rambrij 2018:11). Technology makes possible new configurations and combinations of modal resources (Canale 2019: 46), while each mode conveys different aspects of

meaning in different ways (Olivier 2020a, Olivier 2020b). Aslan and Zhu (2016: 360) encourage teachers to acquire knowledge and skills necessary to design and deliver lessons that highlight technology use, to attain curricular goals. Tshuma (2016: 5) argues that technology integration must begin with a need, a problem, a rationale for the selection of a particular technology to be used as a resource and the integration must consider the context, content, and pedagogy of the discipline.

The successful integration of technology into teaching and learning, being dependant on a teacher's digital skills and the ability to use pedagogical knowledge, means that teachers need to develop strategies to keep students engaged during instruction by considering that students learn at different rates and have different learning styles (Tontus 2019). Gardner (1983) suggests that pedagogy incorporating multiple modalities has the advantage of engaging students according to their ability since humans use eight identified types of basic intelligences simultaneously and in a blended manner for meaning making. The eight basic intelligences that influence how people learn are linguistic, logical-mathematical, spatial, musical, body-kinesthetics (movement), interpersonal, intrapersonal, and naturalistic.

Figure 2.4: The main components of new classrooms
Source: Göçen, Eral and Bücük (2020).

A digitally supported multimodal teaching approach is effective in its appeal to provide students with more options for expressing their knowledge and ideas (Doyle-Jones

2015: 24). Graham and Benson (2010: 93-97) state that if teachers intend to incorporate many modes in their pedagogy, they must be attentive to the process so that students are provided with numerous opportunities to learn with and through digital technologies. A teacher must design instruction such that students are encouraged to read, contemplate, collaborate, discuss, assess their understanding, and create new knowledge (Meyer 2010). Students have different strengths and weaknesses regarding learning. Designing a lesson integrated with multiple modalities, allow for communication through many different languages (Williams 2014: 332). Ioannou, Vasiliou and Zaphiris (2016) showed in their study that using many modes to communicate was effective in a problem-based learning intervention in a multimodal learning environment. Multimodal pedagogy, made possible by innovating technologies, give students the opportunity to recognise a modality of instruction that suits their learning style (Malczyk 2018: 28).

2.8 Multimodal pedagogy

Teaching is an illustration of multimodal communication, and a multimodal teaching and learning environment can be designed using a range of different communicative resources (Bezemer and Kress 2016:13). According to Olivier (2020b: 24) multimodal pedagogy is a student-centred approach that promotes active learning where the instructional method engages students in the learning process. Malczyk (2018: 16) describes multimodal instruction as the new hybrid, a new student-centred approach that allows students to decide whether to attend lectures synchronously, asynchronously or contact. However, Nixon, Scullion and Hearn (2016) express concern over a predominantly student-centred approach as this may compromise the integrity of higher education, simultaneously harming the student and altering the traditional way of teaching. Since higher education students have developed multimodal learning capabilities, pedagogical approaches must adapt and align, through instruction and design of learning environments, to support and enhance students' multimodal learning (Nouri 2019: 697).

2.9 Summary

This chapter reviewed literature on multimodal pedagogy in higher education. The multifaceted concept of multimodality present in the literature was discussed within the context of education. The TPACK theoretical framework underpinning this study was

expounded upon. Various aspects of multimodal teaching, namely, technological knowledge, alignment of curriculum, and digital pedagogical skills, were explored. The next chapter presents a detailed discussion of the research methodology adopted for this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapters introduced the research study and its purpose, presented a review of literature on multimodal pedagogy in accounting in higher education, and discussed the theoretical framework of the study. This chapter delineates the research methodology, examines the philosophical underpinnings and the research approach adopted for this study.

3.2 A definition for research

A core instinct of human nature is inquisitiveness, which is the “mother of all knowledge”. Research is the method one employs to acquire knowledge of the unknown (Kothari and Garg 2019: 1). Research is a process that leads to new knowledge. Creswell and Guetterman (2019: 3) explain research as a process which involves engaging in a few logical steps to collect and analyse data to understand a topic. Leedy, Ormrod and Johnson (2021: 24) define research as a “systematic process of collecting, analysing, and interpreting information in order to increase our understanding of a phenomenon about which we are interested”.

3.3 Research methodology

Research methodology is the broad overarching strategy of systems (principles, processes, and procedures) employed to fulfil the research purpose. Research methods are the procedures or tools applied to each part of the research study and form part of research methodology (Surbhi 2018) and involves the different forms of data collection, analysis and interpretation (Creswell and Creswell 2018: 335). Research is made up of several tasks, from planning and conducting an experiment to developing a survey and canvassing a questionnaire. Various methods are employed to facilitate and accomplish individual tasks. Research methodology is the protocol that defines each task, the superstructure that pervades the complete research exercise (Mukherjee 2020:19). The techniques and procedures used to obtain and analyse data are referred to as methods, while methodology is the theory of how research is carried out (Saunders, Lewis and Thornhill 2016: 4).

3.4 Research design

Research design is the roadmap that the researcher follows to find answers to research questions (Kumar 2019:154). According to Creswell (2009: 3), research designs are the types of inquiry within each research approach. Cohen, Manion and Morrison (2018:173) state that research design is determined by “fitness for purpose”. This implies that the purpose of the research decides the research design which then influences the methodology. The research design is the blueprint or plan that a researcher develops to collect, measure, and analyse data to answer research questions (Sekaran and Bougie 2016: 95). It provides the structure for the procedure the researcher follows, for the data that is collected and for the data analysis (Leedy, Ormrod and Johnson 2021: 106).

3.5 Research philosophy

A researchers’ beliefs and understanding of the world forms the basis for their research (Sekaran and Bougie 2016: 28). These philosophical assumptions or worldviews indicate a researcher’s views and thoughts about research and the best way to conduct it to develop new knowledge (Leedy, Ormrod and Johnson 2021: 30). Creswell and Creswell (2018: 44) defines paradigm as “a basic set of beliefs that guide action”, whether everyday action or relative to a disciplined inquiry. Paradigm refers to the way phenomena are researched, and knowledge developed (Cohen, Manion and Morrison 2018: 8). A researcher’s philosophical orientation is the underlying motivation for the selection of methodologies and methods for a research study (Creswell and Creswell 2018: 44). Philosophies differ according to ontology, which is the belief about the nature of reality, epistemology which relates to beliefs about knowledge generation of that reality, and axiology which refers to the role of values for learning about reality (Plano Clark and Ivankova 2016: 196). The most popular research paradigms discussed in literature are positivism, interpretivism and pragmatism which are discussed below.

3.5.1 Positivism

The followers of the positivism paradigm believe that research can unearth, using appropriate measurement tools, irrefutable truths that explain cause and effect relationships in the physical world (Leedy, Ormrod and Johnson 2021: 30). This worldview posits that the absolute truth of knowledge can be developed through

observation and measurement, as is the case in scientific research, where the laws can be tested and verified to understand the world (Creswell and Creswell 2018: 44). The positivism worldview researcher seeks explanations through observation, measurement, and hypotheses testing that is grounded in the natural sciences (Cohen, Manion and Morrison 2018: 34). According to positivism, there exists a single reality. The researcher must be an independent observer and maintain an objective stance to learn about that reality (Plano Clark and Ivankova 2016).

3.5.2 Interpretivism

Proponents of interpretivism advocate against a single reality, claiming that multiple realities exist. Interpretivism assumes that reality is socially constructed, that is, individuals create their own realities (Plano Clark and Ivankova 2016). Understanding the social world from the perspective of the individuals' interpretations of the world around them is termed subjective, as it leads to multiple interpretations and perspectives of reality, driven by changing situations, resulting in multi-layered, complex realities. Interpretive researchers investigate a phenomenon through the expressions, behaviour, and interactions of participants (Cohen, Manion and Morrison 2018: 17) and rely on the participant's construction of meaning either individually or in discussion groups, while recognising that their own life experiences filter into and shape the research. The subjective meanings so formed are influenced by a participant's social interactions, historical and cultural experiences (Creswell and Creswell 2018: 46). Closely associated with interpretivism, hermeneutic theory allow researchers to construct complex meanings through deep study of text (Neuman 2014: 103).

3.5.3 The pragmatic worldview

Advocates of pragmatism, Charles Sanders Peirce, William James, John Dewey, George Herbert Mead (Leavy 2017:13), Patton (1990) and Murphy (1990), focus on action and consequences, understanding the research problem and finding solutions to the problem. Pragmatists do not view the world as an absolute reality, they are concerned with employing available methods to answer research questions (Creswell and Creswell 2018: 48). A pragmatic paradigm accepts that different perspectives and ideas help researchers to gain a better understanding of the world. Research must have practical relevance (Sekaran and Bougie 2016: 29). This research philosophy

harmonises with complexity and diversity, simultaneously favouring a rational, approach that works. It is a worldview that embraces the practical and useful. Hence, the cornerstone of pragmatism is logic (Creamer 2018: 45). Denscombe (2008: 280) and Cohen, Manion and Morrison (2018: 36) agree with Creamer's views, stating that pragmatism is a philosophy of practicality.

Pragmatism's flexibility in its of choice of methods to answer the research questions, thereby producing knowledge, appeals to researchers. The paradigmatic approach is to use any method to accomplish the purpose of the research study (Tashakkori, Johnson and Teddlie 2021: 63). Pragmatism accepts the use of inductive and deductive reasoning in a study (Creswell and Plano Clark 2018: 88). Research phenomena can be understood through deductive or inductive reasoning, or a combination of both. Multiple observations of a phenomenon and then drawing conclusions is called inductive reasoning (Sekaran and Bougie 2016: 26). Deductive logic is used to test a theory. It starts with a premise/assumption about a topic. A logical application of reasoning to the premise leads to conclusions (Leedy, Ormrod and Johnson 2021: 42). Therefore, a pragmatic researcher may combine the use of quantitative and qualitative methods in a single research study to collect different types of data to answer the research questions (Creswell and Plano Clark 2018: 54).

3.6 Choice of worldview

Neuman (2014) describes pragmatism as a "common sense" paradigm to understand circumstances and experiences. Tashakkori, Johnson and Teddlie (2021: 76) argue for the adoption of the pragmatic philosophy as the underlying paradigm for mixed methods research, as pragmatism's rejection of the either-or choice of paradigms makes it particularly appealing. As stated by Creswell and Creswell (2018:48), the appeal of pragmatism as a paradigm lies in its versatility because it supports different worldviews and assumptions, various methods of data collection and analysis, as well as different research approaches.

The researcher's choice of worldview was informed by the objectives of the study, the research questions, and the context of the research. The pragmatist orientation was selected as the epistemological lens for this study.

3.7 Research strategy

A research strategy is a plan of action for achieving the research objectives and answering the research questions (Sekaran and Bougie 2016: 96). It acts as the procedural link between the study's philosophy and the researcher's choice of methods to collect and analyse data. There are various strategies, each with its own characteristics, such as case study, experiment, survey, action research, grounded theory, ethnography, narrative inquiry, and archival and documentary research. These various strategies are not mutually exclusive, they can be combined with one another in a mixed methods approach (Saunders, Lewis and Thornhill 2016: 177-178).

The research strategy selected for this study is the case study. Sekaran and Bougie (2016: 98) describe a case study as a research strategy that allows the researcher to investigate, empirically, a phenomenon of interest, within its real-world context, through the employment of multiple data collection methods. Saunders, Lewis and Thornhill (2016: 185) explain that the distinguishing feature of a case study research strategy is studying the case to gain an understanding of the dynamics of the topic within its real-life context. The case is a "phenomenon of some sort occurring in a bounded context". A case is a bounded entity (a person, an organisation, an event), but the boundary between the case and its context is blurred (Maree *et al.* 2019: 89).

The DUT was selected as the case study for exploration. This case study allowed the researcher to gain a deeper and broader understanding of the various aspects relating to the teaching of accounting using a multimodal approach.

3.8 Research approach

According to Creswell and Creswell (2018: 40), research approaches refer to the plans and procedures pertaining to the study, detailing the various stages from hypothesis to methods of data collection, analysis, and interpretation. Informing the choice of approach is the philosophical assumptions, research designs and specific research methods. Research approaches are classified as quantitative, qualitative, and mixed methods; each differing in the level of flexibility allowed in the research process (Kumar 2019: 16). Each of these approaches are discussed below.

3.8.1 Quantitative approach

The quantitative approach has its roots in the positivist worldview. The aim of quantitative research is to quantify the level of change in a phenomenon and to give numerical strength to the views of respondents. To achieve this, the researcher follows a structured, pre-determined procedure to conduct their research. The design is decided upon prior to data collection and cannot be altered during the study (Kumar 2019:16). Data is collected and analysed objectively to prevent biased data; direct contact with respondents is restricted (Leavy 2017: 38). The quantitative researcher seeks results that can be statistically generalised to the larger population or used to make predictions or to confirm existing theories (Leedy, Ormrod and Johnson 2021: 113). The analytical nature of quantitative studies allows data to be expressed in the form of numbers which can be analysed through the application of mathematical and statistical techniques resulting in accurate answers (Grønmo 2020: 135). Logical reasoning is fundamental to quantitative research which tends to tilt the approach towards deductive reasoning, starting with a premise and then drawing logical conclusions from it (Leedy, Ormrod and Johnson 2021: 114). Hammersley (2013: 10) states that quantitative research involves the use of hypothesis testing, numerical data suitable for statistical analysis to describe patterns in the data, generalisation of findings to the larger population, and the control of variables.

3.8.2 Qualitative approach

Researchers employ a qualitative approach to better understand complex situations. A qualitative study is generally “holistic and emergent”. The study’s focus, design, data collection methods and interpretations unfold as the study progresses (Leedy, Ormrod and Johnson 2021: 113). Qualitative research relates to the use of words to enquire about and interpret human experiences. Hammersley (2013:12) ascribes the following characteristics to qualitative research:

- Is a form of social inquiry
- Is flexible and data-driven
- Uses loosely structured data
- Highlights the importance of subjectivity in the research process
- Favours verbal over statistical analysis of data
- Studies a small number of cases in natural settings

Qualitative research allows the researcher to gently probe into participants issues to elicit in-depth, complex, and detailed meanings of situations and experiences from participants. Qualitative research acknowledges the dynamism of multiple realities constructed by participants' differing interpretations of a given situation (Cohen, Manion and Morrison 2018: 287). The underlying philosophy supporting qualitative research is interpretivism. The purpose of the qualitative approach is to "explore diversity" by accentuating the narrations of feelings, perceptions, and experiences, and to employ descriptive and narrative ways to communicate findings (Kumar 2019: 16). Relationship building is fundamental to the research endeavour due to the close interaction with the participant. Essential elements in the use of the qualitative approach are to build trust, develop a rapport with the participant and set expectations by demonstrating enthusiasm in the participant's experiences (Leavy 2017: 39). Qualitative data is analysed thematically and interpreted through the application of inductive reasoning (bottom-up). A qualitative study may be construed as subjective due to the researcher's close interaction with participants and data gathering, the analyses of which may be influenced by the researcher's personal background, thereby shaping the direction of the study (Creswell and Creswell 2018: 258).

3.8.3 Mixed methods approach

3.8.3.1 Defining mixed methods research

According to Leedy, Ormrod and Johnson (2021: 291), mixed methods research involves the collecting, analysing, and interpreting of quantitative and qualitative data, with the merging of both data findings into a "cohesive whole". The integrating of both sets of data findings is considered challenging and requires skill and experience.

The focus of mixed methods research is on collecting both quantitative and qualitative data, analysing, and integrating the two forms of data, using distinct research designs that may include theoretical frameworks and worldviews. Three separate components are contained within this definition: philosophical worldview assumptions (refer 3.5), the related research design and the specific research methods that are put into practice (Creswell and Creswell 2018: 41).

Though quantitative and qualitative approaches mostly address different kinds of research problems and questions, combining these two approaches in a single study may produce a more holistic understanding of a phenomenon as these two

approaches are generally not mutually exclusive (Leedy, Ormrod and Johnson 2021: 115). This implies that combining these two methods yields a richer and deeper understanding of a phenomenon than either method on its own. The bias and weakness of one method can be neutralised by the other method. This is especially useful when the problem under investigation is complex and multifarious (Grønmo, 2020: 64).

Mixed methods research has its roots in the pragmatic paradigm, and has its own ontology, epistemology, axiologies and methodologies (Cohen, Manion and Morrison 2018: 31).

3.8.3.2 Mixed methods designs

Mixed methods designs exist in various forms in social research. Creswell and Creswell (2018: 52) presents three basic designs:

- *Convergent mixed methods.* The researcher collects qualitative and quantitative data independently and analyses each data set separately. The data are then compared for similarity and difference. The researcher reports on the integrated results.
- *Explanatory sequential mixed methods.* In this two-phase process, quantitative data is gathered first and analysed. The results are then used to decide on the qualitative step, that is, the research questions to be asked in the interviews and the selection of participants.
- *Exploratory sequential mixed methods.* Qualitative data is collected first from participants and analysed. The findings are used to plan the second quantitative phase of the research study which entails identifying appropriate instruments and sample selection for the quantitative phase.

3.8.3.3 Choosing the mixed methods approach

Sekaran and Boogie (2016: 106) are of the view that the combination of deductive and inductive reasoning, the use of different types of data and the use of multiple research methods to solve the research problem, makes mixed methods an appealing approach. Creswell and Creswell (2018:57) further explains that a mixed methods approach is appropriate when the quantitative and qualitative approaches, individually, are insufficient to solve the research problem and satisfy the research objectives.

Kumar (2019: 27) confirms that using multiple data sources does make the study's conclusions more meaningful as it presents a more complete picture of the situation.

This research study followed the mixed methods research approach, combining the strengths of the quantitative and qualitative research designs to achieve the study's objectives. The explanatory sequential mixed methods design type was adopted for this study to understand the phenomenon of multimodal teaching at a more detailed level by having follow-up qualitative data provide more depth and insight into quantitative findings by explaining or confirming initial quantitative results (Creswell and Creswell 2018: 305; Plano Clark and Ivankova 2016: 122).

This core design occurred in two distinct interactive phases in which the researcher collected quantitative data first, using closed ended questions in an online survey questionnaire. The results were analysed and were used thereafter to plan the second qualitative phase of the study (mixing point 1). The quantitative results allowed the researcher to determine which participants to purposefully select for the qualitative phase of the study and the type of questions to be asked of accounting academics in the semi-structured online interviews. Data from the survey questionnaire and the semi-structured interviews were analysed separately. The results were integrated at the analysis and interpretation phase of the study (mixing point 2). Priority was given to the quantitative strand of the study, with the qualitative strand playing a supportive, supplementary role.

The explanatory sequential mixed methods design involves the mixing quantitative and qualitative data strands at various stages of the research process (Tashakkori, Johnson and Teddlie 2021). In this study, the quantitative and qualitative phases occurred chronologically, with the first phase using a survey questionnaire, followed by the semi-structured interviews with accounting academics in the second phase. Mixing of the two strands occurred after the collection of quantitative data, the findings of which were used to plan the qualitative phase two and at the data analysis and interpretation stages, with emphasis being place on the quantitative stage.

3.9 Population

Sekaran and Bougie (2016: 236) refer to a population as "the entire group of people, events, or things of interest that the researcher wishes to investigate". The population is therefore the sum of all units of analysis, which is included as elements in the study,

for which the researcher wants to make inferences. Saunders, Lewis and Thornhill (2016: 274) describe a population as “the full set of cases or elements from which a sample is taken”. According to Tashakkori, Johnson and Teddlie (2021: 152), the population is the full group to which the researcher wants to generalise the sample results. It may be difficult to include the entire population in a study due to accessibility, time and cost restrictions (Creswell *et al.* 2016: 222). Consequently, the researcher may redefine the population to a more workable size. This subset of the population is referred to as the target population and becomes the focus of the research inquiry (Saunders, Lewis and Thornhill 2016: 275). According to Creswell and Guetterman (2019: 390) target population is the “actual list of sampling units from which the sample is drawn”.

The target population for this study is 52 accounting academics in the Faculty of Accounting and Informatics at the DUT.

3.10 Sampling

Tashakkori, Johnson and Teddlie (2021:151-152) define sampling as “the act of selecting your data sources in a manner that maximises your ability to find answers to the research questions set forth in your study” and a sample is “a set of cases selected from the larger population of interest to the researcher”. Sampling is the process of selecting an adequate number of elements from the population so that conclusions drawn from studying the sample can be generalised to the population (Sekaran and Bougie 2016: 239).

It is important that the researcher develop a sampling plan as it determines the appropriateness of statistical procedures to be used and the conclusions that can be drawn from the study. Mixed methods research is complex, it is therefore apt to use multiple sampling strategies, which is a defining characteristic of mixed methods research (Creamer 2018: 88). Mixed methods sampling involves a combination of sampling methods which are usually used in quantitative and qualitative research approaches (Tashakkori, Johnson and Teddlie 2021: 153). In quantitative research, it is necessary for the sample to be representative of the population so that the researcher, by studying the sample, can generalise the results to said population of interest (Devlin 2018: 311; Sekaran and Bougie 2016: 237). The strategy of choice in quantitative studies, is probability (random) sampling. In this sampling procedure, units

are chosen randomly, so that each unit of analysis has a known and equal chance of being selected (Creswell and Plano Clark 2018: 270). The most widely used probability sampling strategies are simple random sampling, systematic sampling, stratified random sampling, cluster sampling and multiphase sampling (Cohen, Manion and Morrison 2018: 214).

Non-probability (purposive) sampling is generally the strategy of choice in qualitative studies (Cohen, Manion and Morrison 2018: 223). The purpose of sampling in qualitative research is to gain "in-depth knowledge from 'information rich' respondents about the phenomenon under study" (Kumar 2019: 290). In non-probability sampling, the elements do not have a known chance of being selected (Sekaran and Bougie 2016: 240); elements are selected based on availability (Creswell and Plano Clark 2018: 270). Kumar (2014: 45) and Cohen, Manion and Morrison (2018:214) state that in certain situations some members of the population will be excluded from the sample, implying that each population member does not have an equal chance of inclusion.

The two broad categories of non-probability sampling are convenience sampling and purposive sampling (Sekaran and Bougie 2016: 247). Purposive sampling is the intentional selection of elements based on specific purposes resulting from the research questions, that is, selecting participants that have experience in the phenomenon being researched (Tashakkori, Johnson and Teddlie 2021: 153). With this sampling form, the researcher uses judgement to select elements that are informative and is suitable for small samples (Saunders, Lewis and Thornhill 2016: 301). Purposive sampling strategies include amongst others quota sampling, snowball sampling, extreme case sampling and homogeneous sampling (Tashakkori, Johnson and Teddlie 2021: 159).

In sequential mixed methods sampling, the sample in the first phase influences the sample in the second phase (Cohen, Manion and Morrison 2018: 224). Information gathered in the first phase guides the selection of data sources in the second phase (Tashakkori, Johnson and Teddlie 2021: 172).

The target population for the first phase of this study, the quantitative survey, was 52 accounting academics at DUT. Creswell and Guetterman (2019: 391) advises that when the target population is small, the entire population should be surveyed. Such a survey study is referred to as a census study (Cohen, Manion and Morrison 2018:

339). The small, manageable size of the target population for this study allowed the researcher to conduct a census with 52 accounting academics who agreed to participate in the study.

Phase 2 was semi-structured interviews. Participants were selected based on the responses from the quantitative survey, using purposive sampling. A sample of 12 accounting academics were selected for the semi-structured online interviews, according to the number of years of experience with multimodal teaching as per their responses (refer to Annexure A).

3.11 Data collection

Data collection is the systematic process of gathering data on variables of interest, the analysis of which may provide answers to the research questions. There are two types of data, primary and secondary. Primary data refers to “first-hand information”, data that is collected directly from the source (Kumar 2019: 215). It is data that is original, collected in the field and for the first time by the researcher. Examples of primary data include data gathered through observations, interviews, surveys. On the other hand, secondary data refers to data that has already been gathered and exposed to statistical applications (Kothari and Garg 2019: 89), such as census data, government surveys and administrative data.

3.11.1 Measuring instruments

Measuring instruments are tools designed to collect reliable data from respondents. These include questionnaires, interviews, observations, focus group discussion and experiments (Sekaran and Bougie 2016: 97). Measuring instruments are tools for measuring, observing, or documenting quantitative data. The instruments to be used must be decided upon before data is collected from respondents, and may include questionnaires, observations, interviews, focus groups and experiments (Creswell and Guetterman 2019: 624).

This study used an online survey questionnaire (Annexure A) and online semi-structured, face-to-face interviews (Annexure B) to collect data.

3.11.1.1 Online survey questionnaire

Leedy, Ormrod and Johnson (2021:181) describe survey research as a research design that involves the collection of information from people about their behaviour, experiences, and attitudes by asking a series of questions in the form of questionnaires and interviews. According to Sekaran and Bougie (2016: 97), a survey is the systematic act of collecting information from a pre-defined group of respondents, to describe, compare or explain their knowledge, attitudes, and behaviour. Neuman (2014:316-317) considers a survey to be a data-gathering technique which can provide accurate and reliable data by using interviews, internet polls and questionnaires and it is suitable for exploratory, descriptive, or explanatory research. A survey design yields quantitative data which describes attitudes and opinions of the study's sample population, numerically (Creswell 2009:137).

A questionnaire is a popular measuring instrument within the survey strategy, is used to gather data from respondents, and consists of a list of questions sequenced in a logical order (Kothari and Garg 2019:90). Sekaran and Bougie (2016: 142) define a questionnaire as a "preformulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives".

When designing a questionnaire, the wording of the questions is important in terms of content appropriateness, the elegance of the language used, type, form, and sequencing of questions (Sekaran and Bougie 2016: 145). A well-designed questionnaire is visually pleasing (Saunders, Lewis, and Thornhill 2016: 439). The researcher must ensure that questions are free from ambiguity, not double-barrelled, must not be leading, and questions must not be emotionally phrased (Kumar 2019: 232; Sekaran and Bougie 2016: 148).

The advancement of technology has made it possible for survey questionnaires to be administered online. This online approach is flexible both for the researcher and the respondents in terms of accessibility and availability of the survey questionnaire. Online survey platforms allow responses to be downloaded directly into statistical software or spreadsheet software, ready for further analysis. This reduces cost, time, and improves accuracy of data entry (Devlin 2018: 172).

A survey questionnaire can be e-mailed to respondents via the internet, making a questionnaire-based survey inexpensive to conduct. However, the response rate may

be lower compared to personally administering the questionnaire and may require repeated follow-ups (reminders) by the researcher to non-respondents (Tashakkori, Johnson and Teddlie 2021:226). The use of an online survey via email requires the provision of a link in the email which enables respondents to access the questionnaire for completion (Kumar 2019: 223).

This study used the survey approach to explore and understand the pedagogical implications of using multiple modes to deliver the accounting curriculum at a higher education institution. Within the survey strategy, the questionnaire was employed as the measuring instrument for this study. A questionnaire was selected because it is cost effective and it allowed for detailed data to be collected on the technological knowledge and digital pedagogical skills of accounting academics, and curriculum alignment, to establish the effectiveness of multimodal teaching in accounting.

The researcher considered the design principles stated above when designing the survey questionnaire. The questionnaire was designed utilising closed ended questions to which responses could be quantified using statistical techniques. The scales of measurement used in the development of the questionnaire included a combination of nominal (categorical), ordinal, interval and six point-Likert scale.

The questionnaire was refined and amended several times prior to finalisation to ensure alignment to the research objectives. The services of a professional statistician were employed to assess the final draft of the questionnaire. Google Forms software, a free, easy to use, web-based application was used to configure the questionnaire for this study. Google Forms generates a survey link which allows respondents to access and complete the questionnaire. Responses are automatically saved on a Google Forms spreadsheet which can be downloaded to Microsoft Excel (Devlin 2018: 178).

The online delivery of the survey questionnaire was tested prior to the questionnaire being sent to respondents. This pre-testing was carried out to resolve any potential problems with delivery.

The questionnaire was administered using the online survey, through the provision of a link in the body of the email sent to respondents, directing potential respondents to the web survey. The online email survey was chosen for its convenience, low cost and due to COVID-19 restrictions. As all accounting academics (target population) at DUT

were working remotely, access to email and the internet was provided by the institution. A single round of friendly reminders was sent to respondents, which prompted a quick turnaround response time.

3.11.1.2 Structure of the online survey questionnaire

The structure of the online survey questionnaire (Annexure A) used in this study comprised four sections, each designed to gather the necessary data to answer the research questions, thereby satisfying the research objectives:

Section 1 This section requested demographical information of the accounting academics.

Section 2 This question focused on the general technological knowledge and knowledge on MS Teams and Moodle of accounting academics

Section 3 Respondents were required to provide information on accounting curriculum alignment and on the extent of alignment of the accounting curriculum.

Section 4 Digital pedagogical skills of accounting academics were explored in this section.

3.11.2 Pre-testing the questionnaire

Kumar (2019: 237) considers pre-testing the research instrument to be an important step in the data gathering phase of the research process. Pre-test entails examining the understanding of each question by the respondents. According to Sekaran and Bougie (2016: 155) a pre-test involves a small-scale study with a few respondents to test the appropriateness of the questions and the appraise the respondents' comprehension of the questions. The purpose of pre-testing is to identify possible flaws in the instrument like ambiguity, incorrect wording, vague instructions, or deficiency in sequencing of questions. Any inadequacies can be rectified before administering the instrument, thereby reducing bias.

The researcher pre-tested the survey questionnaire in March 2022, using a sample of ten (10) academics, selected from the Information Technology, Information Systems, and Information and Corporate Management departments in the Faculty of Accounting and Informatics at the DUT. The survey instrument was administered for pre-testing,

through the provision of a web link via email, which also tested the efficiency of the delivery method used. Analysing the responses from pre-test respondents indicated that there were no issues with the questionnaire either with comprehension, interpretation, or sequencing of questions.

The respondents who participated in the pre-test exercise, were not included in the main survey as the study's survey target population comprised only accounting academics. Another reason for their exclusion was the possibility of biased main survey results if the pre-test respondents were included in the main survey.

The interview schedule, containing semi-structured questions was tested on an academic from the Information Systems department. This allowed for the questions to be refined and for the researcher to gain experience in conducting in-depth interviews. The staff member was excluded from the main study.

3.11.3 Covering letter

A covering letter and a gatekeepers permission (Annexure F) letter was provided to respondents as attachments to the email containing the link to the web survey. The covering letter contained brief information about the researcher and an outline of the purpose of the research study. Respondents were assured of anonymity and confidentiality regarding their participation in the study. The gatekeepers permission allowed the researcher to approach the accounting academics to request their participation in the study.

3.11.4 Informed consent

Respondents and participants (prior to the commencement of each interview) were informed of their right to participate voluntarily in the study without being coerced in any way, and the right to withdraw from the study at any time. They were further assured that their participation did not expose them to any form of risk or danger and that participation would be confidential and anonymous.

For the online quantitative survey, the letter of informed consent (Annexure E) was attached to the beginning of the questionnaire. Respondents could access the questionnaire for completion only after consenting to participate by ticking the appropriate box.

3.11.5 Administering the measuring instrument

The researcher commenced with data collection after approval for the study was given by the Accounting and Informatics Faculty Research (FRC) and after ethical clearance was granted (Annexure C). A list was compiled of accounting academics and their contact details. The target population for the quantitative survey phase of the study was 52 accounting academics. Fifty-two survey questionnaires were emailed to accounting academics, from 23 March 2022 to 06 April 2022. The researcher received 42 responses, which translates to a response rate of 81%. There were no incomplete responses. The gathered data was downloaded onto a Microsoft Excel spreadsheet and sent to a professional statistician for analysis. Once the researcher received the completed analysis from the statistician, the results were used to plan the second qualitative phase of the research study. The quantitative results determined the sample procedures and the type of questions to be asked in the second qualitative phase of the research.

3.11.6 Interviews

An interview is a data collection method involving two-way interactions, in which the interviewer asks the participants questions to collect data (Maree *et al.* 2019: 108).

The interview is a dynamic data collection strategy because there is direct personal contact with the participant, allowing the interviewer to probe for in-depth information and to ask for clarification on vague answers (Tashakkori, Johnson and Teddlie 2021:221). Sekaran and Bougie (2016: 113) describe an interview as a "guided, purposeful conversation between two or more people to gather data". The purpose of interviews is to extract rich, deep descriptive data about a participant's views, ideas, opinions, and experiences about the phenomenon being studied (Maree *et al.* 2019: 108).

Interviews can be categorised as follows:

- Unstructured interview – the interview structure is flexible, there is no rigid boundaries, and researcher deviations from the pre-determined course is acceptable. There is not an interview schedule although the interviewer has a plan for questions to direct the interview (Kumar: 2019:238).

- Semi-structured interview –the interviewer compiles a list of questions (interview schedule) with in-built flexibility for follow-up questions as the interview develops.
- Structured interview – The interview schedule is planned, and the interview is conducted in the same manner and questions are asked in the same order for each interviewee. There are no follow-ups. It is like a “verbally administered questionnaire” where the questions are pre-set (Devlin 2018: 217).

The qualitative phase of this study used semi-structured online interviews to access participants’ views, experiences, and opinions on multimodal teaching of accounting. From the quantitative population, twelve (12) accounting academics were purposively selected, according to the number of years of experience teaching accounting multimodally. Each selected academic was contacted by the researcher by email and/or telephone to request his/her participation in the interview. A date and time were arranged to conduct the interview with those academics who agreed to participate. The researcher prepared an interview schedule (Annexure B) of questions to be asked of the participants at the semi-structured interviews. The survey questionnaire findings (phase one) informed the type of questions that were asked at the semi-structured interviews. Interviews were conducted from 04 July 2022 to 13 July 2022 on MS Teams software application, as this was most convenient for the participants. At the commencement of each interview, permission was requested to record the interview. All the interviews were recorded and transcribed on MS Teams, except for one participant who submitted written answers to the questions. The researcher downloaded all transcripts as word documents and saved them for further perusal.

The use of the semi-structured interview type allowed the researcher to corroborate and interrogate findings from the quantitative survey that required more depth, and to identifying and probe new emerging lines of inquiry relating to multimodal teaching of accounting. Interviews proved to be an effective and versatile way of collecting data as it allowed the researcher to clarify any vague and incomplete responses immediately.

3.12 Data analysis

Data analysis techniques are dependent on the nature of the collected data, the method used for data collection, and the research objectives (Grønmo 2020: 63). In

mixed methods research, analysing gathered data begins with understanding the basic strategies for analysing quantitative and qualitative data strands (Tashakkori, Johnson and Teddlie 2021: 247)

Quantitative data in its raw form is meaningless. For data to be converted to information, it must be processed (Saunders, Lewis and Thornhill 2016: 496). Quantitative data analysis is examining numeric data using statistical techniques like descriptive and inferential statistics (Tashakkori, Johnson and Teddlie 2021: 255). The collected quantitative data was analysed using the Statistical Package for Social Sciences (SPSS), version 25, through the application of descriptive and inferential statistics.

Descriptive statistics provide descriptive information for the researcher to analyse and interpret and include amongst others, frequencies (%), standard deviations, and measures of central tendency (means, modes, medians). Central tendency refers to the clustering of a set of scores around the middle of the score set (Cohen, Manion and Morrison 2018: 762). A measure of central tendency is a value explaining a data set by identifying the centre of the data set (Measures of central tendency 2018).

The mean is the sum of observations divided by the number of observations. It is the centre of data and is commonly referred to as the average (Agresti 2018). Standard deviation describes variability (Agresti 2018: 29) and is a measure of dispersal, indicating the average distance each score is from the mean (Cohen, Manion and Morrison 2018: 762). The mode is the value that occurs most frequently, mainly used with categorical data. Median, a simple measure of the centre, is the observation that falls in the middle of the ordered sample (Agresti 2018). A frequency is a listing of possible values for a variable, including the number of observations at each value and can be expressed in percentages or numbers, depicted graphically or in tabular form (Agresti 2018: 30).

Section 1 (demographics) of the survey questionnaire for this study was analysed using frequencies (percentages), with the results presented in the form of graphs.

The data analysis for sections 2, 3 and 4 of the survey questionnaire, was conducted using descriptive statistics of means, standard deviations, and frequencies and inferential statistical techniques of one sample t-test, chi-square goodness-of-fit-test, binomial test and factor analysis. The findings were presented in the form of tables

and graphs and corroborated by similar results from various other studies (refer Chapter 4). Inferential statistics is a domain of statistics that uses analytical tools to draw conclusions about a population, using sample data (Agresti 2018: 5).

A t-test determines whether there is a statistically significant difference between the means of two groups, that may/may not be related. T-tests are used when data sets follow a normal distribution, and the variances are unknown. The one sample t-test is used to examine if the mean of a population is statistically different to a known hypothesised value. It tests whether a mean score is significantly different from a scalar value (Cohen, Manion and Morrison 2018: 777). This test was applied to section 2 questions 7, 8,9, section 3 question 10 and section 4 question 12 of the survey questionnaire.

The chi-square goodness-of-fit test is a univariate test, used on a categorical variable to test whether any of the response options are selected significantly more or less often that the others (Kothari and Garg 2019). This test was applied to section 3, question 11 of the survey questionnaire.

A binomial test tests whether a significant proportion of respondents select one of a possible two responses. This can be extended when data with more than two response options is split into two distinct groups. (Agresti 2018:168, Cohen, Manion and Morrison 2018). The binomial test was performed on the constructs of Extent of realignment (EoR) and Realignment effect (Rout) in section 4.6.3.2.2.

Qualitative analysis refers to the perusing of narrative data to excavate themes and patterns relating to the phenomenon of interest (Tashakkori, Johnson and Teddlie 2021: 248). Maree *et al*. (2019: 124) describe qualitative data analysis as the summarising of gathered data into common words, themes or patterns and phrases, the purpose of which is to understand and interpret that which surfaces. Leedy, Ormrod and Johnson (2021: 381) state that qualitative data analysis is a complex, interactive and iterative process wherein the researcher goes back and forth among data collection, analysis, and reporting.

Qualitative data analysis for this study commenced with the researcher preparing the data by correcting the transcriptions of the online interviews with participants, a process known as data cleaning. Thereafter, a rigorous examination of each interview content was carried out to identify themes and patterns or common words and phrases for further analysis, to address the research questions. The data was then formatted for software analyses.

This study utilised computer assisted qualitative data analysis software (CAQDAS), NVivo (QSR International) to further streamline the management and organisation of data to facilitate analysis. NVivo is a software program that help researchers to organise, analyse and find insights in qualitative data by coding the data, a key feature of NVivo (Creswell and Plano Clark 2018: 320).

The reviewed transcripts were imported into NVivo. The thematic function in the software enabled the transcript contents to be coded, by allocating the identified themes, phrases, and keywords in the data to a node (a node being a theme code), the effect of which was reduction and rearrangement of the data to a more comprehensive form. When the node is opened, all the allocated references that were coded to the node, can be viewed. Coding is the process of gathering data with similar meanings and could be a word or a short phrase (Saunders, Lewis and Thornhill 2016).

The findings of the quantitative and qualitative data analysis of this study, presented in Chapter 4, includes a discussion on the interpretations of the findings, with simultaneous reference to reviewed literature (Chapter2).

3.13 Validity and reliability concepts

A challenge of using a mixed methods research approach is that two sets of standards are used to assess data quality: one for qualitative and one for quantitative. Quantitative researchers evaluate data quality according to validity and reliability, while qualitative researchers use trustworthiness. Validity and reliability are judgements about the quality of research (Saunders, Lewis and Thornhill 2016: 202).

Validity refers to strategies used during the data collection and data analysis phases of a research study, that authenticate the credibility and justifiability of the conclusions drawn (Creamer 2018: 24). According to Kumar (2019: 270), validity is "the degree to which the researcher has measured what he has set out to measure". Johnson and Christensen (2019) state that research validity refers to the accuracy or honesty of the inferences that are made from the results of the study. The appropriateness and accuracy of each step in the research process, the credibility and dependability of the collected data and appropriateness of analytical techniques used in the study determine the validity of a research study. A statistical technique to assess validity of the measuring instrument is factor analysis (refer to Chapter 4), which is used to determine the grouping of items within a construct according to their homogeneous nature (Maree *et al.* 2019: 264).

Reliability refers to the extent of consistency and repeatability of the measuring instrument. A measure of reliability of an instrument is Cronbach's alpha (see Chapter 4), which measures the internal consistency of items on the instrument (Creswell and Creswell 2018: 215).

Qualitative data quality is measured according to the trustworthiness of the data, meaning that the conclusions drawn from the data analysis is credible, dependable, and defensible. Credibility is akin to the quantitative concept of validity and its achievement is determined by the participants' belief that their narrations are credible. Credibility refers to data quality and the quality of interpretations. Dependability in qualitative research is similar to "reliability" in quantitative research and it relates to the extent to which a phenomenon can be explained consistently by the participant (Tashakkori, Johnson and Teddlie 2021:195). In qualitative data, validity is measured through honesty, depth, authenticity, richness, trustworthiness, dependability, and credibility of the participants (Cohen, Manion and Morrison 2018: 246).

To improve the validity of this study's results, the researcher selected the qualitative sample from the quantitative sample to explain quantitative results in more depth (Creswell and Creswell 2018: 305). The quantitative sample size included all accounting academics at the DUT, therefore a census. According to Maree *et al.* (2019: 45), collecting data from multiple sources, using multiple data collection procedures and research methods (triangulation), reduces bias and the risk of chance associations, enhances the accuracy of findings, thereby supporting and improving a study's validity (Swain 2017: 182; Creamer 2018: 24). This mixed methods research study used quantitative and qualitative data to answer the research questions. Quantitative results were used to inform the qualitative phase in terms of sample selection and the formulation of questions for the semi-structured interviews.

To ensure reliability of the measuring instrument, the survey questionnaire and interview schedule were scrutinised by the supervisor. The quantitative questionnaire was inspected and approved by a professional statistician. Both measuring instruments were pre-tested to eliminate bias. In qualitative research, it is important that questions are asked such that the interviewees understand the questions in the same way (Silverman 2020). The researcher ensured that questions were clear and unambiguous.

3.14 Kaiser-Meyer Olkin and Bartlett's test of sphericity

A Kaiser-Meyer Olkin and Bartlett's test of sphericity were conducted to determine if the data was suitable for factor analysis. KMO values, which measures sampling adequacy, must be equal to or greater than 0.06. The SPSS output indicated that the data was adequate for factor extraction. To be statistically significant, Bartlett's test of sphericity which measures the correlation between variables, must be less than 0.05 (Cohen, Manion and Morrison 2018: 820).

3.15 Ethical considerations

According to Maree *et al.* (2019: 47) there are three main ethical considerations when planning and conducting research. These are: providing informed consent, determining, and communicating risks and benefits, and selecting participants in a fair and equal manner. A mixed methods researcher must be cognizant of these ethical challenges because of the subjective nature of the research study. Swain (2017: 80) identifies six key ethical areas that a researcher must consider: explanations about the

research, informed consent, voluntary participation, right to privacy and confidentiality, protection from harm, and data security. Creswell (2009: 89) states that it is important that participants and the research sites are respected; there must be no deception regarding the purpose of the study and respondents must not be put at risk or harmed in any way.

The applicable ethical issues were considered by the researcher for this study. Prior to the commencement of the study, ethics clearance to conduct the study was obtained from the Ethics committee at the DUT (Annexure C). The researcher also completed an ethics certification training course on ethics (Annexure D) prior to commencement of the research study. The researcher made every effort to comply with the university's ethics procedures through every stage of the research process.

3.16 Summary

This chapter presented the research methodology adopted for this study. The explanatory sequential mixed method research design, encompassing quantitative and qualitative approaches, following a case study research strategy with the associated data collection process and tools were extensively elaborated upon. The selection and discussion on the theoretical framework, pragmatism, was based on the aim, objectives, and methods of inquiry of the study. The concluding segment of the chapter highlighted the significance and necessity of validity and reliability, the judgements of research quality, and the study's adherence to ethical principles. The next chapter discusses the analysis of data and the presentation of findings.

CHAPTER 4: PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

Chapter 3 discussed the research design and the methods that were employed to conduct this study. This study was conducted in two phases where quantitative and qualitative data was collected, using a questionnaire with closed ended questions in an online survey for the initial phase. This empirical research study yielded results that were analysed and used to inform the second qualitative stage of the study. This chapter presents and analyses the data, and reports on the findings from the survey administered to accounting academics and the online interviews with accounting academics. The survey questionnaire was administered to 52 accounting academics, of which 42 (81%) responses were received. The results of the quantitative survey determined the selection of participants (purposive sampling) for the second phase of the study which involved semi-structured interviews with accounting academics. The survey questionnaire results indicated that respondents had on average, 2.41 years of experience teaching accounting using a multimodal approach prior to COVID-19. Online interviews were conducted with 12 accounting academics. The survey results determined the type of questions asked of participants in the interviews. The aim of the study was to explore the teaching of accounting using a multimodal teaching approach at a university of technology (DUT) in KwaZulu-Natal, South Africa. The mixed methods approach was selected for this study with the research design being the explanatory sequential mixed methods design. The responses from the survey questionnaire and the semi-structured interviews were used to satisfy the following objectives of the study:

- To ascertain the technological knowledge needed by academics for multimodal teaching of accounting.
- To determine the extent of the alignment of the accounting curriculum for multimodal teaching.
- To explore the digital pedagogical skills needed for multimodal teaching of accounting.

4.2 Reliability and validity

4.2.1 Validity

Validity is how well an instrument measures the concept it is intended to measure (Sekaran and Bougie 2016: 220). To improve the validity of this study, the researcher used multiple instruments to collect data; a survey questionnaire and semi-structured online/synchronous interviews which were both pre-tested. The supervisor appraised the instrument for face and content validity. To establish factorial validity, the data was submitted for factor analysis.

The results for factor analysis are presented and discussed under the presentation of findings for each section: technological knowledge, curriculum alignment, and digital pedagogical skills.

4.2.2 Reliability

Kumar (2019) states that a research instrument is reliable when it produces similar results when used repeatedly under similar conditions. A reliable instrument is therefore consistent and stable. Inter-item consistency reliability is a consistency test that measures the consistency of respondents' answers to all the items in a measure (Sekaran and Bougie 2016: 224). Cronbach's alpha (alpha coefficient of reliability) measures internal consistency reliability. It is suitable for multipoint-scaled items and provides a coefficient of inter-item correlations. Inter-item consistency reliability is a consistency test that measures the consistency of respondents' answers to all the items in a measure (Sekaran and Bougie 2016: 224). This study used Cronbach's alpha (α) to measure the internal consistency of the multipoint survey response scale. The constructs of the survey that were measured included both independent and dependent variables. The coefficient of reliability was calculated using SPSS v25.

Cronbach is not a statistical test; it is a measure of internal consistency to ensure reliability of the measuring instrument. For this study, the set of items to check the internal reliability of the scale was the quantitative research instrument (survey questionnaire Annexure A). Cohen, Manion and Morrison (2018: 774) suggest the range for the Cronbach alpha coefficient as laid out in Table 4.1.

Table 4.1: Reference ranges for Cronbach's alpha

Alpha coefficient	Internal consistency
> 0.90	Very highly reliable
0.80–0.90	Highly reliable
0.70–0.79	Reliable
0.60–0.69	Marginally/minimally reliable
< 0.60	Unacceptably low reliability

Source: Cohen, Manion and Morrison (2018: 774)

The closer the alpha coefficient is to 1, the greater the internal consistency of scale items.

The internal consistency reliability for each construct for this study is presented and discussed under the presentation and discussion of results for each of the section (themes): technological knowledge, curriculum alignment and digital pedagogical skills.

4.2.3 Kaiser-Meyer Olkin and Bartlett's test of sphericity

A precursor to factor analysis is the Kaiser-Meyer Olkin (KMO) and Bartlett's test of sphericity. A check must be conducted to determine the suitability of the data for factor analysis by examining the KMO and Bartlett test output. The KMO test ensures that the data is suitable for factor analysis. KMO is a measure of sampling adequacy which requires pairs of variables to be statistically significantly correlated. The KMO return values between 0 and 1. The measure of sampling adequacy must be equal to (=) or greater than (>) 0.06. Bartlett's test of sphericity which measures the correlation between variables, should be statistically significant; it must be less than (<) 0.05) (Cohen, Manion and Morrison 2018: 820).

4.2.4 Factor analysis

Factor analysis is an inferential procedure, categorised as a multivariate test often used for data reduction. It is used to assess correlations among variables and to identify groups of interrelated variables that reflect underlying categories within the data (Leedy, Ormrod and Johnson 2021: 368). Factor analysis determines if factors in the research instrument measure the same thing. The various constructs (general technological knowledge, technological knowledge for MS Teams, technological

knowledge for Moodle, curriculum alignment, curriculum alignment extent and digital pedagogical skills) of the questionnaire were subjected to factor analysis to determine the set of items that must be grouped together. The factor extraction method identifies relationship patterns among the items making up the questionnaire. Factor analysis with promax (oblique) rotation was applied to the items within each questionnaire construct. The results are presented and discussed in section 4.5.

4.3 Data collection and capturing

The mixed methods research approach was used for this study. According to Creswell and Creswell (2018), the purpose of using mixed methods is to understand quantitative data at a more detailed level by supplementing with qualitative data. Understanding multimodal teaching within the domain of accounting required the examination of quantitative and qualitative strands to determine the extent to which qualitative results explained and enhanced the quantitative results. The gathered raw data needed to be converted into a form that could be analysed. The researcher had to consider the explanatory nature of the study where the qualitative results were used to provide a more detailed understanding of the quantitative findings and also the type of data analysis tools to employ. SPSS version 25 was used to analyse the data collected from the survey in phase one of the study and NVivo for Windows software was used for the analysis of the qualitative data collected from conducting semi-structured interviews with accounting academics.

The online survey was structured in themes and coded numerically. There were no incomplete questionnaires as respondents could only submit completed questionnaires. Quantitative (raw) data was downloaded from Google Forms to a Microsoft Excel spreadsheet. Thereafter the data was transferred to SPSS version 25 by an external accredited quantitative statistician. The services of an external statistician was used to ensure that results are valid and reliable. The interviews were recorded on MS Teams with the participants permission. The interview data was transcribed and imported into NVivo for Windows software where it was coded in themes.

4.4 Data analysis process

Descriptive statistical analysis and inferential statistical analysis was used to analyse the survey results. The findings are presented using graphs, tables, and narratives.

Thematic analysis was used for the analysis of the interviews. The results are presented and discussed according to themes that address the study's objectives and research questions.

The following research questions were generated to meet the objectives:

1. What technological knowledge do academics need to have to teach accounting using a multimodal approach?
2. To what extent is the current accounting curriculum aligned for multimodal teaching?
3. Which digital pedagogical skills are needed by academics to enable them to employ multimodal teaching in accounting?

Data was collected in two separate phases with a census in the first phase. Qualitative data was collected in the second phase using purposive sampling. The quantitative findings from the online survey determined the sampling and qualitative questions to be asked of participants in the semi-structured interviews. Qualitative results were used to explain in more depth the findings from the survey. The results from the survey are presented first, followed by the findings from the qualitative semi-structured interviews.

The results from the survey (Annexure A) were computed using descriptive and inferential statistics. Biographical data (Section 1) was analysed using primarily descriptive statistics in the form of graphs. Descriptive and inferential statistical analyses were applied to technological knowledge (Section 2), curriculum alignment (Section 3) and digital pedagogical skills (Section 4), to highlight important aspects of the results and to identify patterns that emerged from the analyses. Inferential tests applied were t-tests, chi-square goodness-of-fit-test, binomial test, and the inferential statistical technique, factor analysis. The use of descriptive and inferential statistics allowed for better comparison of the results, and it provided emphasis regarding the themes of the quantitative data.

The analysis of results is presented in sequential order, with four sections, relating to biographical data, technological knowledge, curriculum alignment and digital pedagogical skills (Annexure A), plus an additional section 5, composite test results as represented in the table 4.2 below.

Table 4.2: Presentation of analysis of results

Section	Theme
Section 1	Biographical information – for accounting academics
Question 1 – 6	Biographical information
Section 2	Technological knowledge
Question 7	General technological knowledge
Question 8	MS Teams
Question 9	Moodle
Section 3	Curriculum alignment
Question 10	Alignment of the accounting curriculum
Question 11	Extent of alignment of the accounting curriculum
Section 4	Digital pedagogical skills
Question 12	Digital pedagogical skills
Section 5	Composite test results

4.5 Descriptive and inferential statistics

The presentation of findings for section 2 to 4 of the questionnaire encompasses both descriptive and inferential statistics. Descriptive statistics include mean, standard deviation, percentage, and frequency. Inferential statistics employed were one sample test, chi- square goodness-of-fit test, binomial test, and factor analysis. All testing used a significance level of 5% ($\alpha = 0.05$) that conformed to a 95% confidence interval, significant 2-tailed.

4.5.1 One-sample t-test

The one sample t-test examines if the population mean is statistically different to a known hypothesised value. The one sample t-test was applied to test if the mean values were significantly different from the central rating of 3 and interpreted as per Table 4.3.

Table 4.3: Interpreting the results of one sample t-test

Mean > 3	Mean < 3	Question
Significantly important	Significantly unimportant	7, 8, 9
Significant agreement	Significant disagreement	10
Significantly necessary	Significantly unnecessary	12

P- value	Interpretation
p > .05	There is no statistical significance
p < .05	There is statistical significance

4.6 Presentation of quantitative findings

4.6.1 Section 1: Biographical information

This section analyses the respondents' biographical data obtained from respondents from the Faculty of Accounting and Informatics. A response rate of 80% was achieved. The results are reported using frequency percentages in the categories of gender, age, qualification, lecturing experience, digital teaching proficiency, and experience with multimodal teaching.

4.6.1.1 Gender, age, and qualification category

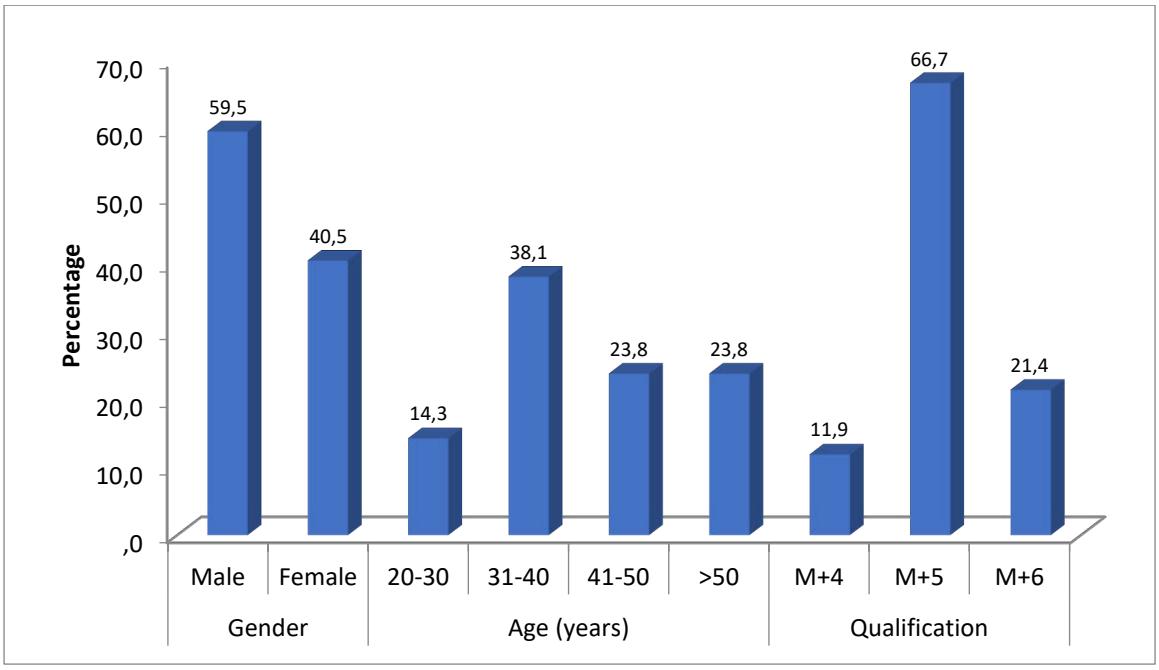


Figure 4.1: Frequency percentage for gender, age and qualification

Figure 4.1 shows the comparative analysis between male and female respondents, with males at 59.5% and females at 40.5%. A corresponding frequency distribution of 19% difference (59.5 and 40.5) exists in the gender category. This could be interpreted as being the result of the accounting cluster having employed more male than female academics.

Figure 4.1 displays the age category of the sample respondents. Most respondents were between the ages of 31-40 years (38.1%). Respondents aged 41-50 years and those older than 50 years were equal at 23.8%. The lowest percentage of respondents were aged 20-30 years (14.3%). Thus, the majority of respondents were between 31-40 years which represents a percentage of 38.1.

To ascertain the qualifications of the respondents they were requested to provide their highest academic qualification. The qualifications were categorised as Honours/Btech degree (M+4), Masters degree (M+5) and Doctorate/PhD (M+6). Figure 4.1 shows the qualification category of respondents, indicated in percentages. A significant number of respondents surveyed are in possession of a masters degree (66.7%). Respondents with doctoral degrees was at 21.4%, while 11.9% of the respondents were in possession of an honours degree/BTech (Bachelor of Technology).

4.6.1.2 Lecturing experience and proficiency

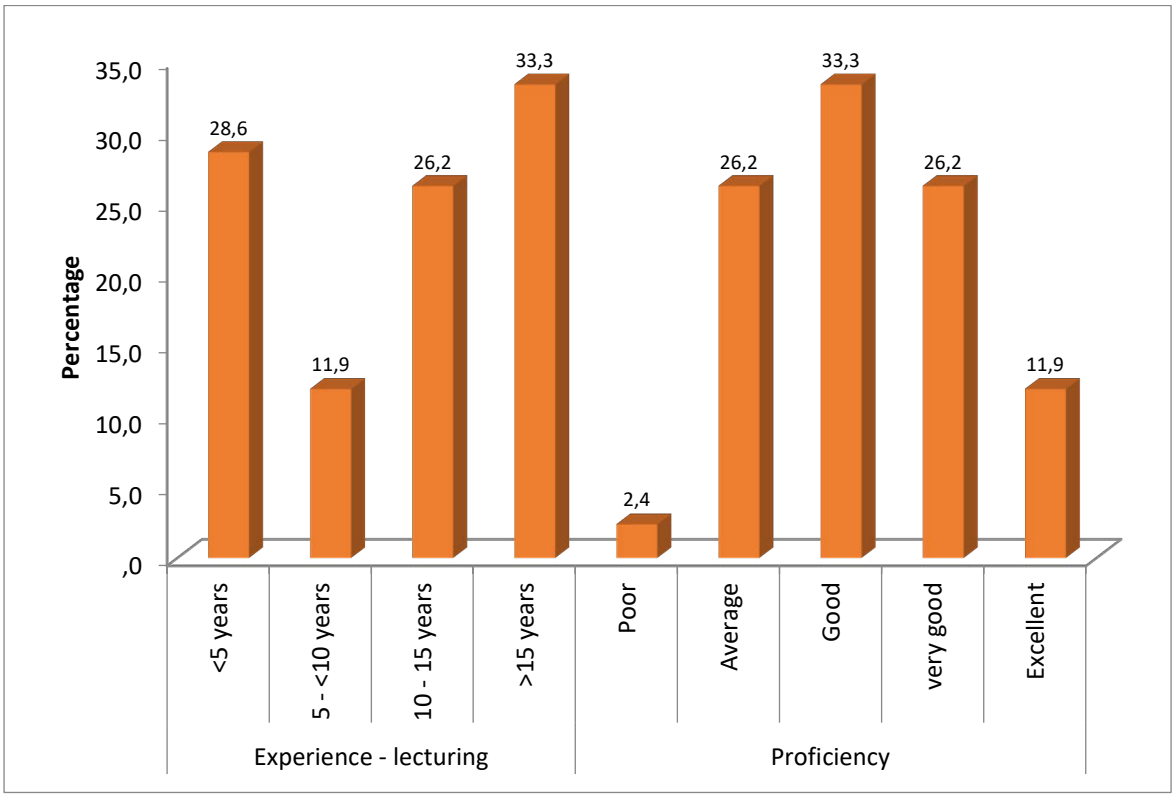


Figure 4.2: Frequency percentage for lecturing experience and proficiency

Respondents were asked to indicate the number of years teaching experience. Figure 4.2 indicates a significant number of accounting academics surveyed (33.3%) having teaching experience of more than 15 years. This together with the fact that 26.2% of the respondents have 10-15 years teaching experience is an indication of the teaching expertise within the accounting cluster. A sizeable number of respondents (28.6%) had less than five years of lecturing experience while respondents with 5-10 years teaching experience were at a frequency of 11.9%. Figure 4.2 shows that more than 50% of the respondents have lecturing experience of 10 years or more.

Respondents were asked to rate their proficiency in teaching with digital technology. The highest percentage of respondents who rated their proficiency in digital teaching as good, was 33.3%. The number of respondents who assessed their competency in digital teaching as average, was 26.2%. The number of respondents who evaluated their digital teaching skill as very good was 26.2% and 11.9% stated that their digital teaching skills were excellent. Only 2.4% of the respondents described their proficiency in teaching with technology as poor. More than 70% of the respondents rated their digital teaching skills as above average (good – excellent). This augurs well for the accounting cluster, as accounting academics may be able to engage in multimodal teaching. These ratings must be approached with caution, as the respondents were asked to rate their own proficiency, which is subjective.

4.6.1.3 Number of years of multimodal teaching

Respondents were asked to indicate the number of years of experience they had, teaching accounting using a multimodal approach prior to the COVID-19 pandemic. Forty- two responses were received. According to the responses, the number of years of experience academics had teaching accounting multimodally prior to the COVID-19 outbreak, ranged from zero to fifteen years. An average value was calculated, indicating that the number of years of experience of respondents using a multimodal approach before COVID-19 was 2.41 years with a corresponding standard deviation of ± 3.046 years.

4.6.2 Section 2: Technological knowledge

Technological knowledge for multimodal teaching of accounting comprises general technological knowledge, and technological knowledge for using Microsoft Teams and Moodle.

4.6.2.1 General technological knowledge

The statistical results for general technological knowledge are presented below.

4.6.2.1.1 Mean values and one sample test

Table 4.4 below summarises the results of one-sample statistics and one sample test (t-test). Figure 4.3 shows the mean values in graphical format.

Table 4.4: General technological knowledge: mean values and one sample test results

Item	N	Mean (SD)	t	df	p-value
7.1 Understanding the technological infrastructure of the institution (e.g. email/ MS Teams/ Moodle/ SharePoint)	42	4.55 (0.633)	15.856	41	< .001*
7.2 Knowing how to access technical support at the institution	42	4.45 (0.889)	10.587	41	< .001*
7.3 Possessing a working knowledge of digital hardware (e.g. laptop, router, digital tablet with pen)	42	4.48 (0.804)	11.905	41	< .001*
7.4 Knowing how to use privacy and security settings in a digital teaching environment	42	4.31 (0.680)	12.475	41	< .001*
7.5 Having knowledge about a range of technological tools that are available to teach accounting	42	4.40 (0.767)	11.870	41	< .001*
7.6 Understanding how the different features of a digital tool can be used for effective teaching	42	4.38 (0.825)	10.848	41	< .001*
7.7 Knowing how to integrate the various digital tools/software for a lecture	42	4.36 (0.727)	12.106	41	< .001*

* indicates significant at the 95% level

Table 4.4 shows the statistical analysis of mean values for general technological knowledge needed by academics to engage in multimodal teaching of accounting. Respondents were asked to indicate the importance of possessing general technological knowledge to successfully teach accounting multimodally. A five-point Likert rating scale with seven items, was used, ranging from 1 = not at all important to 5 = extremely important in ascending order. Results in Table 4.4 were generated through the application of one-sample test.

Each of these items regarding technological knowledge is shown to be significantly important ($p < .05$) to successfully engage in multimodal teaching of accounting. The highest importance rating is given to “understanding the technological infrastructure of the institution” ($M = 4.55$; $p < .001$) and the lowest to “knowing how to use privacy and security settings in a digital teaching environment” ($M = 4.31$; $p < .001$).

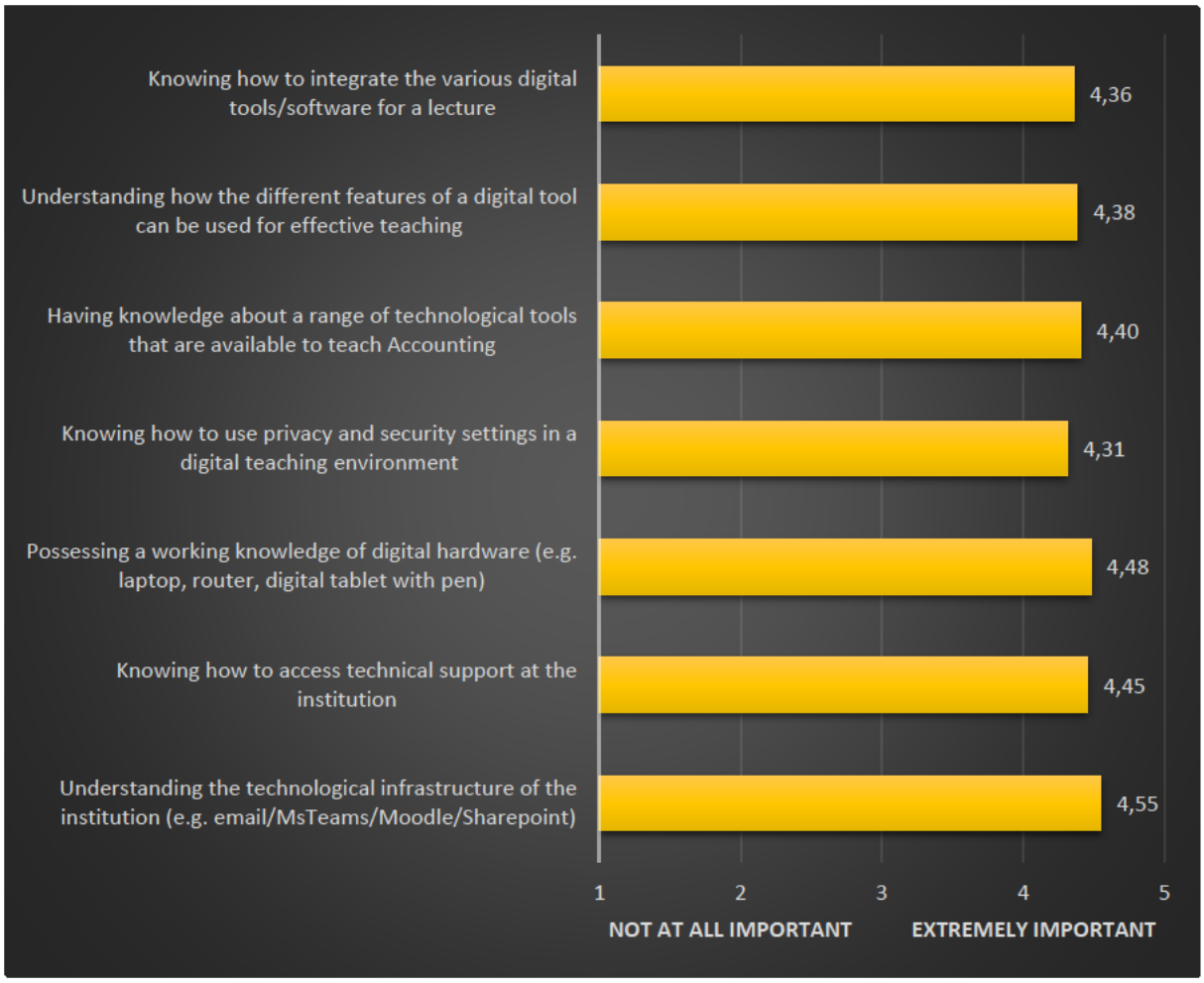


Figure 4.3: General technological knowledge mean values

4.6.2.1.2 Factor analysis

Table 4.5: Summary of factor loadings

	Factor
	1
7.7 Knowing how to integrate the various digital tools/software for a lecture	.863
7.6 Understanding how the different features of a digital tool can be used for effective teaching	.838
7.3 Possessing a working knowledge of digital hardware (e.g. laptop, router, digital tablet with pen)	.800
7.1 Understanding the technological infrastructure of the institution (e.g.email/ MS Teams/ Moodle/ Sharepoint)	.782
7.4 Knowing how to use privacy and security settings in a digital teaching environment	.748
7.2 Knowing how to access technical support at the institution	.744
7.5 Having knowledge about a range of technological tools that are available to teach accounting	.706

Table 4.5 shows the factor loading matrix for the general technological knowledge construct. Factor analysis with promax rotation was applied to these seven items. One factor was extracted which accounts for 61.57% of the variance in the data. A KMO of .831 and a significant Bartlett's test of sphericity indicates that the data was adequate for successful and reliable extraction.

4.6.2.1.3 Composite variable

A composite variable representing general technological knowledge (GENTK) was formed by calculating the average of the importance scores across the seven items. The reliability of the composite variable was tested using Cronbach's alpha. The achieved value of 0.914 indicates that this composite variable was reliable.

4.6.2.2 Technological knowledge for MS Teams

4.6.2.2.1 Mean values and one sample test

Table 4.6: MS Teams: mean values and one sample test results

Item	N	Mean	Standard deviation	t	df	p-value
8.1 Setting up MS Teams	42	4.60	0.734	14.075	41	< .001*
8.2 Creating/joining a team	42	4.62	0.623	16.847	41	< .001*
8.3. Adding members to an existing team	42	4.62	0.582	18.017	41	< .001*
8.4 Scheduling a lecture	42	4.71	0.457	24.298	41	< .001*
8.5 Starting an online lecture	42	4.69	0.517	21.174	41	< .001*
8.6 Uploading resources	42	4.71	0.457	24.298	41	< .001*
8.7 Creating new channels within a team	42	4.33	0.874	9.884	41	< .001*
8.8 Creating breakout rooms for student collaboration	42	4.29	0.805	10.350	41	< .001*
8.9 Using the chat feature for class/individual discussions	42	4.50	0.634	15.324	41	< .001*
8.10 Using the voice call option	42	4.14	0.952	7.782	41	< .001*
8.11 Collaboration using groups, forums, wikis, etc.	42	4.00	1.082	5.990	41	< .001*
8.12 Making announcement to class/individual students	42	4.48	0.862	11.096	41	< .001*
8.13 Sending emails to members from a team	42	4.33	0.846	10.216	41	< .001*
8.14 Customizing the messages you receive, using the notifications setting	42	4.24	0.906	8.861	41	<.001*
8.15 Using ‘PVT’ chat or “message me directly”	42	4.05	1.011	6.716	41	< .001*
8.16 Using “Roadmaps” or “Add from app store” to add new features	42	3.60	1.270	3.038	41	= .004*
8.17 Switching off the camera or muting the microphone	42	4.50	0.672	14.472	41	< .001*
8.18 Using “polls” to gather feedback	42	4.07	1.068	6.500	41	< .001*
8.19 Setting up audio	42	4.26	0.912	8.965	41	< .001*
8.20 Viewing participants and changing their permissions	42	4.48	0.634	15.091	41	< .001*
8.21 Using the ‘Analytics” feature to track attendance and level of student activity	42	4.36	0.850	10.344	41	< .001*
8.22 Sharing your screen/whiteboard	42	4.67	0.570	18.941	41	< .001*
8.23 Recording a meeting/lesson	42	4.79	0.415	27.866	41	< .001*
8.24 Accessing a recorded meeting/lesson	42	4.71	0.596	18.636	41	< .001*
8.25 Accessing other APPS via MS Teams	42	4.07	1.045	6.644	41	< .001*

* indicates significant at the 95% level

Table 4.6 shows the statistical analysis of mean values for technological knowledge of MS Teams needed by academics to engage in multimodal teaching of accounting. Respondents were asked to indicate the importance of possessing technological knowledge of MS Teams to successfully teach accounting using a multimodal approach. A five-point Likert rating scale with 25 items, was used, ranging from 1 = not at all important to 5 = extremely important in ascending order. Results in Table 4.6 were generated using one-sample test.

Each of the 25 items making up technological knowledge of MS Teams is thought to be significantly important ($p < .05$) to successfully engage in multimodal teaching of accounting. The highest importance rating is given to “recording a meeting/lesson” ($M = 4.79$; $p < .001$). Equal ratings were ascribed to “accessing a recorded meeting/lesson” ($m = 4.71$; $p < .001$), “scheduling a lecture” ($M = 4.71$; $p < .001$), “uploading resources” ($M = 4.71$; $p < .001$). The lowest rating was given to “using roadmaps/add from app store to add new features” ($M = 3.60$; $p = .004$).

The mean values for technological knowledge for MS Teams are presented below in Figure 4.4.

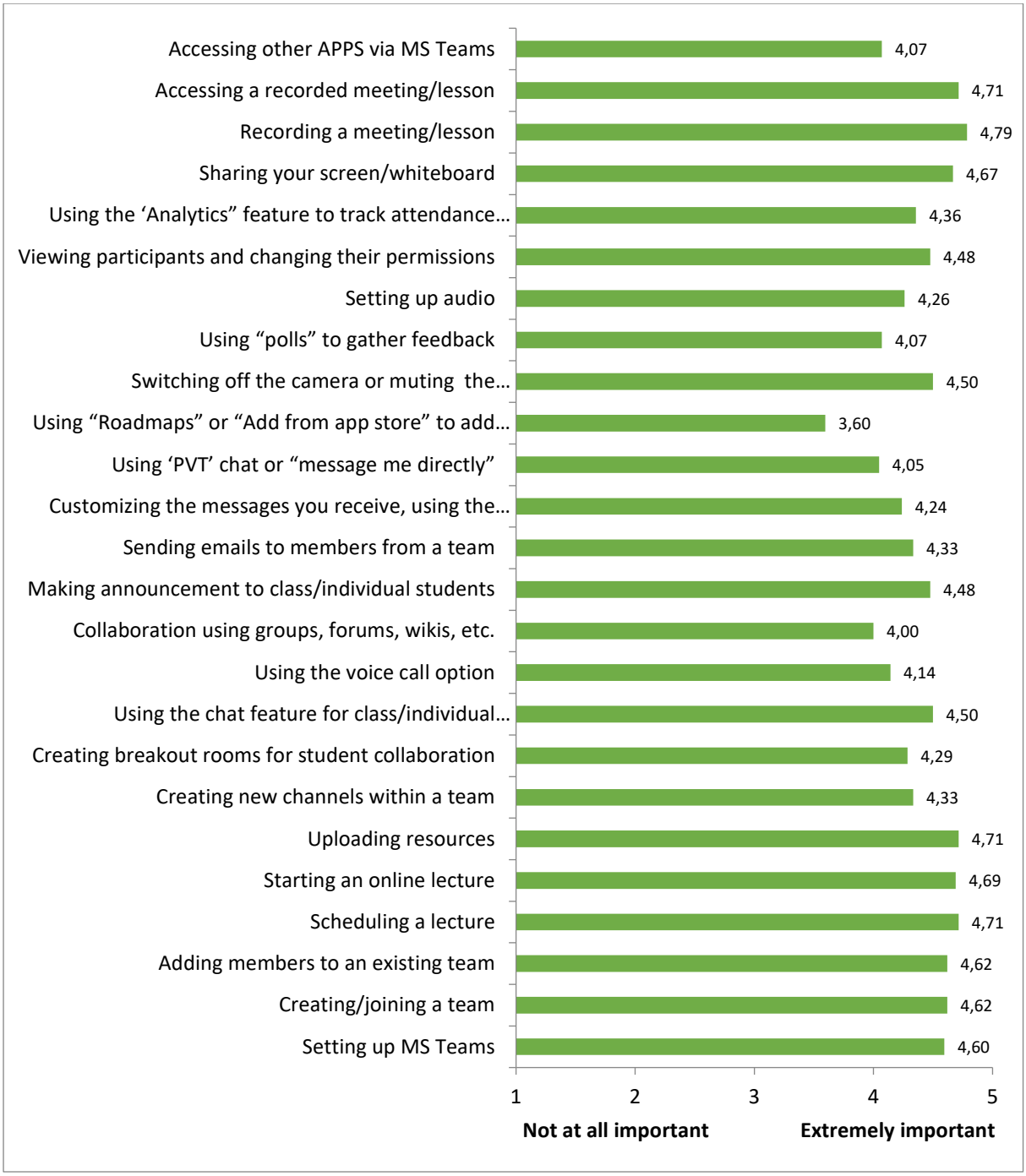


Figure 4.4: Technological knowledge for MS Teams: mean values

4.6.2.2.2 Factor analysis

Factor analysis with promax rotation was applied to these 25 items. Three factors were extracted which account for 66.33% of the variance in the data. A KMO of .740 and a significant Bartlett's test indicates that the data was adequate for successful and reliable extraction. The factor loadings are summarised in Table 4.7.

Table 4.7: Factor loadings – Using MS Teams

	Factor		
	1	2	3
8.25 Accessing other APPS via MS Teams	.936		
8.11 Collaboration using groups, forums, wikis, etc.	.881		
8.10 Using the voice call option	.865		
8.7 Creating new channels within a team	.859		
8.16 Using "Roadmaps" or "Add from app store" to add new features	.753		
8.15 Using 'PVT' chat or "message me directly"	.744		
8.14 Customizing the messages you receive, using the notifications setting	.650		
8.21 Using the 'Analytics" feature to track attendance and level of student activity	.640		
8.12 Making announcement to class/individual students	.573		
8.8 Creating breakout rooms for student collaboration	.538		
8.9 Using the chat feature for class/individual discussions	.525		
8.13 Sending emails to members from a team	.345		
8.5 Starting an online lecture		.902	
8.6 Uploading resources		.852	
8.4 Scheduling a lecture		.815	
8.2 Creating/joining a team		.782	
8.3 Adding members to an existing team		.758	
8.1 Setting up MS Teams		.706	
8.20 Viewing participants and changing their permissions			.777
8.17 Switching off the camera or muting the microphone			.722
8.24 Accessing a recorded meeting/lesson			.692
8.18 Using "polls" to gather feedback			.628
8.23 Recording a meeting/lesson			.618
8.22 Sharing your screen/whiteboard			.568
8.19 Setting up audio			.536

4.6.2.2.3 Composite variables

Details of these factors (Table 4.7) and their reliability are summarised in Table 4.8.

Table 4.8: Technological knowledge for MS Teams

Factor	Construct	Items included	Variance extracted	Cronbach's alpha
1	Complex use of the application (COM)	8.7 – 8.16, 8.21, 8.25	46.65	0.941
2	Setting up and conducting the lecture (LEC)	8.1 – 8.6	12.86	0.919
3	Controlling the lecture session (ConLec)	8.17 – 8.20, 8.22 – 8.24	6.83	0.870

Composite variables are formed by calculating the average of the importance ratings for all items included in a variable. With a minimum value for alpha of 0.870, these composite variables are all reliable.

4.6.2.3 Technological knowledge Moodle

Statistical results for technological knowledge on using Moodle is presented below.

4.6.2.3.1 Mean values and one sample test

Table 4.9: Moodle: mean values and one sample test results

Item	N	Mean	Standard deviation	t	df	p-value
9.1 Creating, organizing, and uploading content for your course	42	4.57	0.801	12.719	41	< .001*
9.2 Using the Announcement forum to communicate with students	42	4.43	0.887	10.433	41	< .001*
9.3 Using the "Show/Hide" feature to control access to specific course activities	42	4.48	0.804	11.905	41	< .001*
9.4 Creating, modifying and uploading a quiz	42	4.55	0.803	12.498	41	< .001*
9.5 Creating an assignment that allows students to submit their work	42	4.45	0.861	10.930	41	< .001*
9.6 Setting up a discussion forum for students to communicate in real time using text	42	4.14	0.952	7.782	41	< .001*
9.7 Configuring the Gradebook to calculate course grades	42	4.29	0.944	8.822	41	< .001*
9.8 Creating a grading rubric	42	4.21	0.925	8.509	41	< .001*
9.9 Running reports to monitor student activity	42	4.19	0.943	8.180	41	< .001*
9.10 Knowing how to take attendance	42	4.24	0.932	8.609	41	< .001*
9.11 Adding/deleting sections to your course page	42	4.36	0.879	10.012	41	< .001*
9.12 Editing the course name on your course page	42	4.36	0.906	9.709	41	< .001*
9.13 Adding a textbook to your course page	42	4.24	0.983	8.162	41	< .001*
9.14 Adding images to your course page	42	3.98	1.199	5.275	41	< .001*
9.15 Adding a syllabus to your course page	42	4.29	0.891	9.349	41	< .001*
9.16 Adding hyperlinks to online resources, to your course page	42	4.14	1.026	7.220	41	< .001*
9.17 Adding videos to your course page	42	4.21	1.048	7.506	41	< .001*

* indicates significant at the 95% level

Table 4.9 shows the statistical analysis of mean values for technological knowledge of Moodle, required by academics to engage in multimodal teaching of accounting. Respondents were asked to rate the importance of possessing technological knowledge of Moodle to successfully teach accounting multimodally. A five-point Likert rating scale with 17 items, was used, ranging from 1 = not at all important to 5 = extremely important in ascending order. Results in Table 4.9 were generated through the use of one-sample test.

Each of these items regarding technological knowledge of Moodle is shown to be significantly important ($p < .05$) to successfully engage in multimodal teaching of accounting. The highest importance rating is given to “creating, organizing and uploading content for your course” ($M = 4.57$; $p < .001$), the second highest importance rating was “creating, modifying and uploading a quiz” ($M = 4.55$; $p < .001$) and the lowest importance rating is given to “adding images to your course page” ($M = 3.98$; $p < .001$).

Figure 4.5 shows the mean values for technological knowledge for Moodle.

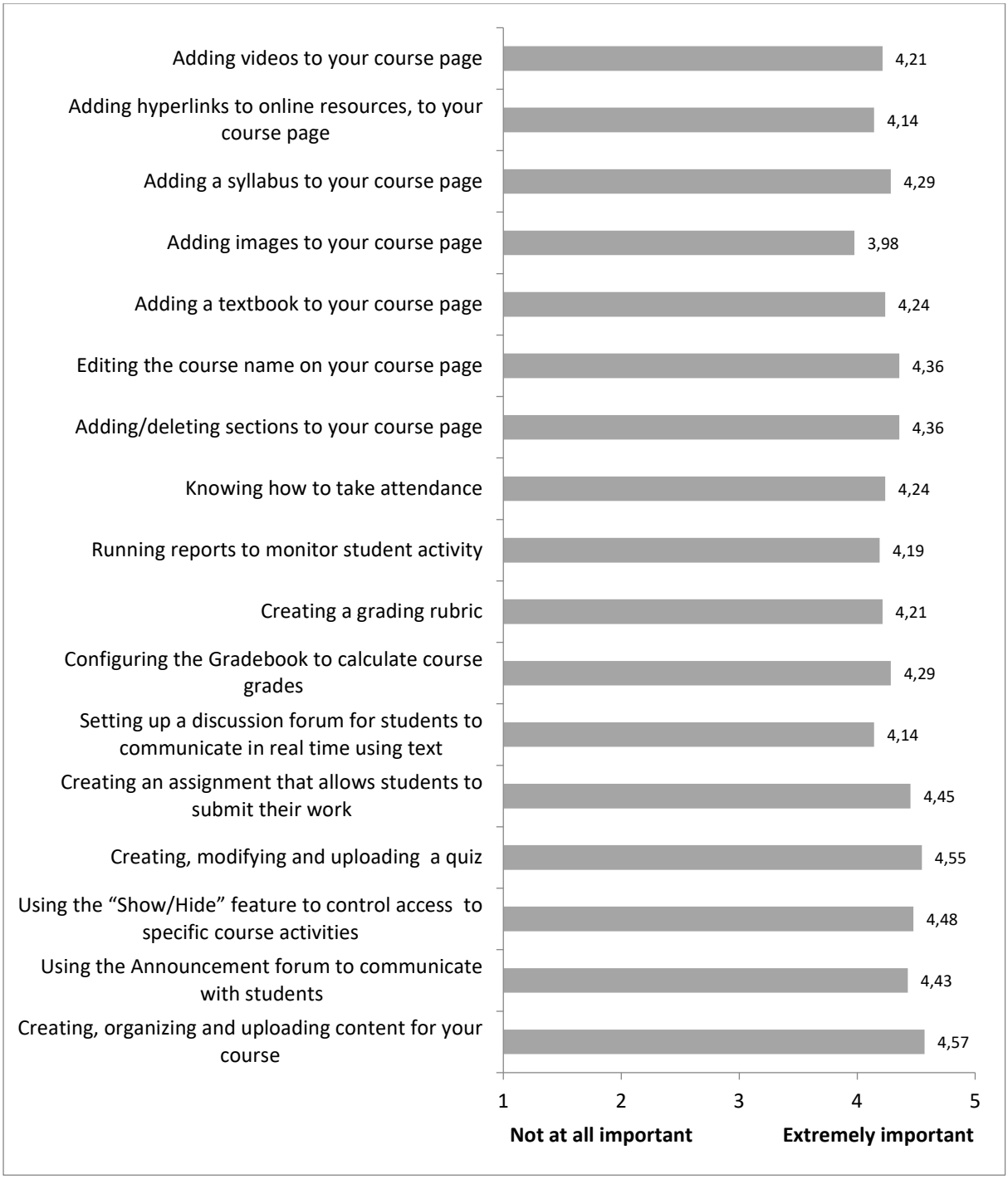


Figure 4.5: Mean values for Moodle

4.6.2.3.2 Factor analysis

Factor analysis with promax rotation was applied to these 17 items. One factor was extracted which accounts for 72.32% of the variance in the data. A KMO of .866 and a significant Bartlett's test indicates that the data was adequate for successful and reliable extraction. The factor loadings are summarised in Table 4.10.

Table 4.10: Factor loadings - Moodle

	Factor
	1
9.15 Adding a syllabus to your course page	.937
9.11 Adding/deleting sections to your course page	.923
9.16 Adding hyperlinks to online resources, to your course page	.892
9.13 Adding a textbook to your course page	.881
9.12 Editing the course name on your course page	.877
9.17 Adding videos to your course page	.876
9.5 Creating an assignment that allows students to submit their work	.875
9.4 Creating, modifying and uploading a quiz	.875
9.10 Knowing how to take attendance	.874
9.8 Creating a grading rubric	.851
9.6 Setting up a discussion forum for students to communicate in real time using text	.849
9.3 Using the “Show/Hide” feature to control access to specific course activities	.839
9.7 Configuring the Gradebook to calculate course grades	.813
9.1 Creating, organizing and uploading content for your course	.787
9.14 Adding images to your course page	.777
9.2 Using the Announcement forum to communicate with students	.762
9.9 Running reports to monitor student activity	.740

4.6.2.3.3 Composite variables

A composite variable representing general technological knowledge (MOODLE) was formed by calculating the average of the importance scores across the 17 items. The reliability of the composite variable was tested using Cronbach’s alpha. The achieved value of 0.977 indicates that this composite variable is reliable.

4.6.3 Section 3 Alignment of the accounting curriculum

Statistical results for adaptation of the accounting curriculum and the extent of accounting curriculum realignment for multimodal teaching are presented below.

4.6.3.1 Adaptation of the accounting curriculum

A summary of results for adaptation of the accounting curriculum for multimodal teaching is presented below in Table 4.11.

4.6.3.1.1 Frequencies, mean values and one sample test

Table 4.11: Adaptation of accounting curriculum: frequencies, mean values and one sample test results

Item	Responses as Frequency (%)						n	Mean (SD)	t	df	p-value
	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree					
10.1 The institution's guidelines to assist with adapting the accounting curriculum for multimodal teaching were easily accessible and relevant	2 (4.8)	7 (16.7)	5 (11.9)	15 (35.7)	10 (23.8)	3 (7.1)	42	3.79 (1.317)	3.868	41	< .001*
10.2 Open learning resources, (for example, creative commons) were accessible to assist with re-aligning the accounting curriculum for multimodal teaching	3 (7.1)	5 (11.9)	5 (11.9)	16 (38.1)	10 (23.8)	3 (7.1)	42	3.81 (1.330)	3.946	41	< .001*
10.3 The learning goals and outcomes were timeously identified and adapted for multimodal teaching	3 (7.1)	5 (11.9)	3 (7.1)	7 (16.7)	23 (54.8)	1 (2.4)	42	4.07 (1.369)	5.074	41	< .001*
10.4 The accounting course content was reviewed and adjusted for a multimodal teaching approach	6 (14.3)	4 (9.5)	3 (7.1)	7 (16.7)	19 (45.2)	3 (7.1)	42	3.90 (1.590)	3.688	41	.001*
10.5 The range of learning activities was adapted for students to master the re-designed content	3 (7.1)	4 (9.5)	7 (16.7)	8 (19.0)	17 (40.5)	3 (7.1)	42	3.98 (1.388)	4.558	41	< .001*
10.6 Collaboration among academics in the accounting cluster ensured that there was no duplication of content in related courses after the re-alignment of the accounting curriculum content for multimodal teaching	8 (19.0)	5 (11.9)	4 (9.5)	6 (14.3)	16 (38.1)	3 (7.1)	42	3.62 (1.696)	2.366	41	.023*
10.7 The modified curriculum encouraged active student engagement through the learning activities	6 (14.3)	5 (11.9)	2 (4.8)	8 (19.0)	19 (45.2)	2 (4.8)	42	3.83 (1.576)	3.427	41	.001*
10.8 The adapted curriculum allowed students to reflect on the learning trajectory in relation to their own learning pathways	5 (11.9)	4 (9.5)	4 (9.5)	13 (31.0)	13 (31.0)	3 (7.1)	42	3.81 (1.469)	3.571	41	.001*
10.9 Skills and knowledge required by students were digitally embedded within the re-designed content	4 (9.5)	8 (19.0)	1 (2.4)	8 (19.0)	18 (42)	3 (7.1)	42	3.88 (1.549)	3.685	41	.001*
10.10 Learning materials were updated and made easily accessible to students	3 (7.1)	4 (9.5)	0	7 (16.7)	13 (31.0)	15 (35.7)	42	4.62 (1.561)	6.772	41	< .001*

* indicates significance at the 95% level

Table 4.11 depicts the survey results for the adaptation of the accounting curriculum for multimodal teaching. Respondents were asked if the accounting curriculum was adapted for multimodal teaching. A six-point Likert scale with (10 items, with ratings from strongly disagree to strongly agree, was used.

It is encouraging to note that 19 (45.2%) respondents agreed and a further three (7.1%) strongly agreed that the accounting curriculum content was reviewed and adjusted for multimodal teaching. A notable 73.9% (combined rating of slightly agree to strongly agree) of respondents indicated that the learning goals and outcomes were timeously identified and adapted for multimodal teaching. It is interesting to note that over 80% (combined rating of slightly agree to strongly agree) of the respondents agreed that learning materials were updated and made easily accessible to students, with 35.7% (15) strongly agreeing. Fifteen respondents (15; 35.7%) slightly agreed that the institution's guidelines to assist with adapting the accounting curriculum for multimodal teaching were easily accessible and relevant, while 10 respondents (23.8%) where in agreement and three respondents (7.1%) strongly agreed. A notable 17 (40.5%) respondents agreed that the range of learning activities was adapted for students to master the re-designed content, while 8 (19%) respondents slightly agreed and a further 3 (7.1%) respondents strongly agreed.

There is significant agreement ($p < .05$) with each of the items regarding adaptation of the accounting curriculum for multimodal teaching. The highest agreement rating is given to "learning materials were updated and made easily accessible to students" ($M = 4.62$; $p < .001$) while "the learning goals and outcomes were timeously identified and adapted for multimodal teaching" ($M = 4.07$; $p < .001$) received the second highest agreement. "Collaboration among academics in the accounting cluster ensured that there was no duplication of content in related courses after the re-alignment of the accounting curriculum content for multimodal teaching" received the lowest mean score (Mean = 3.62; $p = .023$), with 17 respondents (40%) disagreeing with the statement.

Figure 4.6 is a graphical representation of mean values for accounting curriculum adaptation.

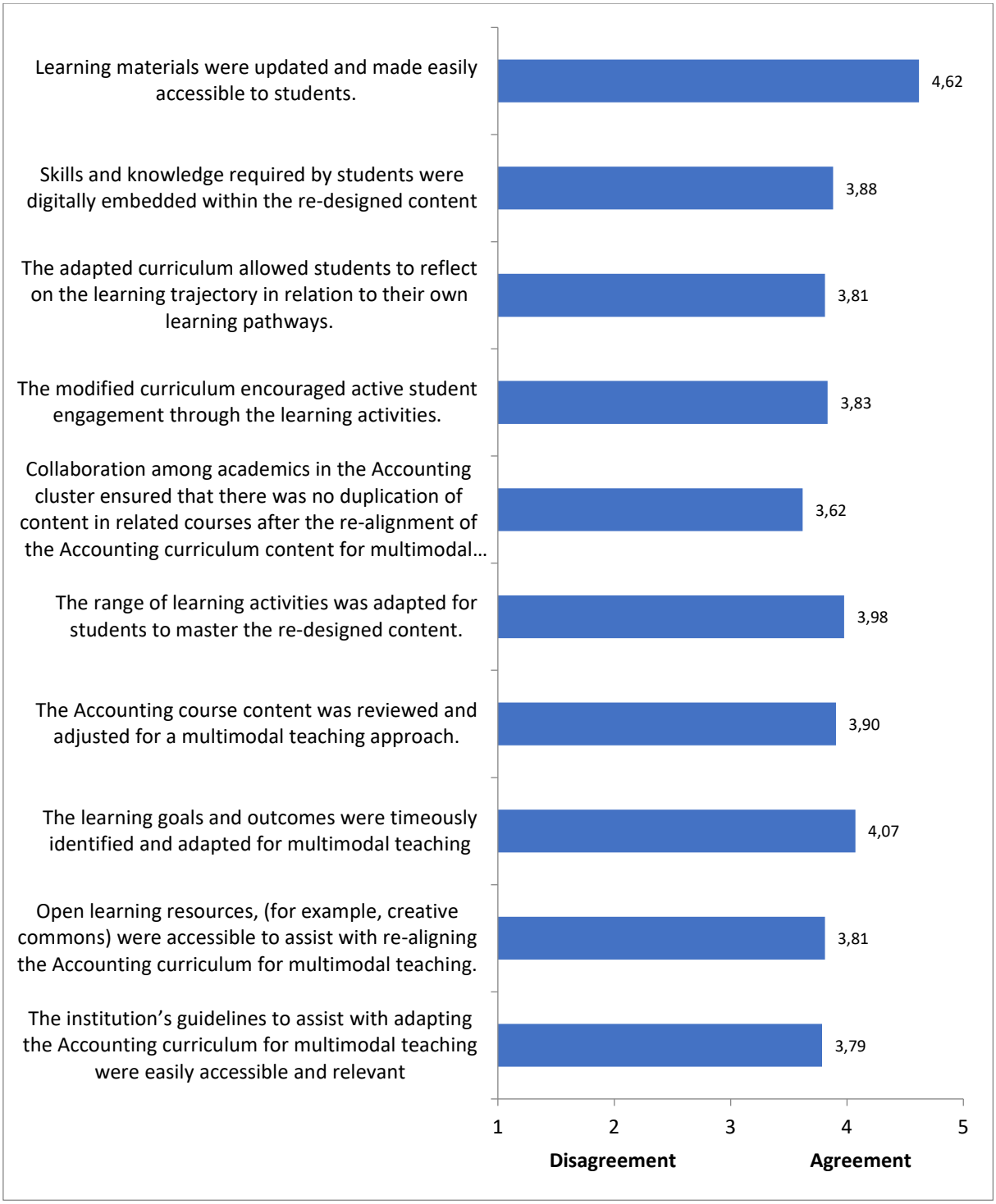


Figure 4.6: Mean values for accounting curriculum adaptation

4.6.3.1.2 Factor analysis

Factor analysis with promax rotation was applied to these 10 items. One factor was extracted which accounts for 67.71% of the variance in the data. A KMO of .880 and a

significant Bartlett's test indicates that the data was adequate for successful and reliable extraction. The factor loadings are summarised in Table 4.12.

Table 4.12: Factor loadings – Accounting curriculum adaptation

	Factor
	1
10.7 The modified curriculum encouraged active student engagement through the learning activities	.946
10.8 The adapted curriculum allowed students to reflect on the learning trajectory in relation to their own learning pathways	.932
10.5 The range of learning activities was adapted for students to master the re-designed content	.930
10.3 The learning goals and outcomes were timeously identified and adapted for multimodal teaching	.924
10.4 The accounting course content was reviewed and adjusted for a multimodal teaching approach	.904
10.9 Skills and knowledge required by students were digitally embedded within the re-designed content	.854
10.2 Open learning resources, (for example, creative commons) were accessible to assist with re-aligning the accounting curriculum for multimodal teaching	.698
10.10 Learning materials were updated and made easily accessible to students	.665
10.6 Collaboration among academics in the accounting cluster ensured that there was no duplication of content in related courses after the re-alignment of the accounting curriculum content for multimodal teaching	.663
10.1 The institution's guidelines to assist with adapting the accounting curriculum for multimodal teaching were easily accessible and relevant	.612

4.6.3.1.3 Composite variables

A composite variable representing general adaptation of the accounting curriculum for multimodal teaching (ADAPT) is formed by calculating the average of the importance scores across the 10 items. The reliability of the composite variable is tested using Cronbach's alpha. The achieved value of 0.950 indicates that this composite variable is reliable.

4.6.3.2 Extent of realignment of the accounting curriculum

The statistical results for extent of accounting curriculum realignment for multimodal teaching is presented below.

4.6.3.2.1 Response frequencies and chi-square goodness-of-fit-test

Table 4.13 shows the results for respondent responses and chi-square goodness-of-fit-test.

Table 4.13: **Summary of frequencies and chi-square goodness-of-fit test results**

Item	Responses as Frequency (%)						Chi-square X^2	df	p-value
	Not at all	A very small extent	A small extent	A moderate extent	A large extent	A very large extent			
11.1 To what extent was the accounting curriculum content re-worked to make it compatible for multimodal teaching?	5 (11.9)	8 (19.0)	5 (11.9)	**15** (35.7)	8 (19.0)	1 (2.4)	15.714	5	.008 *
11.2 To what extent did the learning objectives/ outcomes need to be revised?	8 (19.0)	5 (11.9)	5 (11.9)	**16** (38.1)	7 (16.7)	1 (2.4)	18.000	5	.003 *
11.3 To what extent did the restructuring of the content influence the coherence and alignment of the learning trajectory for multimodal teaching?	5 (11.9)	3 (7.1)	10 (23.8)	**17** (40.5)	6 (14.3)	1 (2.4)	23.714	5	.000 *
11.4 To what extent were the learning activities altered to allow for the mastering of the re-aligned content by students?	5 (11.9)	4 (9.5)	7 (16.7)	**17** (40.5)	9 (21.4)	0	12.762	4	.012 *
11.5 To what extent did the learning materials need updating?	3 (7.1)	2 (4.8)	9 (21.4)	**15** (35.7)	**11** (26.2)	2 (4.8)	21.429	5	.001 *
11.6 To what extent does the adapted curriculum assert the attainment of lifelong skills?	2 (4.8)	6 (14.3)	9 (21.4)	**15** (35.7)	**10** (23.8)	0	11.095	4	.026 *
11.7 To what extent does the adapted curriculum content promote active learning?	3 (7.1)	6 (14.3)	6 (14.3)	**13** (31.0)	**11** (26.2)	3 (7.1)	12.286	5	.031 *

* indicates significance at the 95% level

The chi-square goodness-of-fit test is a univariate test, used on categorical data. This analysis was done to determine if any response option was selected significantly more often. Under the null hypothesis, it is assumed that all responses are equally selected.

Respondents were asked to indicate the extent of accounting curriculum realignment for multimodal teaching. A six-point Likert scale was configured with seven items. The rating options extended from “not at all” to “a very large extent”.

Table 4.13 shows the results of response frequencies and chi-square goodness-of-fit test. Fifteen (15; 35.7%) respondents indicated that the accounting curriculum content had been reworked to make it compatible for multimodal teaching, to a moderate extent. Sixteen (16; 38.1%) respondents indicated that the learning objectives/outcomes needed to be revised, to a moderate extent. Seventeen respondents (17; 40.5%) believed that the restructuring of the content influenced the coherence and alignment of the learning trajectory for multimodal teaching to a moderate extent. The number of respondents who indicated that learning activities were altered to allow for the mastering of the re-aligned content by students, to a moderate extent, totalled 17 (40.5%). With respect to the “extent the learning materials required updating”, a total of 15 respondents (35.7%) selected a moderate extent, while 11 respondents (26.2%) chose “a large extent”. The adapted curriculum asserts the attainment of lifelong skills, to a moderate extent, was the view of 15 respondents (35.7%), while 10 respondents (23.8%) indicated that it was to a large extent. Thirteen (13; 31%) respondents indicated that the adapted curriculum content promoted active learning to a moderate extent, while 11 respondents (26.2%) felt it was to a large extent.

The frequencies for extent of realignment of the accounting curriculum is presented as a graph in Figure 4.7.

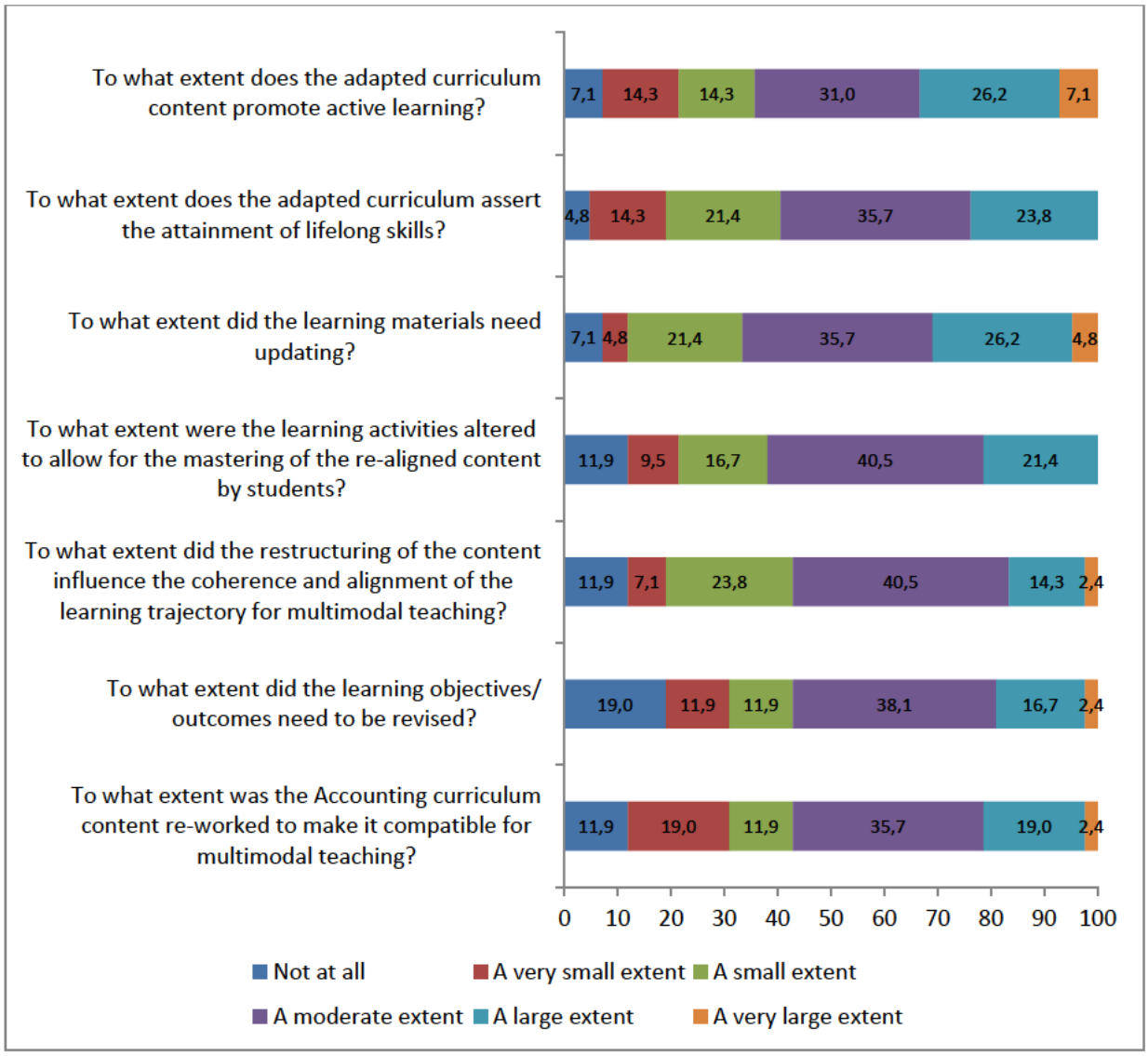


Figure 4.7: **Frequencies (%) for extent of realignment of the accounting curriculum**

4.6.3.2.2 Categorical principal components analysis

Analysis was done using a factor extraction method, categorical principal components analysis, suitable for ordinal data – CATPCA.

Analysis was done on these seven items to determine specific groupings of the items. A total of 78.2% of the variance in the data was accounted for in two dimensions. Specific groupings and their reliability are summarised in Table 4.14.

Table 4.14: **Extent of realignment of accounting curriculum**

Factor	Construct	Items included	Variance extracted	Cronbach's alpha
1	Extent of realignment (EoR)	11.1 – 11.5	65.39%	0.892
2	Realignment effect (Rout)	11.6, 11.7	12.81%	0.919

4.6.3.2.3 Composite variables

Composite variables representing extent of realignment (EoR) and realignment effect (Rout) were formed by calculating the average of the extent scores across the items included in the composite variables. The reliability of the composite variables was tested using Cronbach's alpha. The achieved values of 0.892 and 0.919 indicate that these composite variables were reliable (Table 4.14).

4.6.4 Section 4: Digital pedagogical skills

Statistical results for digital pedagogical skills necessary for multimodal teaching of accounting is presented below.

4.6.4.1 Mean values and one sample test

The mean values and the results of the one sample test is presented in Table 4.15.

Table 4.15: **Digital pedagogical skills: mean values and one sample test results**

Item	n	Mean (SD)	t	df	p-value
12.1 The ability to design a digital learning environment that promotes active participation of students.	42	4.29 (0.708)	11.763	41	< .001*
12.2 Knowing how to evaluate technological tools and media for achieving learning outcomes and goals.	42	4.21 (0.813)	9.685	41	< .001*
12.3 The ability to integrate various digital tools and their features with other modes for effective lessons.	42	4.38 (0.661)	13.543	41	< .001*
12.4 Being able to select teaching methods that support the achievement of learning outcomes, skills, and knowledge in a multimodal environment.	42	4.33 (0.687)	12.584	41	<.001*
12.5 Knowing how to adapt teaching approaches and methodologies using technology that is more student centred.	42	4.29 (0.673)	12.381		< .001*
12.6 Being skilled at adapting lectures to a digital platform to facilitate synchronous student interaction.	42	4.40 (0.665)	13.695		< .001*
12.7 Possessing the expertise to offer digital learning activities at the appropriate digital competency level of each student.	42	4.36 (0.656)	13.408		< .001*
12.8 Being proficient in designing collaborative learning spaces.	42	4.17 (0.696)	10.871		< .001*
12.9 Knowing how to use data analytics when evaluating lesson activities.	42	4.02 (0.841)	7.893		< .001*
12.10 Having the aptitude to structure and deliver the accounting curriculum that allows for the detection of gaps in student knowledge and student difficulties.	42	4.33 (0.687)	12.584	41	< .001*
12.11 Knowing how to create teacher presence in a digital learning environment.	42	4.36 (0.618)	14.239	41	< .001*
12.12 The ability to work in a team to design a teaching approach that facilitates multimodal teaching of accounting.	42	4.29 (0.673)	12.381	41	< .001*

* indicates significant at the 95% level

Table 4.15 portrays the statistical analysis of mean values for digital pedagogical skills required by academics to engage successfully in multimodal teaching of accounting. Respondents were asked to indicate the necessity of possessing pedagogical skills of a digital nature to adeptly teach accounting multimodally. A five-point Likert rating scale with 12 items, was used, with the scale ranging from 1 = not at all necessary to 5 = extremely necessary, in ascending order.

Each item regarding digital pedagogical skills is thought to be significantly necessary ($p < .05$) to successfully engage in multimodal teaching of accounting. The item that is most necessary is “being skilled at adapting lectures to a digital platform to facilitate synchronous student interaction” ($M = 4.40$; $p < .001$). The second highest significantly necessary skill was “the ability to integrate various digital tools and their features with other modes for effective lessons” ($M = 4.38$; $p < .001$). “Knowing how to use data analytics when evaluating lesson activities” was considered as least necessary ($M = 4.02$; $p < .001$).

A graphical representation of mean values for digital pedagogical skills is shown in Figure 4.8.

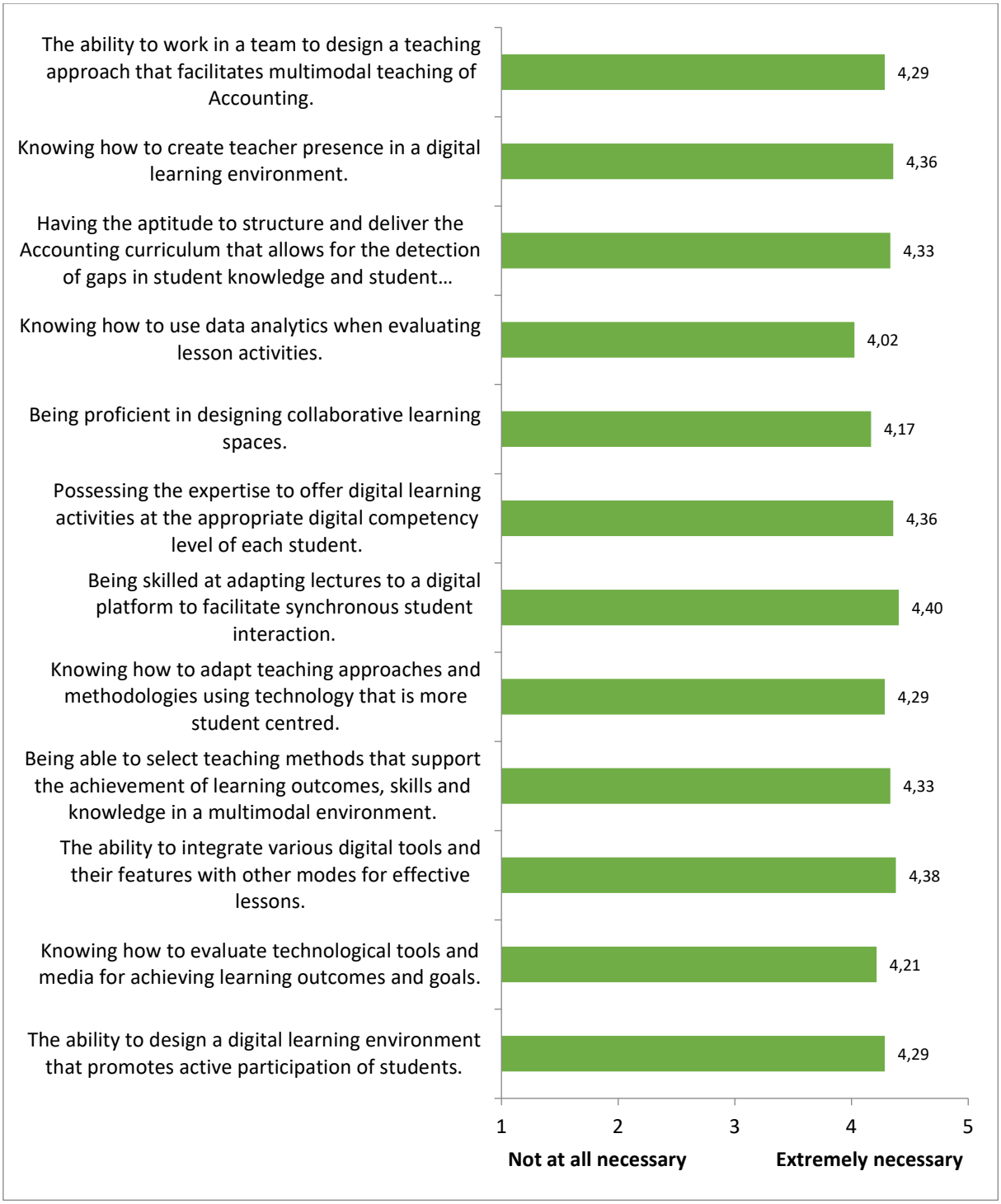


Figure 4.8: Digital pedagogical skills mean values

4.6.4.2 Factor analysis

Factor analysis with promax rotation was applied to these 12 items. Two factors were extracted which account for 68.28% of the variance in the data. A KMO of .877 and a significant Bartlett's test indicates that the data was adequate for successful and

reliable extraction. Item 12.8 was dropped during the process because it did not load strongly onto any factor. The factor loadings are summarised in Table 4.16.

Table 4.16: Factor loadings – Digital pedagogical skills

	Factor	
	1	2
12.2 Knowing how to evaluate technological tools and media for achieving learning outcomes and goals.	1.000	
12.1 The ability to design a digital learning environment that promotes active participation of students.	.917	
12.6 Being skilled at adapting lectures to a digital platform to facilitate synchronous student interaction.	.832	
12.5 Knowing how to adapt teaching approaches and methodologies using technology that is more student centred.	.763	
12.4 Being able to select teaching methods that support the achievement of learning outcomes, skills and knowledge in a multimodal environment.	.748	
12.3 The ability to integrate various digital tools and their features with other modes for effective lessons.	.659	
12.9 Knowing how to use data analytics when evaluating lesson activities.	.612	
12.10 Having the aptitude to structure and deliver the accounting curriculum that allows for the detection of gaps in student knowledge and student difficulties.		.922
12.12 The ability to work in a team to design a teaching approach that facilitates multimodal teaching of accounting.		.910
12.11 Knowing how to create teacher presence in a digital learning environment.		.541
12.7 Possessing the expertise to offer digital learning activities at the appropriate digital competency level of each student.	.371	.485

4.6.4.3 Composite variables

Details of above factors and their reliability are summarised in Table 4.17

Table 4.17: Digital pedagogical skills-composite variables

Factor	Construct	Items included	Variance extracted	Cronbach's alpha
1	Designing the digital learning environment and adapting pedagogy to digital (DENV)	12.1- 12.6, 12.9	46.65	0.929
2	Creating the digital learning experience (CEXP)	12.7, 12.10 – 12.12	12.86	0.867

Composite variables are formed by calculating the average of the ratings for all items included in a variable. With a minimum value for alpha of 0.867, these composite variables were both reliable.

4.6.5 Section 5: Analysis of composite variables

The results of a one-sample test performed on composite variables is presented in table 4.18.

Table 4.18: One sample test results

Item	n	Mean	Standard deviation	T	df	p-value
GENTK	42	4.4184	0.62181	14.783	41	< .001*
MOODLE	42	4.3011	0.79646	10.587	41	< .001*
ADAPT	42	3.9310	1.23634	4.880	41	< .001*
COM	42	4.1984	0.73366	10.586	41	< .001*
LEC	42	4.6587	0.48129	22.335	41	< .001*
ConLec	42	4.4966	0.54306	17.860	41	< .001*
DENV	42	4.2755	0.60641	13.631	41	< .001*
CEXP	42	4.3333	0.55674	15.521	41	< .001*

* indicates significant at the 95% level

4.6.5.1 One sample test

A one-sample test was performed on composite variables. The results presented in Table 4.18 indicate the following:

General technological knowledge (GENTK) is significantly important to successfully engage in multimodal teaching of accounting, $M = 4.42$, $p < .001$.

When working with MS Teams, significant importance is given to technological skills for using complex applications (COM), $M = 4.20$, $p < .001$; for setting up and conducting a lecture (LEC), $M = 4.66$, $p < .001$; and for controlling the lecture session (ConLec), $M = 4.50$, $p < .001$.

Technological knowledge and skills for using Moodle as a teaching platform is significantly important to successfully engage in multimodal teaching of accounting, $M = 4.3$, $p < .001$.

There was significant agreement to adapting the accounting curriculum for multimodal teaching (ADAPT), M = 3.93, p = < .001.

For digital pedagogical skills, designing the digital learning environment and adapting pedagogy to digital (DENV), M = 4.3, p < .001 and creating the digital learning experience (CEXP), M = 4.3, p < .001, were both considered significantly necessary for successful multimodal teaching of accounting.

4.6.5.2 Binomial test

A binomial test was performed on composite variables EoR and Rout. The results are presented in Table 4.19.

Table 4.19: **Binomial test on composite variables**

	Frequency (%)		**n**	**p-value**
	At most a small extent (1 2 3)	At least a moderate extent (4 5 6)		
EoR	12 (29)	30 (71)	42	.008*
Rout	14 (33)	28 (67)	42	.044*

* indicates significant at the 95% level

Table 4.19 show the results of the binomial test that was performed on the constructs of extent of realignment (EoR) and realignment effect (Rout) (Table 4.14), to test if a significant proportion of respondents rated these composite variables as “at most a small extent” or “at least a moderate extent”.

Results show that a significant 71% rated the extent of realignment as ‘at least moderate’, p = .008. A significant 67% rated the effect of the realignment as ‘at least moderate’, p = .044.

4.7 Presentation of qualitative findings

The broad purpose of the study was to explore multimodal teaching of accounting at the DUT. Semi-structured interviews were conducted to collect data from accounting academics. The questions for the semi-structured interviews were informed from the results of the quantitative data analysis. The qualitative data was analysed using NVivo software.

4.7.1 Qualitative technique used: word cloud

A word cloud is an image of a collection of words. It is used to highlight important text. The more frequently a word appears in the text being analysed, the larger the word appears in the image generated (Atenstaedt 2012).

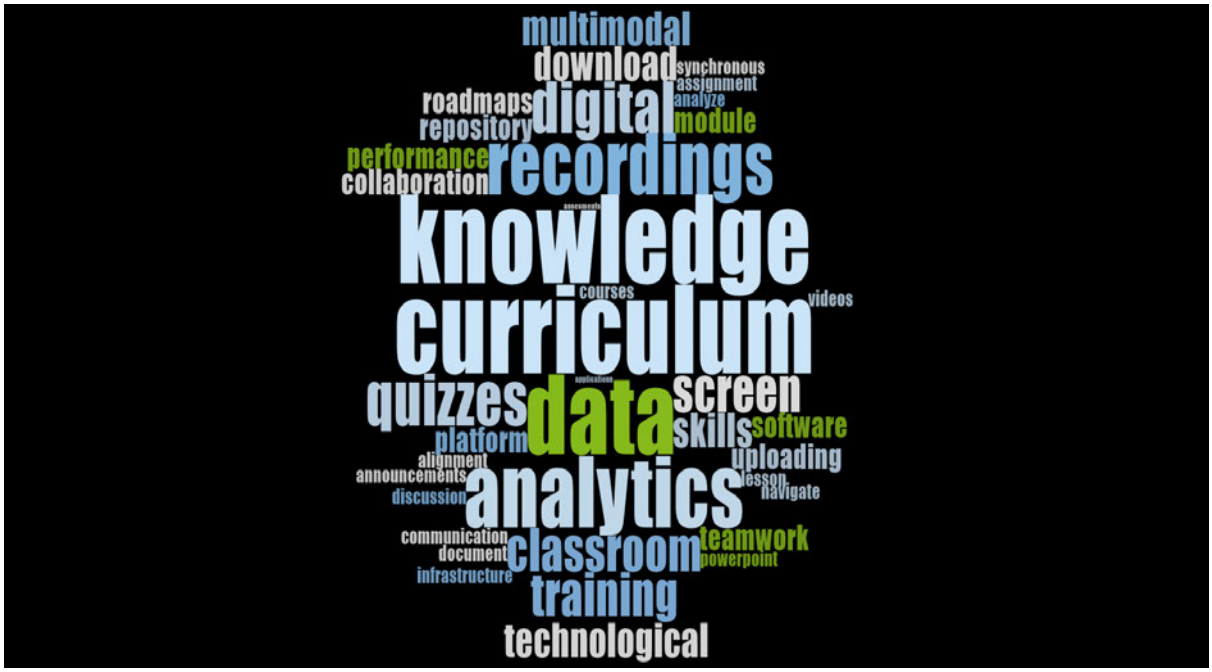


Figure 4.9: Word cloud of all themes

Figure 4.9 shows the words most often used in the qualitative analysis, for example, knowledge, curriculum, data, analytics, recordings, and training.

4.7.2 Technological knowledge for multimodal teaching

The following section presents the data from the interviews with accounting academics on technological knowledge needed by academics for multimodal teaching of accounting.

4.7.2.1 General technological knowledge

Accounting academics were asked about the digital knowledge required for teaching accounting multimodally. Some participants indicated that the initial transition to multimodal teaching was difficult as they lacked a working knowledge of DUT's technological infrastructure *and "accounting is not a very easy discipline, I would say to teach electronically"* (participant 2*)*. However basic software and hardware knowledge alleviated some of the difficulties, as expressed by participant 2, *"I had a*

very sketchy idea of what it was … what I did find was helpful for me was being somewhat familiar with the software", and participant 3, *"it was very rocky to start off with and you have to constantly look for the support".* In contrast, participant 4 experienced a seamless changeover to multimodal teaching, "*On my side, I think the transition was very easy. I was anticipating you know that we have not involved enough technology in the way that we teach."* This positive experience by participant 3 was attributed to digital competencies acquired prior to switching to multimodal teaching of accounting.

Participant 4 had a similar view as participant 2 on the importance of software knowledge*, "the academic must be ready and open to learn the various software programs that are there to assist us".* Of significant importance to participant 4, was the knowledge and use of Microsoft excel, "*I teach using Microsoft Excel, so I found that my knowledge of Excel is very helpful".* Participant 7 also expressed a strong view on accounting academics knowledge of Microsoft Excel, "*academics must learn Excel".*

The initial step towards digital literacy is gaining a basic understanding of hardware and how it works. Academics teaching accounting multimodally "*must be very fluent with how to use the device that they are teaching from, be it the tablet, phone or laptop; they must be able to navigate through easily",* as conveyed by participant 3. This view that academics must be digitally literate for multimodal teaching, is also shared by participant 8, *"they have to have basic computer skills, e.g., basically, to operate all the equipment that they need"* and participant 12, *"they must be computer literate in basic skills".*

4.7.2.2 MS Teams

Some respondents found it easy to teach on MS Teams as they were technologically savvy while others who were not knowledgeable on how to use this teaching mode, experienced challenges. Training and digital support assisted in overcoming the hurdles. Participant 2 expressed this view, "OK, it was very difficult. I felt like a dinosaur sometimes because, you know ... it's something that I had never used before. I went for the training every week and I went back, and I listened to the recordings, and I watched the YouTube videos both on MS Teams and on Moodle just to keep myself refreshed on how to use the software".

Participant 4's experience using Teams was comparatively easier than participant 2, *"using MS Teams, there's so many features that can help make your life easier … really understanding the various inbuilt tools".*

Participants considered acquiring knowledge on the following MS Teams features very important to teach accounting effectively: sharing your screen, white board, chat box, recording a lecture, and breakaway rooms. Participant 7 considered, *"How to make a call on Teams, how to schedule, you know, your class on the calendar, how to create a classroom, knowing how to chat with students using Teams, how to record on Teams",* as very important. Participant 2 comments: *"I think it's very important to know how to share your screen and the chat box was very very useful because I found that some students were afraid to speak, but they would kind of feel a bit anonymous if they typed it out in the chat box".* Participant 4 gave great significance to the breakaway rooms feature, *"I think the breakout rooms that feature in MS Teams, is absolutely important because students do need to be working in small groups".*

All participants communicated that recording a synchronous lecture was very important if a multimodal approach to teaching is adopted. Participant 4 expressed this view on the recording of synchronous lectures, "r*ecording a lesson, it's absolutely important, simply because I think from a student perspective. A student can say let me relisten to the recording, you know, twice or thrice to really grasp what the lecturer was saying. That feature is absolutely crucial from a lecturer perspective as well. If there's a dispute by others about what was said by you to students, you know the recording is there, you know, if anyone disputes anything, or we've got a different version of events. You simply pull up the recording and it tells exactly what was said and how and so forth".* Recording a synchronous lecture was very important, especially for part-time students. This was conveyed by participant 9, *"recording a synchronous lecture is very important. So, what has happened now with lectures being recorded, it gives broader access to students. So those students are working; it's not an issue now because all they do is they just replay the lectures at night; it's a great tool".*

Accounting, a number intensive, technical discipline requires academics to perform numerous calculations, which makes the white board feature indispensable, as conveyed by participant 3*, "Teams as you know, has a white board; because when you're teaching accounting, you can't just sit there and talk to the screen. You need to*

be doing the workings. You need to be showing the students how to unpack the question and where the calculation comes from".

Most participants indicated they did not use nor were they aware of the "road maps" and "add from app store" features, although some stated they were aware of the "add from app store feature". As stated by participant 2, "*No, I didn't use those features*". Participant 4, "*Add from app stores. I'm quite aware that you can add a lot of features"*. Participant 7, "*It's my first time I'm hearing about roadmaps and 'add from app store'".*

4.7.2.3 Learning management system (LMS) – Moodle

Interviewed academics stated that Moodle was used primarily as a repository and to run quizzes, as explained by participant 2, "*OK so Moodle I used as a repository, and I did use it to make class announcements and I did use it just for the quizzes"*, and participant 3, *"Moodle is just the repository".*

Participant 4's view on Moodle," *I've used it very minimally this semester. I used it only to run quizzes. It is not well designed and not well run as your MS Teams. I never understood why we need to have parallel systems. Moodle was just not viable for me".* Participant 9 claimed that if Moodle was equipped with the functionality of MS Teams, it would be the perfect learning management system. At present, Moodle is used to upload content, *"we use Moodle as a repository for uploading contents and assessments".*

Interviewed academics indicated that Moodle was not used for teaching. This was confirmed by participant 12*, "I didn't use Moodle to teach. I use Moodle for my tests and for uploading all my study material".*

4.7.3 Curriculum alignment

Several of the interviewed academics stated that the curriculum content was not adjusted for multimodal teaching, however, changes were made to the learning outcomes, learning activities, assessment criteria and mode of assessments. The reason given for not adjusting content according to participant 7, was, *"what we teach now is a prerequisite for the next level*. *We just changed the mode of assessment".* "*All we had to do was basically teach the same content differently",* stated participant 4, and participant 3 said *"I had to make changes to learning outcomes and learning activities".* The decision was made at departmental level according to participant 10,

"It was a departmental decision that we do not adjust the curriculum content". Attempts by the researcher to probe deeper about changes to curriculum content were unsuccessful.

A few participants indicated that initially no changes were made to the curriculum but as they became more proficient in teaching with multiple modes, approximately 90% of the curriculum was realigned for multimodal teaching, as expressed by participant 2*, "initially, none of it … about 90% of our curriculum was aligned to multimodal teaching".*

Participants stated that virtual collaborations took place among accounting academics to ensure no duplication of curriculum content in related courses, *"we're all unanimous"*, commented participant 4.

Contrasting views were elicited from interviewed academics regarding the restructured accounting curriculum content's effect on the alignment of the learning trajectory for multimodal teaching. Some participants stated that there was no effect despite a change in teaching mode, while other respondents indicated that realigning the curriculum content did affect the learning trajectory by approximately 60%, "*I would say 60%"* according to participant 2.

4.7.4 Digital pedagogical skills

The following section presents the data from the interviews with accounting academics on the digital pedagogical skills needed for multimodal teaching of accounting.

4.7.4.1 Teamwork

Participants stated that working as a team creates a feeling of inclusion and interdependence and it has a positive impact on team members. When academics are sharing a class, teamwork becomes very necessary as team teaching requires academics to work purposefully and cooperatively with one another as explained by participant 12*, "Teamwork with colleagues is very important if you are sharing a class, if you are team teaching",* and participant 10, *"teamwork is very important … the team must come together as a cohesive unit".*

4.7.4.2 Teacher presence

An academic's ability to maintain teacher presence, when teaching in a digital learning environment was considered very necessary, as mentioned by participant 4, "Students *are not used to being taught by somebody who's not physically next to them … a lot can get lost in meaning when you are talking through a particular mode and not face to face, and the student is losing the advantage of facial expression, and sometimes changes in tone".*

4.7.4.3 Data analytics

Interviewed academics had differing views on the ability to use data analytics. Some stated that knowing how to use data analytics proved to be useful and effective, as conveyed by participant 2, "*I used it when I was doing statistics, it was very helpful".* Participant 3 stated, *"Data analytics is very useful when you've got such large classes".*

According to participant 12, knowing how to use data analytics is necessary, "*it is necessary to know how to use data analytics because we have to download the attendance reports and keep this as proof that we did have a lecture".*

Participants 4 and 10 had the complete opposite view*, "So those analytics have disadvantages you know"*, and participant 10, *"I did use the data analytics tools, but it didn't help me in any way".*

4.7.4.4 Digital learning environment

An academic's ability to design a digital classroom was considered an important skill. According to participant 8*, "They would need to know how to set up the classroom for a lecture. There are different features that you can use e.g. To disable the mute function so that students cannot unmute themselves. It helps to have better control over your lecture. So, it's all about setting up the classroom"* and participant 10, *"A academic must know how to build your classroom, and how to structure your lectures".*

4.7.4.5 Teaching approach

The semi-structured interviews revealed that accounting academics must be very skilled in designing and delivering lectures digitally, particularly because accounting is a number intensive, technical discipline. This is supported by participant 7, "*Yeah, it is very important to be able to adapt your lectures to a digital platform. You should be*

able to control, you know, the learning environment and the atmosphere", further adding, *"The approach to digital teaching is very important, for example, teaching to the digital competency level of the student must be taken into account".* Participant 8 stated that presenting lectures digitally is a necessary skill, *""Knowledge on how to present your lectures electronically".* This view was supported by participant 11.

4.8 Discussion of findings

This section discusses the results of the data analysis of both the quantitative and qualitative data pertinent to the objectives of the study and the research questions that were generated to address the objectives.

The aim of this study was to explore the teaching of accounting using a multimodal approach in the Faculty of Accounting and Informatics at the Durban University of Technology (DUT) in South Africa, as a case study.

4.8.1 Technological knowledge for multimodal teaching

Research question 1: What technological knowledge do academics need to have to teach accounting using a multimodal approach?

This research question sought to determine the technological knowledge that academics must possess, to successfully teach accounting using multiple modes.

4.8.1.1 General technological knowledge

Table 4.3 and the composite variable GENTK indicated that general technological knowledge was considered significantly important to successfully teach accounting, using multiple modes. This implies that respondents were familiar with technology and have ample experience teaching with a variety of modes. This could be attributed to management's investment in improvements to the institution's digital infrastructure, accompanied by access to frequent, high quality training programmes on the pedagogical use of such technologies, as explained by participant 2, "*I did spend a significant amount of time training"* and participant 11, *"Training was given on the various platforms".* One participant stated that there was no support and digital knowledge was acquired from peers in the department and self-teaching, "*we didn't get the support from the university on how to use the electronic tools".*

It was important for academics to acquire knowledge on DUT's technological infrastructure, to be able to assist students with digital challenges*, "It is important, especially when, for example, when students can't log in",* as stated by participant 3. The provision of digital infrastructure is fundamental, in terms of importance and influence, to academics becoming knowledgeable and digitally competent (Jorge-Vázquez *et al.* 2021).

Apart from basic digital literacy skills, participant 3 attributed high importance to hardware knowledge of academics teaching accounting multimodally "*academics must be very fluent with how to use the device that they are teaching from, be it the tablet, phone or laptop, they must be able to navigate through easily".*

There was unanimity by all participants that software knowledge was an important determinant of successful multimodal teaching of accounting. As opined by participant 10, "*If you're going to use multiple modes as means of teaching, you must be proficient in Ms Office, you must know how to use Excel"*

Knowledge about hardware, software and technological infrastructure is imperative for multimodal teaching in higher education (Mujallid 2021). Multimodal teaching requires supporting technological infrastructure and a knowledge base (Børte, Nesje and Lillejord 2020). Academics knowledge, skill and approach to software influences the successful employment of technology in teaching (Ahmadi and Keshavarzi 2013). Respondents indicated that it was very important for academics to possess technological knowledge on a wide range of digital tools for effective multimodal teaching of accounting. A study by Goradia (2018) found that academics engaged with a wide range of technologies to enhance digital teaching.

4.8.1.2 Technological knowledge for MS Teams

Table 4.4 and composite variables COM, LEC, ConLec portray the technological knowledge of MS Teams required by academics to engage in successful teaching of accounting, multimodally. Findings from the survey with accounting academics revealed that knowledge about MS Teams was significantly important for successful multimodal teaching of accounting. Academics may have sufficient knowledge about MS Teams to teach multimodally, gained through training and through use of the mode as indicated by academics in the semi-structured interviews.

One academic commented that MS Teams is continuously evolving, therefore it is difficult to be familiar with all its capabilities, but even with a basic knowledge of MS Teams, an academic can successfully conduct a lecture.

The most significant feature of MS Teams was the recording of a meeting/lesson. Participant 4 explained the importance of the "recording" feature as follows: *"Recording a lesson it's absolutely important from a student's perspective. Students really needs something that they can always fall back on, to say let me relisten to the recording you know twice or thrice to really grasp what the lecturer was saying. Having video recordings is a huge advantage compared to teaching face to face".* Another participant commented that the recording feature was particularly important for students who study part-time, *"And the part time stream was geared obviously, towards people who worked after hours and who couldn't access full time lectures. But now, remember to host a part-time class, you needed to have a certain level of capacity within the institution ... So what has happened now with lectures being recorded, it gives a broader access to the students who are working. It's not an issue now because all they do is they just replay the lectures at night, right. So it's a great tool for access, to broaden access".*

The features "roadmaps" and "Add from app store" to add new features, were considered of lesser importance. Interviews with academics revealed that some were aware of these features, but no need arose that warranted its use, while others were unaware of it. *"… and the road maps, I am not familiar with, but I've added apps, yeah",* stated participant 9. Participant 11 was completely unaware of both these features, "*I was not aware of either of these functions*."

A study by Bsharat and Puteh-Behak (2021) and Basu (2020) found similar results regarding the use of MS Teams, where teachers found that by recording a lesson, students who were not present for the synchronous lesson, had access to the lesson, through the recording and could view it multiple times.

4.8.1.3 Technological knowledge for Moodle

Table 4.5 and composite variable, MOODLE represents the technological knowledge of Moodle (DUT's learning management system) that academics need to have to teach accounting using a multimodal approach. Respondents considered technological knowledge of Moodle as significantly important. Respondents regarded "creating,

organizing and uploading content for your course" as most important. This may indicate that respondents have gained and/or improved their knowledge on Moodle through training, use, and collaboration with peers as also indicated in the semi-structured interviews. The one-on-one semi-structured interviews revealed that respondents found Moodle to be user friendly and helpful yet limited in its functionality. It was used mainly for uploading of content (repository) and to run quizzes. One academic was very vocal about Moodle being unnecessary due to its digital limitations compared to MS Teams and considered it a waste of financial resources of the institution. In contrast, participant 9, disagreed, stating *"… but Teams lack the functionality for assessments that's required, that we have in Moodle. You need Moodle to have Teams functionality if you know what I mean, then you'd have the perfect learning management system".* Hebron (2020) found that academics with adequate knowledge of Moodle were comfortable using the LMS, while those who lacked sufficient knowledge to use Moodle effectively, predominantly used the "uploading of content" feature, as this was considered most important. Cabero-Almenara, Arancibia and del Prete (2019) found that Moodle was used primarily to transmit content and the pedagogical potential of Moodle was relatively unexplored, due to insufficient knowledge on the tools Moodle offers.

The qualitative results have richly supported the quantitative results, that general technological knowledge was considered significantly important to successfully teach accounting, using multiple modes as indicated in Table 4.3 and composite variable GENK. This answers research question number 1.

4.8.2 Alignment of the accounting curriculum for multimodal teaching of accounting

Research question 2: To what extent is the current accounting curriculum aligned for multimodal teaching?

Table 4.9, together with composite variable ADAPT (Table 4.15), depict the results for accounting curriculum realignment for multimodal teaching. There was significant agreement regarding adapting the various elements of the accounting curriculum for multimodal teaching. These results suggest that academics understand the curriculum process and are able to recognise which elements within the process require adjustments when aligning curriculum for multimodal teaching as also indicated in the

semi-structured interviews. Furthermore, Table 4.13 indicated that the accounting curriculum must be aligned to at least a moderate extent for successful multimodal teaching. These results were confirmed by the binomial test in Table 4.19. Moreover, interviewed accounting academics indicated that the curriculum content was realigned to a moderate extent for successful multimodal teaching and that learning goals and outcomes, learning activities, and learning materials were adjusted moderately to align with the adjusted curriculum content. They further stated that virtual collaboration with colleagues ensured that there was no duplication of content in related courses. Cahapay (2020) asserts that curriculum must be "relevant, appropriate and responsive", comprising content that is "significant, relevant and useful". To this end, Amin and Mahabeer (2021) contend that curriculum adaptation is an effective way to improve and adjust curriculum to realign it with new ways of teaching, to achieve teaching and learning goals.

4.8.3 Digital pedagogical skills

Research question 3: Which digital pedagogical skills are needed by academics to enable them to employ multimodal teaching in accounting?

Table 4.12 and composite variables DENV and CEXP show the digital pedagogical skills that are significantly necessary for multimodal teaching of accounting. Interviewed academics with multimodal teaching experience indicated having developed digital pedagogical skills through teaching experience and/or through training. Interviewed academics commented that teamwork is essential amongst academics especially when they are team teaching. These participants found that maintaining teacher presence in a digital learning environment alleviated students' feeling of isolation. Butler, Leahy and Hallissy (2017) state that designing digital learning environments and implementing new digital teaching practices encourages collaboration amongst teachers. A study by Lewin, Cranmer and McNicol (2018), found that the development of digital pedagogy demanded the essential skills of teamwork and collaboration amongst teachers. The teacher's presence in a digital learning environment encourages student engagement as it creates a sense of belonging (Holland 2019).

Quantitative analysis indicated that knowing how to use data analytics is a necessary skill. Interviewed participants stated that knowledge on the use of data analytics was

very useful while some disagreed. It is important for academics to acquire knowledge necessary for understanding the teaching and learning environment. This implies that teachers must develop data analytical skills to access analytics related to their teaching practice and learning outcomes to enhance teaching performance (Ndukwe and Daniel 2020).

Participants also expressed the view that it was essential for academics to be competent in designing a digital learning environment. Digital pedagogy requires competence in learning design, where teaching is designed around the students' learning needs and, the employment of a varied collection of instructional approaches (Børte, Nesje and Lillejord 2020).

The discipline of accounting can be described as "a course with strong operability, applicability, and practicality" (Dai 2018). This uniqueness makes it challenging to teach digitally. It is incumbent upon accounting academics to become proficient in adapting and delivering lessons, using a digital mode, that is student centred and appropriate for students' competency level. (Papageorgiou and Lameras 2017; Paz 2017). With the evolution of new modes of delivery in higher education, being skilled at teaching to student's ability, improves learning (Ra *et al.* 2019).

The interviews also revealed that it was necessary for academics to be able to blend digital tools, for example, use Microsoft excel with Microsoft Teams, a view shared by Alarcón, del Pilar Jimenez and de Vincente-Yague (2020).

4.9 Conclusion

This chapter presented and discussed the quantitative and qualitative analyses of the data collected for this research study. Quantitative analysis involved the use of descriptive and inferential statistics. Qualitative analysis utilised thematic analyses to unearth important themes to facilitate a better understanding of the phenomena. The discussion was supported by similar findings of previous researchers.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The previous chapter presented and discussed the findings of the study within the context of the theoretical framework and the reviewed literature. This study used a two-phase research design. Raw data collected in the first phase was analysed using the quantitative techniques of descriptive and inferential statistics. Semi-structured interviews were used to gather data for phase two of the study. The qualitative data was analysed using thematic analysis. This chapter provides a summary of the study and addresses the achievement of the aim and objectives, and whether the research questions have been answered.

5.2 Summary of the study

Chapter 1 observed that the proliferation and advancement of technology had rapidly expanded into higher education, thereby presenting accounting academics with a variety of modes for teaching. This study is contextualised within the COVID-19 pandemic, which compelled higher education institutions globally to transition to emergency remote digital teaching, as described in Chapter 1.

Chapter 2 reviewed literature on multimodal teaching within the domain of higher education, specifically in the discipline of accounting. Within the ambit of digital literacy, digital pedagogical competency was identified as fundamental for the successful teaching of accounting using a multimodal approach. The chapter also discussed the theoretical framework underpinning this research study and noted TPACK as the blueprint through which this research study has been conceptualised.

Chapter 3 focused on the research methodology adopted for this study. The mixed method approach, explanatory sequential research design was discussed. The chapter also contained a discussion on the pragmatism paradigm.

Chapter 4 presented the results of the data analyses, followed by a discussion of the findings. The chapter identified that a basic understanding of technology, coupled with the necessary skills to create and deliver pedagogy utilising multiple modes, and aligning accounting curriculum for multimodal teaching through adapting one or more

of the curriculum elements, were pre-requisites for the successful teaching of accounting multimodally.

5.3 Alignment of the study with the purpose

There is an existent body of knowledge that suggest that the essence of multimodal teaching is to provide students with access to a range of resources, thereby allowing students to select those resources that cater to their individual leaning styles. (Papageorgiou and Lameras 2017). Several studies have focused on multimodal learning within and across disciplines, primarily from the perspective of the VARK model of learning styles (visual, auditory, reading/writing, and kinaesthetic) (Mariappan and Vijayalakshmi 2013; Simpson and Archer 2019). There is limited research on multimodal teaching in the accounting discipline, and even fewer studies focusing on technology, curriculum, and pedagogy (Teviotdale 2019; Simpson and Archer 2019). This study attempts to address this gap in the literature. This study provides an analysis of multimodal teaching in the discipline of accounting at the Durban University of Technology, with a focus on the aspects of technology, curriculum, and pedagogy.

The purpose of this study was to explore the teaching of accounting using multiple modalities with a view to enhancing the teaching and learning of accounting, and its accomplishment was achieved through the objectives, using the TPACK framework.

TPACK is a technology integration framework that identifies three interrelated types of knowledge that instructors need to blend for successful teaching – technological, content and pedagogical. Teachers must have knowledge on a broad range of technologies, both standard technologies (books, blackboards, pens) and advanced digital technologies (internet, operating systems, application software, hardware, information technology) to enable its productive application in teaching (Mishra and Koehler 2008). The findings of this study indicate that academics must possess varied technological knowledge for effective multimodal teaching. These findings agree with the framework.

It is important for teachers to know and understand the content of the subjects they teach. Teachers must be able to not only interpret discipline knowledge but be able to adapt learning materials as per changing circumstances and, find creative ways to represent this knowledge, bearing in mind that the choice of technology impacts the

types of content that can be taught (Mishra and Koehler 2008). The study's findings revealed that accounting academics at DUT adjusted various elements of the curriculum, including content, to a moderate extent as per the dictates of the technology selected, for successful multimodal teaching. The findings align with the framework.

Pedagogical knowledge is knowledge about processes and practices of teaching and learning. It involves understanding the techniques that are effective in the classroom and understanding how students construct knowledge and acquire skills. Teachers must comprehend how integrating technology in pedagogy affects teaching and learning. Furthermore, teachers must develop the necessary competencies to be able to teach digitally (Koehler and Mishra 2009). The findings of this study identified the digital pedagogical competencies that are most necessary for successful multimodal teaching of accounting. These findings harmonise with the framework.

5.3.1 Objective 1: To ascertain the technological knowledge needed by academics for multimodal teaching of accounting.

An extensive and rigorous review of literature, combined with quantitative and qualitative data analysis, unearthed the digital knowledge required for multimodal teaching of accounting. The study tested seven types of general technological knowledge required for multimodal teaching. The analysis showed all seven types of knowledge (technological infrastructure, accessing technical support, operating hardware, using security and privacy settings, range of technological tools, how to use the various features for teaching and integrating technology into teaching) were considered as significantly important for successful multimodal teaching, with "understanding the institution's infrastructure" as most important. The composite variable GENTK also indicated that general technological of accounting was rated as very important for multimodal teaching. These findings are corroborated by the literature. This indicates that accounting staff at DUT are able to identify different types of digital knowledge that is required to teach accounting multimodally.

The use of MS Teams as a teaching platform was implemented at DUT during the COVID-19 pandemic. It was therefore necessary to understand the knowledge that academics needed, to enable them to use MS Teams effectively to teach accounting.

The quantitative questionnaire contained twenty-four (24) specific types of digital knowledge required for the use of MS Teams to teach accounting effectively. The findings showed that all twenty-four (24) knowledge types were considered highly important. “Recording a meeting/lesson” emerged as the most important. Though the knowledge pertaining to “using roadmaps” or “add from app store” received the lowest rating yet, they were still considered as significantly important. These findings were corroborated by the literature and the findings of the semi-structured interviews.

The learning management system (LMS) operated by DUT is Moodle. Data was gathered on seventeen technological knowledge types required to use Moodle as a teaching mode for accounting. The findings revealed that the various types of knowledge needed to use Moodle as a teaching mode for accounting was considered as significantly important. Knowing how to create, organise and upload course content emerged as most important. The requisite knowledge for “adding images to your course page” was considered as least important. The reviewed literature and the interview results concurred with these findings viz., Moodle is used mainly as a repository due to academics’ lack of knowledge of its teaching potential.

The study’s findings, supported by the literature (refer 4.8.1.1, 4.8.1.2, 4.8.1.3), have successfully achieved objective number one.

5.3.2 Objective 2: To determine the extent of the alignment of the accounting curriculum for multimodal teaching.

A comprehensive review of relevant literature related to curriculum alignment was conducted in Chapter 2. The results of descriptive and inferential statistics applied to the gathered data indicated that accounting academics at DUT appropriately adjusted the various elements of the curriculum for multimodal teaching. The findings show significant agreement with each of the items pertaining to curriculum adaptation for multimodal teaching of accounting. Accounting academics agreed that the learning goals and outcomes were timeously adapted, and that the accounting course content was reviewed and adjusted for multimodal teaching of accounting. Adapting the curriculum promoted active student engagement through the learning activities and allowed students to evaluate their learning pathways relative to the learning trajectory.

The literature review revealed that successful teaching of accounting with multiple modes depend on the flexibility of the various elements of the curriculum (Gao: 2020).

The study's findings showed that adapting the content, learning objectives, learning activities, and learning materials to a moderate extent facilitated successful multimodal teaching of accounting. Furthermore, a moderate level of restructuring of the curriculum content supported a multimodal learning trajectory and positively impacted active learning.

The study's findings, supported by the literature (refer 4.8.2) have achieved objective number two.

5.3.3 Objective 3: To explore the digital pedagogical skills needed for multimodal teaching of accounting.

Successful teaching of accounting using a multimodal approach requires academics to possess a blend of pedagogical competencies that allow for digital navigation. According to the literature, academics must demonstrate technical, creative, and problem-solving skills (van Laar et al 2017) that aid in the evaluation and selection of digital tools that are compatible with the selected pedagogical approach (Alarcón, del Pilar Jimenez and de Vincente-Yague 2020). The study's findings indicated that accounting academics at DUT consider designing a digital learning environment that encourages student participation as an important skill for multimodal teaching. The ability to assess and select digital tools suitable for the intended pedagogical approach, and the skill to adapt teaching approaches with the use of technology were rated as significantly necessary. The use of multiple modes to teach accounting necessitates the competency of integrating various digital tools with other modes. The pedagogical competency of adapting lectures to a digital platform to facilitate synchronous student interaction was considered most necessary. The skill of using data analytics to evaluate learning activities was appraised as at least necessary. Creating teacher presence in a digital learning environment and teamwork are significantly necessary skills for teaching accounting multimodally.

The study's findings, supported by the literature (refer 4.8.3), have successfully achieved objective number three.

5.4 Contributions of the study

Multimodality is not a new concept in research. The internet abounds with studies on this topic. However, much of the research pivots around students (multimodal learning). There are few studies that focus on academics, and even fewer studies researching multimodality in the discipline of accounting, and from the perspective of digital knowledge, curriculum, and digital pedagogy. This study explored multimodal teaching of accounting at the Durban University of Technology.

This study contributes to the existing body of knowledge on multimodal pedagogy by excavating the technological knowledge that is required for the successful teaching of accounting by employing a variety of modes, by identifying the digital competencies that an accounting academic must develop to engage in multimodal pedagogy and by discussing the alignment of the accounting curriculum for multimodal teaching. The findings of this study may provide guidance to accounting academics who are hesitant to adopt multiple teaching modes.

5.5 Recommendations of the study

The following recommendations arise from the study's findings:

1. Higher education institutions should prioritise an increase in investment in technology and should promote specific training programmes for accounting academics in the areas of the design and application of multimodal pedagogy (knowledge and skill acquisition). Such training should include, inter alia, workshops to disseminate knowledge on the latest technologies and tools available for the teaching of accounting, followed by training on selected technologies. Academics should be taught how to design a digital learning environment, how to integrate various digital tools, how to design and deliver a lesson effectively using multiple modes. A virtual/mock classroom could be set-up to allow academics to practice their learning, to allow knowledge to transform into skills.
2. Moodle must be exploited to its full potential, not just serve as a repository. It is recommended that piecemeal training be offered on Moodle to accounting academics.

3. Training should be conducted regularly and in small groups. The availability and accessibility of digital support must be provided as and when it is needed.

4. In designing new courses, the benefits of multimodal teaching must be considered in relation to teaching philosophies, teaching methods, learning styles, and learning theories. Accounting academics must acquaint themselves with emerging developments in multimodal pedagogy, so that new thinking may be subsumed into curriculum design and delivery.

5. Most accounting academics do not have curriculum experience or capacity and are unaware of the formal curriculum process. It is recommended that all accounting academics become involved to some extent in the curriculum process. This will increase their awareness of the curriculum and allow them to make informed contributions regarding modifications to the curriculum that need to be effected to keep the curriculum relevant, and improve their understanding of the positioning of their courses within the context of a specific learning pathway. An evaluation process must be developed (as part of the continuous improvement process) and implemented to assess the success of realigned curriculum. Appropriate measures must be identified for such an evaluation.

6. In instances where there is a lack of or inadequate processes to support academics multimodal teaching and encourage peer collaboration, this lack should motivate higher education institutions to develop scholarly academics who share their findings, thereby strengthening the knowledge base for multimodal teaching.

5.6 Areas for future research

The following suggestions are possible research areas:

1. The role of training and technical support to promote accounting academics multimodal teaching, and the impact of multimodal pedagogy on student assessments and performance, though not part of this study but mentioned briefly, did emerge very strongly during the interviews as areas of discontent and controversy, therefore warrants further investigation.

2. How digitally driven multimodal pedagogy helps practitioners design and support teaching and learning activities that enhance student learning.

3. Investigating the effectiveness of various technological tools for multimodal teaching in accounting education.
4. Determining if multimodal pedagogy fosters accounting students deep learning.
5. Examining team-teaching and collaborative practices among accounting academics utilising multimodal instructional designs.
6. An area for further research could be to examine the curriculum content to determine if it is aligned for multimodal teaching and learning.

5.7 Conclusion of the study

The inherent technical nature of the accounting discipline has earned it the reputation of “difficult to teach digitally”. It is this perception that makes accounting academics in higher education wary of adopting technology into their teaching. However, it must be emphasised that employing a multimodal teaching strategy does negate this difficulty and provide accounting academics and students with a varied teaching and learning experience, respectively.

Changes in the business ecosystem have redefined the role of the accounting professional. These changes require higher education to be focused on delivering quality teaching, so that students’ digital skills and capabilities are developed with and through learning. Multimodal teaching of accounting is embedded with the potential to expose students to opportunities to develop the requisite skills to advance a future-ready profession.

The researcher is confident that this study has been successful in meeting the objective of exploring the technological knowledge and pedagogical skills required for multimodal teaching of accounting in higher education. It is hoped that the findings of this study will motivate accounting academics to venture into the world of multimodal teaching.

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ANNEXURES

Annexure A: Survey questionnaire

Multimodal Teaching

CONSENT

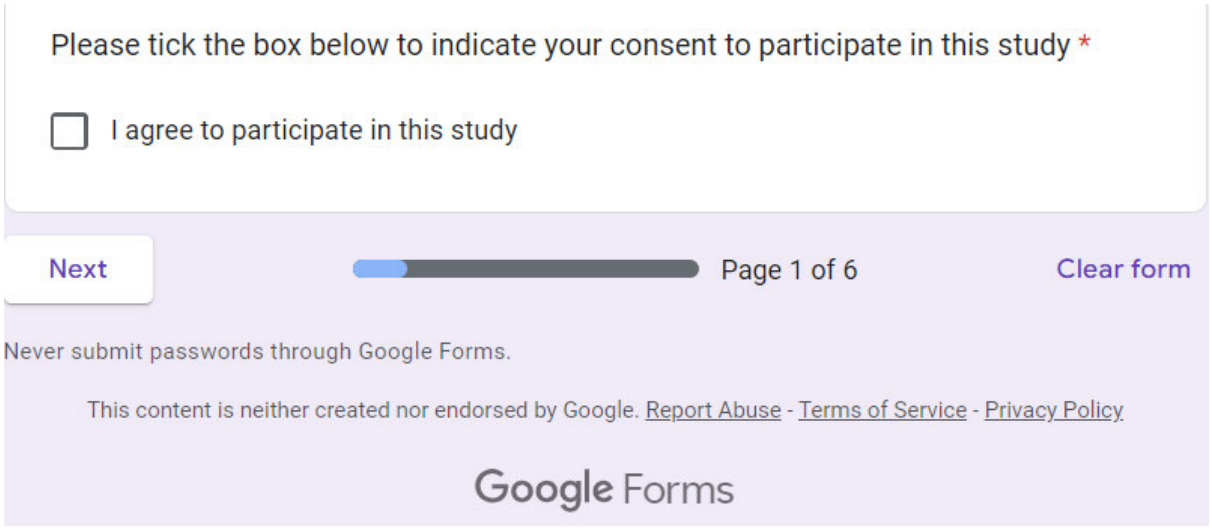
Full Title of the Study: Multimodal Teaching of Accounting in higher education

Names of Researcher: Indira Mahes

Statement of Agreement to Participate in the Research Study

I hereby confirm that I have been informed by the researcher, Indira Mahes, about the nature, conduct, benefits and risks of this study.
I have also received, read and understood the above 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 computerized system by the researcher.
I may, at any stage, without prejudice, withdraw my consent and participation 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.
I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

* Required


Please tick the box below to indicate your consent to participate in this study *
I agree to participate in this study
Next
Page 1 of 6
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Google Forms

Multimodal Teaching

* Required

Demographics

1. State your gender *

- ◯ Male
- ◯ Female

2. What is your age group? *

- ◯ 20 – 30
- ◯ 31 - 40
- ◯ 41 - 50
- ◯ Older than 50

3. What is your qualification? *

- ◯ M+4 (Honours/Btech)
- ◯ M+5 (Masters)
- ◯ M+6 (PHD)

4. How many years have you been lecturing for? *

- ◯ Less than 5 years
- ◯ 5 to <10 years
- ◯ 10 to 15 years
- ◯ More than15 years

5. How many years of experience do you have teaching Accounting using a Multimodal approach prior to the Covid-19 pandemic? *

Your answer

6. How would you rate your proficiency in teaching with digital technology? *

- ◯ Poor
- ◯ Average
- ◯ Good
- ◯ Very good
- ◯ Excellent

Back Next Page 2 of 6 Clear form

Multimodal Teaching

* Required

Technological knowledge

Indicate how important it is (from 1 = not at all important to 5 = extremely important) for an academic to have the following technological knowledge to successfully engage in multimodal teaching of Accounting. *

	Not at all important 1	2	3	4	Extremely important 5
7.1 Understanding the technological infrastructure of the institution (e.g. email/MsTeams/Moodle/Sharepoint)	○	○	○	○	○
7.2 Knowing how to access technical support at the institution	○	○	○	○	○
7.3 Possessing a working knowledge of digital hardware (e.g. laptop, router, digital tablet with pen)	○	○	○	○	○
7.4 Knowing how to use privacy and security settings in a digital teaching environment	○	○	○	○	○
7.5 Having knowledge about a range of technological tools that are available to teach Accounting	○	○	○	○	○
7.6 Understanding how the different features of a digital tool can be used for effective teaching	○	○	○	○	○
7.7 Knowing how to integrate the various digital tools/software for a lecture	○	○	○	○	○

8. In your experience of teaching Accounting on the MS Teams platform, rate the importance (from 1 = not at all important to 5 = extremely important) of the following statements pertaining to technological knowledge for Multimodal teaching of Accounting *

	Not at all important 1	2	3	4	Extremely important 5
8.1 Setting up MS Teams	○	○	○	○	○
8.2 Creating/joining a team	○	○	○	○	○
8.3 Adding members to an existing team	○	○	○	○	○
8.4 Scheduling a lecture	○	○	○	○	○
8.5 Starting an online lecture	○	○	○	○	○
8.6 Uploading resources	○	○	○	○	○
8.7 Creating new channels within a team	○	○	○	○	○
8.8 Creating breakout rooms for student collaboration	○	○	○	○	○
8.9 Using the chat feature for class/individual discussions	○	○	○	○	○
8.10 Using the voice call option	○	○	○	○	○

8.11 Collaboration using groups, forums, wikis, etc.	○	○	○	○	○
8.12 Making announcement to class/individual students	○	○	○	○	○
8.13 Sending emails to members from a team	○	○	○	○	○
8.14 Customizing the messages you receive, using the notifications setting	○	○	○	○	○
8.15 Using 'PVT' chat or "message me directly"	○	○	○	○	○
8.16 Using "Roadmaps" or "Add from app store" to add new features	○	○	○	○	○
8.17 Switching off the camera or muting the microphone	○	○	○	○	○
8.18 Using "polls" to gather feedback	○	○	○	○	○
8.19 Setting up audio	○	○	○	○	○
8.20 Viewing participants and changing their permissions	○	○	○	○	○

8.21 Using the 'Analytics" feature to track attendance and level of student activity	○	○	○	○	○
8.22 Sharing your screen/whiteboard	○	○	○	○	○
8.23 Recording a meeting/lesson	○	○	○	○	○
8.24 Accessing a recorded meeting/lesson	○	○	○	○	○
8.25 Accessing other APPS via MS Teams	○	○	○	○	○

9. In your experience of teaching Accounting through a Learning Management system (Moodle), rate the importance (from 1 = not at all important to 5 = extremely important) of the following Moodle features pertaining to technological knowledge for Multimodal teaching of Accounting. *

	Not at all important 1	2	3	4	Extremely important 5
9.1 Creating, organizing and uploading content for your course	○	○	○	○	○
9.2 Using the Announcement forum to communicate with students	○	○	○	○	○

9.3 Using the "Show/Hide" feature to control access to specific course activities	○	○	○	○	○
9.4 Creating, modifying and uploading a quiz	○	○	○	○	○
9.5 Creating an assignment that allows students to submit their work	○	○	○	○	○
9.6 Setting up a discussion forum for students to communicate in real time using text	○	○	○	○	○
9.7 Configuring the Gradebook to calculate course grades	○	○	○	○	○
9.8 Creating a grading rubric	○	○	○	○	○
9.9 Running reports to monitor student activity	○	○	○	○	○
9.10 Knowing how to take attendance	○	○	○	○	○
9.11 Adding/deleting sections to your course page	○	○	○	○	○

9.12 Editing the course name on your course page	○	○	○	○	○
9.13 Adding a textbook to your course page	○	○	○	○	○
9.14 Adding images to your course page	○	○	○	○	○
9.15 Adding a syllabus to your course page	○	○	○	○	○
9.16 Adding hyperlinks to online resources, to your course page	○	○	○	○	○
9.17 Adding videos to your course page	○	○	○	○	○

Multimodal Teaching

* Required

Alignment of the Accounting curriculum

10. Indicate the extent of your agreement/disagreement with the following statements: *

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree
10.1 The institution's guidelines to assist with adapting the Accounting curriculum for multimodal teaching were easily accessible and relevant	○	○	○	○	○	○
10.2 Open learning resources, (for example, creative commons) were accessible to assist with re-aligning the Accounting curriculum for multimodal teaching.	○	○	○	○	○	○

10.3 The learning goals and outcomes were timeously identified and adapted for multimodal teaching	○	○	○	○	○	○
10.4 The Accounting course content was reviewed and adjusted for a multimodal teaching approach.	○	○	○	○	○	○
10.5 The range of learning activities was adapted for students to master the re-designed content.	○	○	○	○	○	○

10.6 Collaboration among academics in the Accounting cluster ensured that there was no duplication of content in related courses after the re-alignment of the Accounting curriculum content for multimodal teaching.	○	○	○	○	○	○
10.7 The modified curriculum encouraged active student engagement through the learning activities.	○	○	○	○	○	○
10.8 The adapted curriculum allowed students to reflect on the learning trajectory in relation to their own learning pathways.	○	○	○	○	○	○

10.9 Skills and knowledge required by students were digitally embedded within the re-designed content	○	○	○	○	○	○
10.10 Learning materials were updated and made easily accessible to students.	○	○	○	○	○	○

11. For each of the following statements, indicate the extent of realignment carried out on the current Accounting curriculum for multimodal teaching of Accounting *

	Not at all	A very small extent	A small extent	A moderate extent	A large extent	A very large extent
11.1 To what extent was the Accounting curriculum content re-worked to make it compatible for multimodal teaching?	○	○	○	○	○	○

11.2 To what extent did the learning objectives/ outcomes need to be revised?	○	○	○	○	○	○
11.3 To what extent did the restructuring of the content influence the coherence and alignment of the learning trajectory for multimodal teaching?	○	○	○	○	○	○
11.4 To what extent were the learning activities altered to allow for the mastering of the re-aligned content by students?	○	○	○	○	○	○
11.5 To what extent did the learning materials need updating?	○	○	○	○	○	○

11.6 To what extent does the adapted curriculum assert the attainment of lifelong skills?	○	○	○	○	○	○
11.7 To what extent does the adapted curriculum content promote active learning?	○	○	○	○	○	○

Multimodal Teaching

* Required

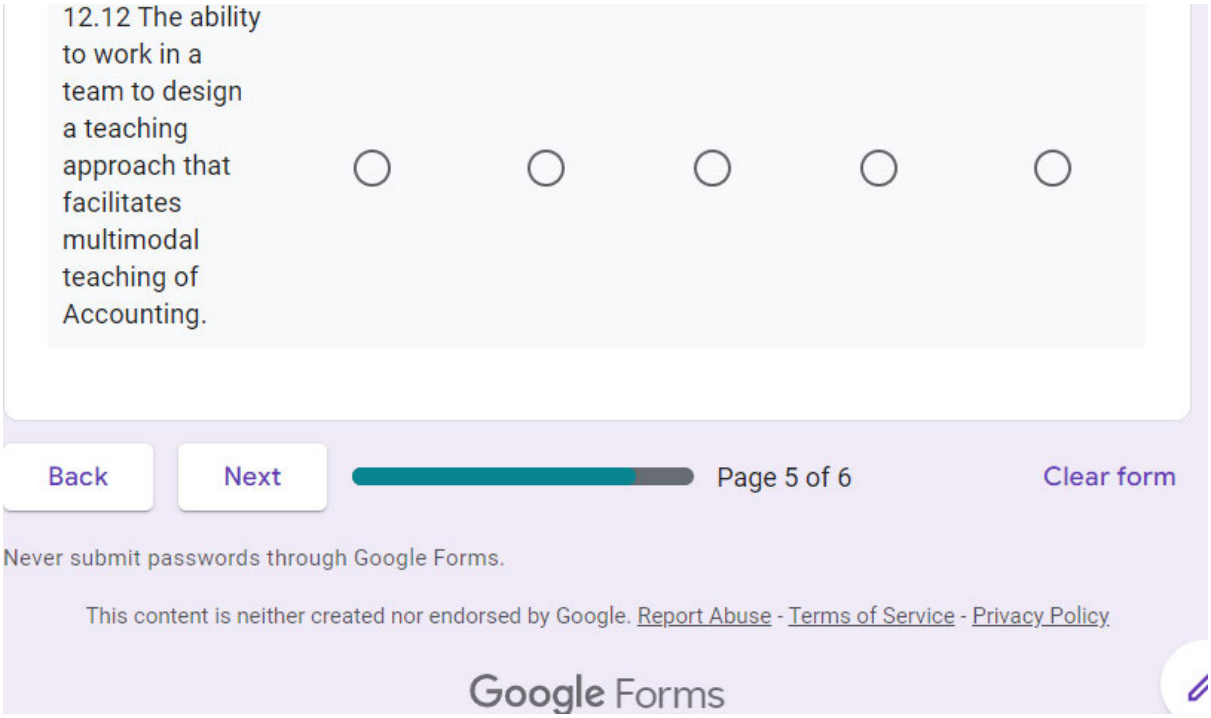
Digital Pedagogical skills

12. How necessary (from 1 = not at all necessary to 5= extremely necessary) are the following digital pedagogical skills to your teaching of Accounting when using a multimodal teaching approach? *

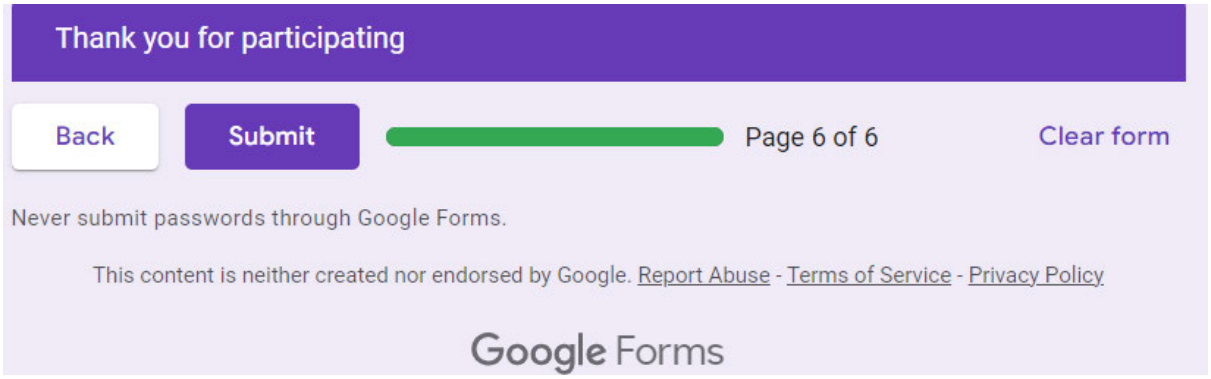
	Not at all necessary 1	2	3	4	Extremely necessary 5
12.1 The ability to design a digital learning environment that promotes active participation of students.	○	○	○	○	○
12.2 Knowing how to evaluate technological tools and media for achieving learning outcomes and goals.	○	○	○	○	○
12.3 The ability to integrate various digital tools and their features with other modes for effective lessons.	○	○	○	○	○

12.4 Being able to select teaching methods that support the achievement of learning outcomes, skills and knowledge in a multimodal environment.	○	○	○	○	○
12.5 Knowing how to adapt teaching approaches and methodologies using technology that is more student centred.	○	○	○	○	○
12.6 Being skilled at adapting lectures to a digital platform to facilitate synchronous student interaction.	○	○	○	○	○
12.7 Possessing the expertise to offer digital learning activities at the appropriate digital competency level of each student.	○	○	○	○	○

12.8 Being proficient in designing collaborative learning spaces.	○	○	○	○	○
12.9 Knowing how to use data analytics when evaluating lesson activities.	○	○	○	○	○
12.10 Having the aptitude to structure and deliver the Accounting curriculum that allows for the detection of gaps in student knowledge and student difficulties.	○	○	○	○	○
12.11 Knowing how to create teacher presence in a digital learning environment.	○	○	○	○	○



Multimodal Teaching



Annexure B: Semi-structured interview schedule

Semi structured interview – schedule of questions

Thank you for participating.

Topic: Multimodal teaching of accounting in higher education

This study is using the mixed methods explanatory sequential design approach which involves the gathering of quantitative and qualitative data. Quantitative data has been collected and analyzed. This next phase is to collect qualitative data through semi-structured interviews, hence this interview.

This interview is structured in three parts. Please note that this interview is being recorded.

Do you have any questions before we start?

A. Technological knowledge needed for multimodal teaching

1. From your experience teaching Accounting using a multimodal approach, what general technological knowledge would you say, an academic must acquire to teach Accounting effectively using multiple modes?
2. How would you describe your experience of, learning to teach accounting, using MS Teams and Moodle?
3. For an academic to teach Accounting on MS Teams and Moodle, what technological knowledge does he/she need to acquire about both these platforms?
4. What importance would you ascribe to the following features:

MS Teams – recording a lesson.

Moodle – creating and uploading content/adding images to course page.

5. Did you use the "Roadmaps or "Add from app store" feature on MS Teams?

4a. If yes – How did you use it and was it effective?

4b If no – Where you aware of these features? Was it not necessary?

(Did you not encounter a situation where you needed to use it?)

B. Curriculum alignment (and extent of realignment) for multimodal teaching

1. Roughly, what percentage of the curriculum content was revised?

If no, why do you think that there was no need to realign the curriculum for multimodal teaching?

If yes - Did you find that the adjusted curriculum for multimodal teaching delivered the expected results?

2. Describe the type of collaboration that took place among accounting academics to ensure there was no duplication of content in related courses after realignment of the accounting curriculum for multimodal teaching.

3. To what extent did the restructuring of the content influence the coherence and alignment of the learning trajectory for multimodal teaching?

C. Digital pedagogical skills required for multimodal teaching

1. Were you able to easily adapt to teaching Accounting using multiple modes?

2. Did you identify any particular digital teaching skill that was underdeveloped initially, but improved upon, as you gained experience teaching multimodally? Explain.

3. What particular skill/s, would you say, is essential for an academic to possess, if he/she is contemplating moving to multimodal teaching of accounting?

4. Did you use the data analytics tools in Moodle or MS Teams?

If Yes - Was it effective? Does it inform teaching and learning?

If No – Why? Did you know how to use it? If you were trained on how to use analytics, would you have used it?

Annexure C: DUT ethics clearance

DUT
DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

FACULTY OF ACCOUNTING & INFORMATICS

Faculty Research Office
Durban University of Technology
15 February 2022

Student: I Mahes
Student Number: **18951393**
Degree: Master of Accounting
Email: **18951393**@dut4life.ac.za
Supervisor: Dr M Rajkoomar
Supervisor email: mogier@dut.ac.za

Dear I Mahes

I trust that you are doing well.

I am pleased to inform you that the Faculty Research Ethics Committee (FREC) following feedback from two reviewers, has granted preliminary permission for you to conduct your research "Multimodal teaching of Accounting in higher education".

When ethics approval is granted:
You are required to present the letter at your research site(s) for permission to gather data. Please also note that your research instruments must be accompanied by the letter of information and the letter of consent for each participant, as per your research proposal.

This ethics clearance is valid from the date of provisional approval on this letter for one year. A student must apply for recertification 3 months before the date of this expiry.

Recertification is required every year until after corrections are made, after examination, and the thesis is submitted to the Faculty Registrar.

A summary of your key research findings must be submitted to the FRC on completion of your studies.

Kindest regards.

Yours sincerely

Dr Olga Sizakele Ndlovu
FREC Chair
Faculty of Accounting and Informatics
Durban University of Technology
Ritson Campus
Durban, South Africa
4001

Annexure D: Ethics module certificate

TRREE

Zertifikat

Certificat

Certificado

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

Indira Mahes

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: 2021/08/09

CID : CLzwZK369J

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

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[REV : 20170310]

Annexure E: Consent form

CONSENT

Full Title of the Study: Multimodal Teaching of Accounting in higher education

Names of Researcher: Indira Mahes

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Indira Mahes, 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 computerized 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**

I, Indira Mahes 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 F: Gatekeeper letter

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
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Tel.: 031-3732576/7
Fax: 031-3732946

23rd February 2022
Ms Indira Mahes
c/o Department of Financial Accounting
Faculty of Accounting and Informatics
Durban University of Technology

Dear Ms Mahes

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 **Full Permission** for you to conduct your research "Multimodal teaching of Accounting in higher education" at the Durban University of Technology.

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.

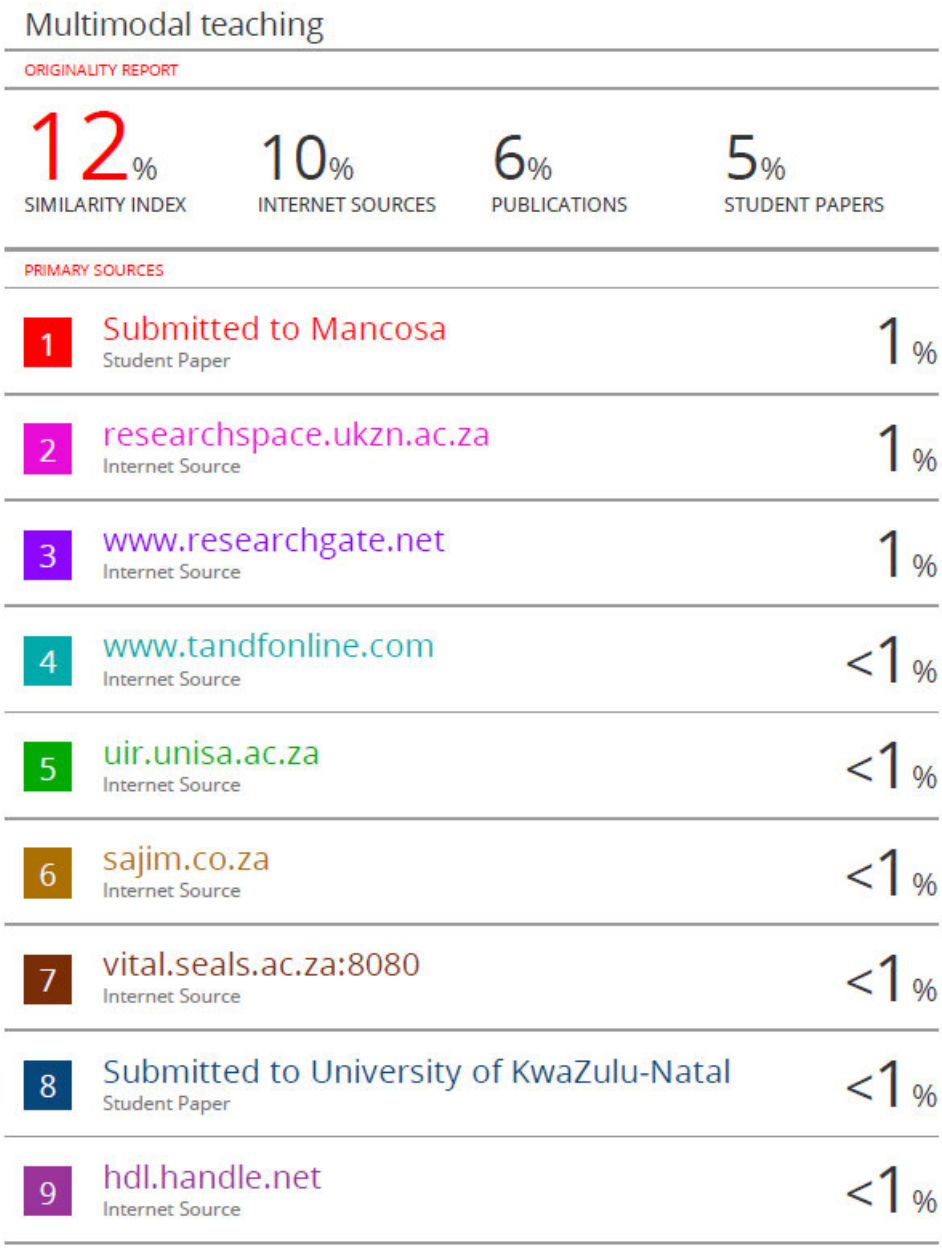
We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

DR LINDA ZIKHONA LINGANISO

DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

Annexure G: Turnitin cover page



Multimodal teaching

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Annexure H: Editing certificate

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EDITING CERTIFICATE

Re: **Indira Mahes**
Durban University of Technology master's dissertation: **Multimodal Teaching of Accounting in Higher Education**

I confirm that I have edited this dissertation and the references for clarity and language. I returned the document to the author with track changes so correct implementation of the changes and clarifications requested in the text and references is the responsibility of the author. I am a freelance editor specialising in proofreading and editing academic documents. My original tertiary degree which I obtained at the University of Cape Town was a B.A. with English as a major and I went on to complete an H.D.E. (P.G.) Sec. with English as my teaching subject. I was a part-time lecturer in the Department of Homoeopathy at the Durban University of Technology for 13 years and supervised many master's degree dissertations during that period.

Dr Richard Steele
03 November 2022
per email