THE ROLE OF TECHNOLOGICAL LEADERSHIP IN INTEGRATING TECHNOLOGY INTO TEACHING AND LEARNING AT SECONDARY SCHOOLS IN KWAZULU-NATAL

by

SUZANNE EMILY NAICKER

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DECLARATION

I declare that *The role of technological leadership in integrating technology into teaching and learning at secondary schools in KwaZulu-Natal* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to the appropriate originality detection system which is endorsed by Unisa and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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ABSTRACT (ENGLISH)

This qualitative study examined the role of technological leadership in integrating technology in secondary schools of KwaZulu-Natal. Global technological advancements had created pressure on schools to include technology in curriculum delivery. The findings of this study highlighted that the COVID-19 pandemic has precipitated the use of technology in schools. During the COVID-19 lockdowns, educational institutions around South Africa used technology to communicate and deliver learning content to learners. The current Generation, known as Generation Z, is regarded as digital natives who learn best when using technology. This study established that one of the major benefits of using technology in teaching and learning is the improvement of learner performance. The study noted that learners enjoyed learning when technology was involved. Furthermore, the study highlighted that technological leadership is pivotal to leading and managing effective technological change in schools. Principals and teachers are identified as technological leaders. Therefore, they play an important role as technological leaders because they support and promote technological change in schools.

Key Words: Technological leadership, technological change in schools, integrating technology in teaching and learning, TPACK, learner performance, Generation Z.

ISIFINQO (ZULU)

Kulolu cwaningo, ngihlolisise indima yobuholi kwezobuchwepheshe ekuxhumaniseni ezobuchwepheshe ekufundeni nasekufundiseni ezikoleni zamabanga aphezulu, esifundazweni sakwaZulu- Natal. Ukuthuthuka kwezobuchwepheshe umhlaba wonke jikelele sekufakele izikole ingcindezi yokusebenzisa ezobuchwepheshe ekufundiseni. Okutholakele ocwaningweni lwami kukhombisa ukuthi ubhubhane lwokhuvethe (covid-19) kwandise ukusetshenziswa kwezobuchwepheshe ezikoleni. Ngesikhathi sokuvalwa kwezwe ngenxa yalolu khuvethe, izikhungo zokufunda eNingizimu Afrika zasebenzisa ezokuxhumana ukudlulisa izifundo kubafundi.

Ngokocwaningo lwami, isizukulwane samanje esibizwa ngeGeneration Z, sigxile futhi sifunda kahle ngokusebenzisa ezobuchwepheshe. Ngiphinde ngathola ukuthi ukusetshenziswa kwezobuchwepheshe ekufundeni nasekufundiseni, kunomthelela omuhle ekuthuthukiseni izinga lokufunda kubafundi. Abafundi bayakuthokozela ukufunda uma kusetshenziswa ezobuchwepheshe, lokhu kungathuthukisa imiphumela.

Ngaphezu kwalokho, ucwaningo lwami luveze ukubaluleka kobuholi bezobuchwepheshe ekunikezeni umhlahlandlela nasekuqinsekiseni ushintsho oluyimpumelelo kwezobuchwepheshe ezikoleni. Othishanhloko kanye nothisha babonwa njengabaholi bezochwepheshe. Bangakwazi ukuqhakambisa ukuxhumanisa ezobuchwepheshe ekufundeni nasekufundiseni ngobuholi nosizo lwabo, okungaholela ekuzuzeni imiphumela encono yokufunda kwabafundi.

Ucwaningo lwami lonkana luveza ubucayi bobuholi bezobuchwepheshe ekuqinsekiseni ukusetshenziswa kwezobuchwepheshe ekufundeni nasekufundiseni. Luphinde lwaveza nokuhle okungalethwa ezobuchwepheshe kwinqubomgomo yokufunda, ikakhulukazi esizukulwaneni samanje sezobuchwepheshe.

AMAGAMA ASEMQOKA: ubuholi kwezobuchwepheshe, ushintsho kwezobuchwepheshe ezikoleni, ukuxhumanisa ezobuchwepheshe ekufundeni nasekufundiseni, TPACK, ukusebenza kwabafundi, iGeneration Z.

ABSTRAK (AFRIKAANS)

In hierdie kwalitatiewe studie het ek die rol van tegnologiese leierskap met die integrasie van tegnologie in onderrig en leer by sekondêre skole in KwaZulu-Natal ondersoek. Globale tegnologiese vooruitgang het druk op skole geplaas om tegnologie in kurrikulum-lewering in te sluit. Die bevindinge van my studie het aan die lig gebring dat die COVID-19-pandemie die gebruik van tegnologie in skole uitgelok het. Gedurende die COVID-19-inperkings het opvoedkundige instellings regoor Suid-Afrika tegnologie gebruik om te kommunikeer en leermateriaal aan leerders te lewer.

Volgens my navorsing is die huidige generasie, soms bekend as Generasie Z, digitale inboorlinge wat die beste leer terwyl hulle tegnologie gebruik. Ek het ook ontdek dat die verbetering van leerderprestasie een van die sleutelvoordele is van die gebruik van tegnologie in onderrig en leer. Wanneer tegnologie gebruik word, geniet leerders gewoonlik die leerproses, wat prestasie-uitkomste kan verbeter.

Verder het my navorsing die belangrikheid van tegnologiese leierskap beklemtoon om suksesvolle tegnologiese verandering in skole te lei en te bestuur. Skoolhoofde en onderwysers word as tegnologiese leiers geïdentifiseer. Hulle kan die integrasie van tegnologie in die onderrig- en leerproses bevorder deur hul leierskap en bystand, wat tot beter leeruitkomste vir leerders kan lei.

Oor die algemeen het my navorsing getoon hoe noodsaaklik tegnologiese leierskap is om die effektiewe inkorporering van tegnologie in onderrig en leer te fasiliteer. Dit het ook die voordele wat tegnologie vir die opvoedkundige proses kan hê (uitgelig/beklemtoon), veral vir die huidige generasie van digitale inboorlinge.

Sleutelwoorde: Tegnologiese leierskap, tegnologiese verandering in skole, integrasie van tegnologie in onderrig en leer, TPACK, leerderprestasie, Generasie Z.

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ACRONYMS AND ABBREVIATIONS

4IR	The Fourth Industrial Revolution
DBE	Department of Basic Education
Gen Z	Generation Z
ICT	Information and communications technology
SMT	Senior Management Team
TPACK	Technological pedagogical content knowledge
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
WEF	The World Economic Forum

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

Technology is increasingly being used in South African schools, which requires education authorities to keep abreast and respond expeditiously to the advancements of technological developments (Penprase, 2018). Rodny-Gumede (2019) highlights that South Africa's educational system has not encouraged the development of creativity and innovation in learners. The demand for the use technology in schools necessitates the emergence of technological leadership. Meyer and Gent (2016:8) state that technology adoption and integration into teaching and learning are greatly influenced by management attitudes towards technology.

Technological leadership plays an integral role in the education sector because it involves the management of technological resources, finding solutions for technological challenges, making decisions regarding the implementation of technology, and empowering others to use technology to enhance learning (National Education Association, 2018).

Accordingly, there is a need for the type of school leadership that promotes the integration of technology into teaching and learning. Wang (2012:56) describes a technological leader as "someone who should understand people, understand technology, understand how technology affects the organisation, and never becomes complacent with the world of technology". The technological leader, therefore, plays an integral role when implementing aspects of technology into teaching and learning. Hence, the successful implementation and integration of technology into teaching-learning situations is dependent on astute, visionary, and effective leadership. In this regard, technological leadership varies from the traditional leadership styles which are behaviouristic in nature. Technological leadership emphasises the importance of

knowledge and the application of technology, including managing physical resources and people. Since the need for effective and efficient technological integration in secondary schools is imperative, school principals, school management teams (SMTs), teachers and other role-players should explore various strategies to adapt technology to school curricula.

Education systems around the world were disrupted by the unprecedented Covid-19 pandemic. As a result, teaching and learning had to depend on technology to deliver subject content via online platforms. The World Economic Forum [WEF] (2020) indicated that the pandemic transformed the way millions of learners are learning subject content and skills. WEF (2020) also stated that the Covid-19 pandemic prompted creative and innovative strategies of teaching by using technology, hence urging 'slow-paced' educational facilities globally, to react quickly by grasping opportunities that promote the delivery of curricula using technology. This challenged educational specialists to obtain skills and knowledge that facilitated the delivery of lessons via online platforms. Teaching and learning are evolving and technological leadership is necessary to provide direction to this evolution. Therefore, a greater emphasis should be placed on technological leadership and its impact on education.

1.2 BACKGROUND OF THE STUDY

The nature and characteristics of technological leadership in education remain unclear (Kim & Tien, 2019). Much clarity is needed about the relationship between leadership, technology, and teaching-learning situations in South African schools. The purpose of this study was to explore the role of technological leadership to determine the extent of success of the integration of technology into teaching and learning.

Due to the impact of Covid-19, there were huge learning losses and managements had to contrive various strategies to get learning content to learners (Tarkar, 2020). According to Parker, Morris and Hofmeyr (2020:24), research revealed that during the 2020 national Lockdown in South Africa, educators experienced a lack of financial support, limited access to data, and emotional problems such as stress and anxiety.

The lack of sound technological leadership, by principals and teachers, created a lack of confidence, anxiety, uncertainty, and a sense of helplessness during the Covid-19 lockdowns (Mishra & Koehler, 2020). Subsequently, principals and teachers experienced many challenges in their attempt to disseminate learning content. Some of these challenges could have been circumvented if adequate technological leadership was implemented. Hersey and Blanchard's (1969) theory on situational leadership assert that there is not a single type of leadership that is more important than the other. Therefore, effective technological leadership should be identified as leadership that is able to adjust to change and handle a variety of challenges according to specific situations. In addition, this study explored transformational leadership as a characteristic of technological leadership. Transformational leadership leads to positive outcomes when using technology to enhance the curriculum delivery (Sikhakhane, Govender & Maphalala, 2021). Transformational leadership aims to influence the attitudes and behaviours of others (Burns, 1978). Technology leaders should adopt transformational leadership and be visionaries who promote technology integration as an important part of teaching and learning (Bülbül & Çuhadar, 2012).

Improved learner performance should be the desired outcome when implementing new teaching and learning strategies. When pedagogy collaborates with technology, effective learning should take place. However, the correlation between technological integration in education and learner performance still remains unclear. This study aimed to explore the way learners' learning is impacted by the use of technology in the learning process.

1.3 PROBLEM STATEMENT

There are various studies and theories based on leadership; however, there is a dearth of literature that explores the characteristics of the 21st-century technological school leader (Wang, 2012:1). Little attention has been paid to technological leadership in South African schools, particularly in secondary schools. Since the South African Department of Basic Education (DBE) has invested in various projects to integrate technology into South African schools, the need for sound leadership has become

critical. One of the DBE's projects included the provision of smartboards and laptops for schools (Frost & Sullivan, 2018). In President Ramaphosa's State of the Nation Address [SONA] (2018), he indicated that every child in South Africa will be provided with a tablet device within six years.

The change in teaching-learning styles of teachers and learners has created a great demand for the use of technology in education. Tran, Ho, Pham, Nguyen, Nguye,n, Khu and Vuong (2020) describe today's school learners as 'digital natives' because they are widely exposed to a digital culture. They also have different views when it comes to learning how to use digital tools. This inclusion of technology in education has created a greater demand for astute and modern technological leaders. However, there is a misconception that technological leadership is limited to the role of the principal. It is thus imperative that technological leadership should also include all members of the school (Abdullah, 2016). Furthermore, technological leadership is lacking in schools because many dubieties are surrounding the concept of 'technological leadership' in education.

In addition, despite the changing learning styles and learners becoming more technology savvy, the integration of technology in the schooling system, particularly in teaching and learning, is very slow (Meyer & Gent, 2016:1). This challenge is not only the South African problem. Abdullah (2016) asserts that the adoption of ICT in Saudi Arabia is still a problem since teachers find it difficult to change from the conventional way of teaching largely as a result of the lack of readiness by the leadership of schools in integrating technology into teaching and learning. The use of technology in teaching and learning coupled with the need for technological leadership in schools, has evoked the researcher to explore this topic. Hence, the purpose of this study was to explore the role of technological leadership in the effective integration of technology into teaching and learning.

1.4 RESEARCH QUESTIONS

Research questions are questions that direct the research process and assist researchers to create focus when conducting the study.

1.4.1 Main research question

In order to assess the degree of success of the integration of technology into teaching and learning, the goal of this study was to investigate the role of technological leadership. The research proposed to ask the question:

- What is the role of technological leadership in integrating technology into teaching and learning in selected secondary schools in Kwazulu-Natal?

1.4.2 Sub-questions

- How does technological leadership benefit teaching and learning in secondary schools?
- What impediments do technological leaders, at the selected schools, encounter when integrating technology into teaching and learning?
- What are the best technological leadership practices and strategies for integrating technology in teaching and learning?

1.5 AIM AND OBJECTIVES

In addressing the central aim of this study, the following specific objectives of the research were:

- To understand the benefits of effective technological leadership in secondary schools;
- To determine the technological impediments in integrating technology into teaching and learning at the selected secondary schools; and
- To explore best practices and strategies for the effective integration of

technology in teaching and learning.

1.6 Literature study: An overview

1.6.1 Need for technology leaders in schools

Generation Z (born between 1997 and 2012) is ‘tech savvy’, more cautious, pragmatic, and adopts a realistic approach to life (Sladek & Grabinger, 2014). This new generation has modern learning styles which precipitated the necessity for changes in current conventional pedagogical methods. Gen Zs are known as ‘digital natives’ who are multitasked, achievement-oriented, and sheltered (Rickes, 2016). Gen Z learners are always exposed to technology, leaving the educational system struggling to keep up with their learning needs. Moreover, technology is a part of who they are and is an extension of themselves (Sladek & Grabinger, 2014). Gen Z is followed by Gen Alpha - both generations are surrounded by technology, therefore they need to be taught via the using technology. Sladek and Grabinger (2014) add that in order to engage Gen Z in the teaching and learning process, learning should have a strong digital presence.

The need for technological leaders in schools stems from the need for learners to be taught via technological tools. Crowther, Ferguson, and Hann (2009) emphasise that school leadership involves everyone, therefore technological leadership in schools is not limited to school management, buincludesinclude teachers and learners. This calls for classroom environments that are set up with technology integration in mind.

1.6.2 The principal as the technology leader

Principals play a pivotal role in the school environment,. Day, Gu and Sammons (2016:253) believe that principals should recognise, understand, and acknowledge the needs of others. Schiller (2003:171-185) states that “principals who keep abreast with technological developments create an environment that benefits staff and learners”. This implies that the school principal should constantly be aware of new technological developments. Wilmore and Betz (2000:15) suggest that “the principal should actively

support, learn, and provide professional development to sub-ordinates for information technology to be successful". This means that when the principal is actively involved in the acquisition of technology skills and knowledge, then subordinates will feel motivated and supported when technological change occurs.

The principal may face the common challenge of 'resistance to change'. The principal as the first line of technological leadership is responsible for minimising resistance by creating a positive climate for the change to occur. Ellsworth (2000:3) states that "when the leader is faced with resistance, that resistance could also be seen as an opportunity to reconsider reasons for transformation, as well as strategies used to affect the change, and to find out the reasons for resistance". According to Wang (2012:53-54), the principal's role in integrating technology in school entails managing, leading, being a role-model, decision-making, and empowering subordinates by delegating tasks. Riisgaard and Thomassen (2016) state that employees are generally capable of, and encouraged by handling tasks delegated to them. Hence, principals should delegate and empower their subordinates to be technological leaders by providing the necessary skills and knowledge in order to implement technology at school. Since the principal is the driving force behind technological advancement at school, he/she should possess the necessary skills and knowledge relevant to implement change. This study unpacks the role of the principal and the elements that influence decision-making regarding digital learning which will influence education policy and leadership styles.

1.6.3 The teacher as the technology leader

The Centre for Development and Enterprise [CDE] (2015) emphasise that teachers are the centre of any education system, and their quality of lesson delivery influences learner achievement. According to Majocha (2015:10), teachers are "silent leaders" who are not aware of their positive leadership role in schools. Merideth (2007:3-9) structured a model that comprises of five "teacher-leader" characteristics: they take risks, they possess effectiveness, autonomy, collegiality, and they have honour (REACH model). Therefore, being a teacher leader of technology is not reliant solely on technological skills, but also on teachers' ability to motivate colleagues and learners. However, Grant (2010: 416) discovered that teacher leadership restricted many KwaZulu-Natal schools.

These restrictions can pose a challenge for educators who desire to fulfill the role of technology leaders in schools.

It has become vitally important that teachers become leaders, not only of learners in their classrooms, but also leaders of technology in teaching and learning. They should work together with their peers to evaluate instructions and assess the results in order to achieve better learning outcomes in schools (Supovitz, Sirinides, & May, 2010). Majocha (2015:37) states that teacher leaders guide others through technological transformation by collecting data, sharing findings and improvements with colleagues, and teaching others how to collaborate with technology and learning. All teachers are lifelong learners because education is evolving rapidly, new understandings are unearthed, learners have a variety of needs that need to be met, the expected quality of learners is changing, and new technology is being used. Parker et al. (2020:24-27) found that before the Covid-19 lockdown in South Africa, most educators had not used online methods of teaching. This was a challenge, hence the need for technological teacher leaders to create change and empower their colleagues in the process.

1.6.4 Skills needed to be a technology leader in education

Beers (2011:4) identified a new set of skills for 21st century leaders: creativity and innovation, critical thinking, problem-solving, communication, and collaboration. Beers (2011) adds that technological, social and personal responsibility are vital for 21st century teaching and learning. Moreover, technological leaders should adapt 21st century skills in order to enhance leadership in teaching-learning spaces. Similarly, Van Laar, Van Deursen, Van Dijk and De Haan (2017) identified 21st century digital skills as including technical, informative, problem-solving, creative, collaborative, and critical-thinking processes. The DBE (2018) aims to prioritise the demands of the 21st century by implementing the skills required for the Fourth Industrial Revolution (4IR).

The technological leader should, therefore, be a transformational leader who possesses digital skills. According to Cetina and Kinikb (2015), transformational leaders are respected, admired, and visionary. They also implement innovative ideas and creative strategies to enhance learner-outcomes. Akberdina and Pushkareva (2019:12) add that

the ability to adapt necessitates a “new kind of leadership”. In other words, technological leadership requires a new form of leadership, one that is amenable to change.

1.6.5 The Fourth Industrial Revolution (4IR)

Everyone should have a global view of how technology is transforming our lives (Klaus, 2017). The Fourth Industrial Revolution (4IR) is a new era of technological advancements. Van Heerden and Goosen (2020) define the fourth industrial revolution as a transforming agent in enterprises by including the movement of data and artificial intelligence. One of the fields impacted by 4IR is Education. The fourth Industrial revolution has transformed the whole perspective of educational innovation (Shahroom & Hussain, 2018). This new era demands new leadership styles. Akberdina and Pushkareva (2019:3) contend that a lack of astute leadership could hinder the implementation of successful 4IR strategies. The introduction of the 4IR in education has its own set of challenges; therefore, a new type of leadership is required when integrating technology into teaching and learning. Technological leadership is not only needed for the 4IR, but also for future industrial revolutions which will also impact on how teaching and learning occur. However, the lack of quality technological leadership will negatively impact on teaching and learning, thus affecting academic results in schools.

1.7 THEORETICAL FRAMEWORK

1.7.1 The TPACK framework and its knowledge components

This study is underpinned by the Technological Pedagogical Content Knowledge (TRACK) framework of Mishra and Koehler (2006) which emphasises three connecting components: content, pedagogy, and technology. Integrating technology into teaching and learning can be challenging given the interdependence between technological knowledge and the ability to apply this knowledge into teaching and learning. Knowledge about educational practices is futile without considering appropriate integration techniques. The technological leader should be familiar with pedagogical

knowledge because technological integration in education should be aimed at successful teaching and learning outcomes.

1.8 RESEARCH METHODOLOGY

1.8.1 Qualitative research approach

The method used to conduct a research study is called research approach (Creswell, 2014). Polit and Beck (2017:741) define the qualitative approach as “the investigation of phenomena, typically in an in-depth and holistic fashion, through the collection of rich narrative materials using a flexible research design". Similarly, Silverman (2021) describes qualitative research as a study that digs deeper into people’s lived-experiences which help us understand what people deem as important. Further, qualitative research is not aimed at quantifying results, but rather involves interviews and observations without formal measurement where is expressed in words. Qualitative research, therefore, is concerned with experiences that are subjective in nature. According to Hennink, Hutter and Bailey (2020:10), “Qualitative researchers also study people in their natural settings, to identify how their experiences and behaviour are shaped by the context of their lives”. Hennink, Hutter and Bailey (2020:107) also mention that qualitative research is in-depth in nature, and therefore requires few participants because only relevant information is needed instead of statistics. The events and information that need interpretation are those that occur in the classroom context and around the school environment. In this regard, qualitative research assisted the researcher in gaining a more contextualised understanding of study as it facilitated an incisive examination on the role of technological leadership in the successful integration of technology in teaching and learning.

1.8.2 Research paradigm

A paradigm is how we understand and study reality (Rehman & Alharthi, 2016). A research paradigm is the researcher’s worldview, it determines the research methodology selected in study (Creswell, 2014). In addition, the research paradigm includes assumptions that act as the foundation for how research is conducted. For this

study, a constructivist-interpretive paradigm was applied. Blandford, Furniss and Makri (2016) describe the constructive-interpretive paradigm as a subjective reality moulded by the interpretations of researchers and study participants.

The researcher selected the constructive-interpretive paradigm because it was suitable for documentation and analysis of the phenomenon under investigation in school settings. A constructivist-interpretive paradigm enabled the researcher to investigate the perspectives and experiences of principals, teachers, and learners when using technology in education. The researcher depended on the perspectives and experiences of participants as the main contribution to elicit results via analysis and interpretation of the study's data.

1.8.3 Research design

The research design is the plan for how the study will be conducted. Polit and Beck (2017:743) define research design as "the overall plan for addressing a research question, including specifications for enhancing the study's integrity". In other words, the framework of research methods and techniques selected by the researcher is called research design. The fundamentals of research design included the ability to conceptualise knowledge that is needed, operationalise the data collection that will obtain the knowledge, and the ability to apply this data to your testable propositions (Lune & Berg, 2017). Accordingly, case studies incorporate qualitative empirical research representing the contextual variableness of the phenomenon, which assists in a more in-depth understanding of this phenomenon in addition to generating hypotheses based on findings (Yin, 2014). Hence, a case study design was appropriate for the purpose of this research.

1.8.4 Sampling

Sharma (2018) describes sampling as a technique chosen by the researcher involving the inclusion of a small number of representatives (subset) from a pre-defined population. The subset represented the 'whole' population. In sum, sampling is a procedure that selects a subset of the population that is a representation of the whole population (Polit & Beck, 2017: 743). For this research, purposive sampling was used.

In purposeful sampling, a non-probability sampling technique, the researcher chooses the participants, taking into consideration the research question of the study (Emmel, 2013). The researcher selected purposeful sampling because it allowed the researcher to choose participants who understand and can provide in-depth responses on the research topic.

1.8.5 Data collection methods

1.8.5.1 Semi-structured interviews

According to Patton (2015: 471), interviewing is all about eliciting relevant answers to gain a meaningful understanding of the interviewee's perspective. Yates (2019) describes an interview as a conversation that asks questions with the purpose of collecting data or information. The data collection method used in this study was semi-structured interviews. The semi-structured interview, required the researcher to ask standard set of questions, including probing for elaboration and clarity (Young, Rose, Mumby, Benitez-Capistros, Derrick, Flinch & Garcia, 2018). This flexibility allowed the researcher to obtain incisive insight into the research topic. For this reason, the semi-structured interview was suitable as a data collection method. Due to the advent of COVID-19, some interviews (depending on the circumstances of the participants) were conducted via *WhatsApp Video Call*.

1.8.6 Data analysis and interpretation

Data analysis is necessary for discovery, communication, organisation, and interpretation of collected data (Polit & Beck, 2017:725). Lune and Berg (2017) describe data analysis as an investigation of the relationship between data and possible solutions to the problems recognised in the first stage of the research process. Therefore, data analysis processes assisted the researcher in organising data, gaining more understanding, and drawing conclusions (Taylor, Bogdan & DeVault, 2016).

One of the methods of data analysis is thematic analysis. Nowell, Norris, White and Moules (2017:1) describe thematic analysis as a relevant qualitative research method. In thematic analysis themes are identified, analysed, organised, described, and

reported within the data (Vaismoradi, Jones, Turunen & Snelgrove, 2016). By using thematic analysis, the coding of data followed the transcription process. During the coding process the researcher opted to use inductive coding which allowed the researcher as much familiarity as possible with the data, and thus refrain from using her own views and interpretations whilst coding the data (Linneberg & Korsgaard, 2019). The researcher also referred to Boyatzis' (1998) model when conducting thematic analysis. Boyatzis (1998:29) identified three stages in thematic analysis: "Stage 1, deciding on sampling and design issues; Stage 2, developing themes and code; Stage 3, validating and using the code". Therefore, thematic analysis was applied in this study because it was a relevant method which allowed the researcher to generate common themes in the data collected for this research study.

1.9 TRUSTWORTHINESS

Trustworthiness, which is an important concept in qualitative research (Anthony, 2019:102), is a planned action that adds to the quality of the research study (Amankwaa, 2016). Lincoln and Guba (1985), state that trustworthiness supports 'the argument that the inquiry's findings are worth paying attention to". Lincoln and Guba (1985) also identified four categories regarding trustworthiness: credibility, transferability, dependability and confirmability. The findings of the research study should correctly and accurately display participants' experiences, this is called credibility (Braun & Clarke, 2022). The term "transferability" refers to the study's potential to be applicable to other studies, contexts, or circumstances that are similar (Braun & Clarke, 2022). The consistency, stability and repeatability of the data is established by dependability (Nowell et al., 2017). Confirmability is pivotal in a research study because it assists in decreasing researcher's bias and ensuring that the study is based on the research data (Braun & Clarke, 2022).

In addition, Yin (2011) identifies transparency, accuracy, and adherence as the three aspects relevant to trustworthiness and credibility. Through careful interpretation of data and verification of data sources, credibility can be attained (Anthony, 2019:104). Audio-recordings were used as a means to assist the researcher in recording accurate

information. Transcripts were re-read to ensure accuracy in the data. Transcripts were given to the participants for the sake of transparency and to be checked (accuracy).

Lastly, the researcher was mindful not to allow bias to affect the research negatively. Haynes (2012:12) describes reflexivity as ‘’interpreting one’s own interpretations, the field notes, diary, observations and subsequent listening to tape recordings all facilitated this process’’. Hence, reflexivity pushes the researcher to re-examine research methodology, theory, participants, and self.

1.10 ETHICAL CONSIDERATIONS

Ethics is a “science or study of what is right, or what ought to be, so far as this depends on the voluntary action of individuals” (Sidgwick, 2019:2). Ethics is pivotal in research as it requires the researcher to conduct research in a way that protects the participants’ well-being (Resnik, 2016). All research conducted included permission from participants who were fully informed of all details of their involvement in the research. Silverman (2014:162) confirms that "Informed consent entails giving as much information as possible about the research so that the prospective participants can make an informed decision on their possible involvement". In this study, all participants voluntarily consented (signed written consent) to participate in this research with no financial benefit and minimal risk. The researcher was honest and truthful, and data was not fabricated, falsified or plagiarised in any way, nor were there any omissions of relevant information. In addition, the researcher was mindful of the participants’ rights (Flicker, Travers, Guta, McDonald, & Meagher, 2015). The researcher protected the confidentiality and privacy of identities and information given by all participants and school sites involved in the study by assigning codes/pseudonyms. Participants were informed that they were permitted to discontinue participation in interviews at any point of the research process, without being disadvantaged in any way. All information was saved in password-protected electronic files and uploaded to the *cloud (Onedrive)*, and was only to be accessed by the researcher and her supervisor. On request, participants would receive an electronic copy of the completed dissertation for perusal.

1.11 DEFINITION OF KEY CONCEPTS

1.11.1 Technological leadership

Technological leadership refers to a leadership that promotes the use of technology to improve the organisations performance (Driessen & Hillebrand, 2017). Technology leadership has recently become a topic of discussion in research fields in relation to the changes in pedagogical methods and the implementation of technology in education (Mwawasi, 2014:1). Technology leadership includes defining characteristics such as curiosity, technical knowledge, communication skills, and leading change (Hurt, 2014:4).

1.11.2 Fourth Industrial Revolution (4IR)

According to leading researchers 4IR will transform the future by its impact on governments and businesses (Xu, David & Kim, 2018:91). “The Fourth Industrial Revolution can be described as the advent of “cyber-physical systems” involving entirely new capabilities for people and machines” (WEF, 2016). Terminology referring to the 4IR will be used in this study as the Department of Education (DoE) aims to include ICT skills in the curriculum to prepare learners for the future.

1.11.3 Principal

The DBE (2019) defines a principal as the manager of a school and an essential representative of the educational system. In addition, the principal is the most significant partner in education. Principals play a pivotal role in this study as they are the authority figures in schools as well as the key decision-makers. According to the Personnel Administrative Measures (PAM) document (2016:41), the duty of a principal is “to ensure that the school is managed satisfactorily and in compliance with applicable legislation, regulations and personnel administration measures as prescribed”.

1.11.4 Teacher

According to the PAM (2016:27) document, the teacher's function is "to engage in class teaching, including the academic, administrative, educational and disciplinary aspects, and to organise extra and co-curricular activities so as to ensure that the education of the learners is promoted in a proper manner". This document highlights that, based on the strategies and needs of the school, the roles and obligations of teachers vary. In addition, the Employment of Educators Act (1998) defines a teacher as an individual who educates and provides professional educational services.

1.11.5 Learner

Hornby (2005:840) in *The Oxford Dictionary*, defines a learner as "a person who is finding out about a subject or how to do something". In this study, the learner is a part of the learning environment, and is the benefactor of the teaching and learning process.

1.12 CONCLUSION

Technology in schools has many benefits such as improving engagement, and encouraging individual learning and collaboration. The world is fast embracing the Fourth Industrial Revolution (4IR), hence possessing knowledge of implementation strategies of technology cannot only be of great advantage in schools, but is a requirement for any school in today's day and age. A lack of technological leadership, like in any other field, might prevent the school from successfully implementing technology. The ultimate purpose of schooling is to prepare our learners for the outside world, and the workforce. Learners are exposed to many technological advances; however, our schooling system has not been revolutionised in an effective manner to accommodate our changing world. This study aimed to identify problems in the implementation and managing of technology in South African schools, as well as unearthing solutions to help alleviate such problems. This study also set out to interrogate the correlation between effective leadership styles and technology integration in the teaching and learning process. This study aimed to identify problems in the implementation and leading of technology in South African schools, as well as

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CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

The use of technology is a revolutionary experience that has transformed the way human beings live their lives**.** It is fast becoming a key instrument of progress in civilisation. Also, technology plays a supportive role in the different sectors of different countries' economies. The dynamics of the working world are changing due to the emergence of the worldwide Fourth Industrial Revolution (4IR) which aligns with technologically advanced economies and artificial intelligences (Thannimalai & Raman, 2018). The working world engages with technology, thus the school should prepare learners for a technology-oriented-world by developing 21st century skills that will encourage them to become active members of an advanced international society.

Technological change is necessary in schools because the world is changing so rapidly; but there still remains a gap in the technological development of the education system. Technology integration in education is a complicated and multidimensional task (Demir, 2011). Technology integration is the inclusion of technology in lessons, which necessitates skilled teachers who are able to design lessons that include technology and implement strategies for effective instructional practices (Demir, 2011). The purpose of technology in education is to improve and enhance teaching and learning.

Furthermore, technological advancements have created changing roles for educational leaders which shift educational leadership from its traditional foundation to embracing technological leadership. Hence, specialist skills for technology leaders are imperatives in schools because those using technology need guidance, support and direction. For the purpose of this study, teachers and principals are referred to as technological leaders. There exists a considerable body of literature on general leadership and leadership in education; however, additional research should be conducted on

technological leadership in education and its impact on teaching and learning. Furthermore, in-depth studies need to be piloted to establish whether technology leadership has an effect on the improvement of learner performance.

One of the greatest challenges that the education field faces is the degree of sound educational leadership on the use of technology (Badugu, 2014). The purpose of technology leadership in schools is to successfully integrate technology for teaching and learning to enhance learners' performance (Al-Hariri & Al-Hattami, 2017). This emphasises the importance of learner-outcomes in terms of technological change in schools. The learner should be the main benefactor of technological integration. According to Lanbon, Chea and Siaw (2020), schooling is improved when technology is integrated successfully into learning and school management, thus increasing the quality of the schooling experience. Technology should be aimed at elevating the quality of learning experiences for learners. In addition, education plays a pivotal role in developing and supporting learners while preparing them for the real working world. Incorporating technology into education allows learners to explore modern technologies which benefit both learners and teachers to reduce the technological literacy gap and equip leanrers for the global job market (Talib, Bettayeb & Omer, 2021).

Traditional school leadership differs from technology leadership because technology leadership does not only entail actions of the leaders, but it also focuses on the leaders' ability to be an ambassador for technological change in schools (Chin, 2010). However, technological leaders are faced with many challenges that require a specific leadership style - leaders should be transformational. According to Burns (1978), a transformational leadership style involves transforming others' beliefs, behaviours and attitudes which lead to positive outcomes when using technology to enhance the curriculum (Sikhakhane, Govender & Maphalala, 2021). These leaders bring about change in the school setting. The changing nature of technology requires leadership that is adaptable to new situations and challenges. The technology leader who should be a transformational leader, promotes change even in difficult times.

This was evident during the Covid-19 pandemic when the expertise of technology leaders was so desperately needed. This pandemic really challenged education systems and school leaders around the world. According to UNESCO (2020), more than a billion learners globally were affected by worldwide lockdowns that demanded school closures to mitigate the pandemic. Due to sudden school closure, face-to-face instruction was replaced by distance, remote, and online learning, which became the universal option to save education (UNESCO-UIS, 2021). There was a huge loss of teaching-learning hours, and schools had to devise different strategies to cover curriculum content (Tarkar, 2020). Teaching and learning had to take up new forms, and teachers had to learn how to use technology and social media as teaching tools. Pedagogy had to be adjusted and technological leadership was necessary to provide direction and support. Schleicher (2020:21) state that “beyond the Covid-19 pandemic, there are evident benefits to learners in expanding their learning time and opportunities beyond the school gate by being able to learn using a variety of distance learning approaches”. Therefore, Covid-19, ironically, has been a huge contributing factor in the progress of utilising technology in education globally.

As much as technology contributes to educational transformation, the core functions of education still remain the same. Technology is not meant to change methods of teaching and learning - it is meant to enhance teachers’ roles as co-creators, mentors, coaches and evaluators (Schleicher, 2020). Furthermore, traditional teaching practices have shifted to a more interactive and collaborative teaching approach. According to Ramamurthy (2017), technology-mediated teaching has replaced traditional classroom teaching. However, there are many countries that are faced with the challenge of under-resourced classrooms, and are far from integrating technology into teaching and learning (Du Plessis & Mestry, 2019). South Africa, in particular, faces many challenges pertaining to changes in education strategies, especially in the integration of technology into the curricula. In addition, there are major challenges such poor socio-economic conditions of communities, and a lack of infrastructure. Uneven distribution of technological resources continues to be a factor that affects the quality of education in South Africa (Choung & Manamela, 2018). As such, technology leaders are faced with many emerging challenges because of the lack of resources in schools.

Technological leadership plays an integral role in the education sector because it involves finding solutions for technological challenges, making decisions regarding the implementation of technology, and empowering others to use technology to enhance learning. Despite the many challenges, technology leaders have the arduous task of successfully leading and implementing technological change in schools. However, the educational system does not prioritise the technological development of educational leaders, despite the dire need for technology leadership as a change agent in the school environment (Chawinga, 2017). Since the role-functions of technological leaders in education have changed enormously over the past few years, greater emphasis should be placed on technological leadership in education. Hence, the purpose of this study was to determine the role of technological leadership in effectively integrating technology in teaching and learning.

2.2 THE CONCEPT OF EDUCATIONAL TECHNOLOGY

Technology is science or knowledge that has been applied to a specific goal (Banta, 2009). The processes of shaping modern society are recognised in the integration of technological evolution in the lives of people (Ng, 2015). The new global economy has also created a need for technological development in education which plays a pivotal role in society as it is responsible for the development of the social, economic, cultural and technological aspects of civilisation (Adewale, Jamil & Khadijah, 2019). According to Li, Wong, Cheung, Lam and Ng (2015), the use of educational technology in teaching and learning has become a worldwide phenomenon and has increased global pressure for technological developments in education. This pressure was exacerbated by the restrictions of the Covid-19 pandemic, which resulted in the popularity of technological tools and virtual platforms. Research findings by Sari and Putri (2019) indicated that an 'App' such as *WhatsApp* fostered enhanced communication among the learners of WhatsApp group chats which created a positive learning atmosphere and a sense of learner- belonging in terms of engendering dialogue and promoting sharing in the use of learning materials.

Educational technology does not have a long history and it is being recognized as a field that is worth exploring for the benefit and improvement of teaching and learning (Scanlon, 2021). The developments in technology necessitates many changes in education (Doğan, 2018). Ronghuai, Spector and Yang (2019) explain educational technology as the enhancement of learning and the improvement of results by designing, utilising, and managing technological processes and resources. The use of educational technology is becoming a fundamental feature in enhancing teaching and learning as it systematically applies modern technological tools to improve the quality of education (Stošić, 2015). Notably, it allows for more effective and faster transmission of information (Harris, Al-Bataineh & Al-Bataineh, 2016).

A successful combination of pedagogy and technology is imperative for ensuring the successful use of technology in the classroom. Technical and pedagogical methods are the foci of educational technology as they are beneficial in supporting learning (Ronghuai, Spector & Yang, 2019). Szeto and Cheng (2017:348) confirm that "a salient component of teaching is not only to use technological gadgets to teach but also to integrate technological knowledge into pedagogy". When educational technology combines technology with pedagogy, partnerships are created, which steers education in a new direction. Educational technology increases efficiency, improves current practices, and creates pedagogical transformation for the improvement of education (Ahmad & Nisa, 2016). Moreover, technology changes pedagogy for the enhancement of education and the augmentation of learning. According to Spector (2016:11), "Educational technology involves multiple disciplines, multiple activities, multiple people, multiple tools, and multiple opportunities to facilitate meaningful change", as educational technology in not limited to a specific practice. It is, rather, a vast field which explores a variety of technological platforms, pedagogical methods, and educational tools.

Technology is viewed as the way of the future, and schools should ensure learners technological preparedness for a 'technology-rich world' (Spector, Ifenthaler, Sampson & Isaías, 2016). In other words, educational technology is paramount to achieve effective teaching and learning as it prepares learners for life outside of school. Life

outside of school include learners' exposure to technology, hence there is a greater demand for the integration of technology into teaching and learning because it assists learners in developing 21st century skills (Hopcan, Yahşi & Hopcan, 2020) which enhance the lives of learners and make learning more practical and relevant.

Huang, Hu and Yang (2015) state that learners' perspectives when occupied in learning environments, influence their learning experiences. Educational technology produces a learning environment that stimulates interest and makes learning more meaningful. Global education and technology has transformed the manner in which learners' learn (Papa, 2011). The simple Venn diagram below (Figure 2.1) shows two intersecting ovals which indicate the relationship between education, education technology, and technology. In figure 2.1, education and technology has four areas: (area: 1) neither education nor technology; (area: 2) education but not technology; (area: 3) technology but not education; and (area: 4) education and technology. When education meets technology it is called Education Technology, a point at which education and technology intersect or combine.

According to research conducted by Gulpan and Baja (2020), when technology integrates with education, it aids teaching and learning because it permeates classrooms with digital learning tools that benefit learners to gain 21st century learning experiences, while creating structural changes that improve school environments to increase educational productivity.

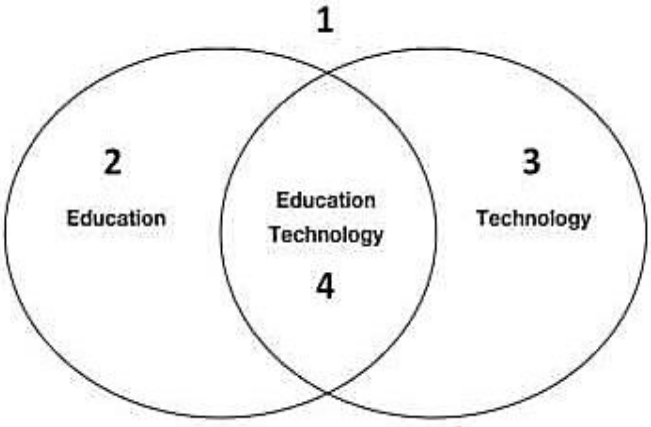


Figure 2.1: Educational technology Venn diagram (Spector, 2016:11)

The Victoria State Government (2020) describes technology teaching as processes that integrate technology into teaching and learning by including technology in the curriculum. Ahmad and Nisa (2016) also describe educational technology as the ability to use modern technology to enhance the quality of teaching and learning. Thus, the expected outcome of the implementation of technology in education should be improved teaching and learning. A misconception exists when schools believe that just being in possession of technological devices is adequate to enhance learning. According to Kör, Erbay and Engin (2016), many schools spend large sums of money on technological devices and networks, but they are still not cognizant of the full benefits of technology in teaching and learning situations.

Hence, it is necessary that technology leadership provides direction for technology integration in school to alleviate challenges associated with implementing technology in the classroom. To this end, technology will only provide impactful learning experiences, if it is adequately integrated into the education curriculum and used effectively (Bull, Thompson, Schmidt-Crawford, Garofalo, Hodges, Spector, Ferdig, Edyburn & Kinshuk, 2016). Therefore, technology leadership is vital as the driving force behind the effective use of technology in schools. Ronghuai, Spector and Yang (2019:4) describe educational technology as "the use of tools, technologies, processes, procedures, resources, and strategies to improve learning experiences in a variety of settings". As result of the COVID-19 pandemic, educational technology policies and procedures have changed in numerous educational institutions (Kimmons, Rosenberg & Allman, 2021). COVID-19 pandemic compelled education to transform by utilising technology in education.

2.3 LINK BETWEEN LEADERSHIP AND EDUCATIONAL TECHNOLOGY

The concept of leadership has been studied by many researchers, therefore there are many different definitions and theories (Alvesson, 2020). According to Laub (2018:62), "Leadership is an intentional process, a process that follows from a compelling vision to pursue change". Leadership, therefore, influences followers to achieve a particular goal. The Covid-19 pandemic has highlighted the importance of astute leadership practices

and its pivotal role during a crisis (Northhouse, 2021). In addition, the pandemic has also exposed many issues in the education. Worldwide lockdowns created a greater demand for distance and blended learning, placing a strain on leadership in education. The process of coordinating, guiding and directing others in educational matters to improve effectiveness to achieve teaching goals, is called leadership in education (Amalia, Komariah, Sumarto & Asri, 2020) which is transforming in that it forces leaders in schools to adapt to the technological changes that are sweeping the world. Therefore, leadership in education needs to be reviewed in terms of leadership practices which should be aligned with new global demands and changes. One of the elements to promote the success of widespread educational change is sound leadership (Harris & Jones, 2016) especially when integrating technology into teaching and learning. Since technology is dependent on human involvement (Papa, 2011), implementing technology in schools requires leadership to work in tandem with technology to ensure successful teaching-learning outcomes.

Additionally, educational leaders are pressured by technological advancements and environmental changes to improve their leadership practices (Shava & Tlou, 2018). Shava and Tlou (2018) agree that educational leadership demands that leadership in schools explore and utilise innovative styles of leadership that promote 21st century skills such that learners obtain knowledge and skills that will prepare them for local and global employment opportunities (Spector, Ifenthaler, Sampson & Isaías, 2016). It is crucial that educational leadership revolves around the needs of learners, therefore, the technology leader has a huge responsibility to ensure that the quality of education is improved by aligning the use of technology in education with 21st century education goals in line with transformational ideals (Bass, 1990) that entails 'model behaviour' - the behaviour which influences others to follow creative and innovative role-models. Moreover, an effective transformational leadership style never changes but rather adapts to change according to situation and context (Bass, 1990). Due to technologies being unpredictable and changing in nature, technology leadership needs to be adaptable, flexible, versatile, resilient, and progressive.

Furthermore, technology leadership changes the school environments through the implementation of visionary policies and procedures. Accordingly, “technology leadership represents all technology-related activities at school including organizational decisions, policies and technology implementation” (Torrato, Aguja & Prudente, 2021:37**).** The technological leader in education must, therefore, employ collaborative leadership skills to facilitate functions such as policymaking in relation to technology expertise for the enhancement of teaching and learning. According to Ololube, Kpolovie and Makewa (2015), technological leadership is leadership that uses knowledge and skills to realise the vision of the school by using technology as an instrument to improve the quality of the organisational functions of the institution. This emphasises that education technology leadership focuses on collaboration, development, and implementation of the vision of technological transformation in schools in all teaching-learning processes (Gulpan & Baja, 2020). Hence, the International Society for Technology in Education [ISTE] (2021) recommends that technology leaders organise, implement and assimilate the utilisation of technological devices as teaching and learning tools and include it as the foundation for strategic planning. This means that the school should view technology as a collaborative ‘partner’ that assists the school in achieving its vision, goals and objectives.

The new goal for education to adapt to technological advancements pressurises technology leaders to confront the challenges of implementing technology in educational settings which can result in leaders implementing technology just for the sake of it, without understanding the full impact of technological integration into education. A study by Webster (2017) on technological leadership in education revealed that leaders experienced great anxiety to keep abreast with the demands of implementing technology. He discovered that leaders simply purchased technology without setting clear educational goals and then left it up to the users to figure out how to use it. Webster’s (2017) study also showed that technology in education should be driven by educational goals, which includes keeping abreast with technological advancements, hence it is imperative for technology leaders in education to possess a full understanding of the reason for implementing technology and its impact on the organisation as this decreases the risk of failure concerning technology implementation.

Goal-setting for using technology in education allows technology leaders to map out important outcomes which provide focus and direction such that technology integration goals are met by those who inspire, direct and support technological change (Doğan, 2018). 'Tech-savvy' school leaders assist in creating environments that embrace technological developments, whilst supporting the growth and development of others (Sheninger, 2014). Therefore, technological leadership plays a pivotal role in the elevation of schools and their standards of education.

Previous research revealed that school leadership necessitates the promotion of technological knowledge and skills (Raman, Thannimalai & Ismail, 2019). The lack of adequate technological leadership in schools creates fear and confusion due to the lack of support and direction. Leadership in educational technology involves more than accounting for technological resources; it is about the responsibility of the technology leader to use and implement technology to enhance the teaching-learning experience. This involves understanding the needs of the classroom and school, using policies and procedures for the benefit of learners, and viewing technology as a tool that improves learning experiences. Therefore, leadership plays a pivotal role when integrating technology in education because it provides support and guidance to all stakeholders involved.

2.4 TEACHERS AS TECHNOLOGY LEADERS

The role of the teachers has transform from "Sage on the stage" to "guide on the side" (King, 1993:30), especially as education moves towards a heutagogical (learner-centred) approach to learning, where learners become more involved in their own learning experience. Teachers facilitate learning to equip learners with 21st century skills and education (Roblyer & Doering, 2014). The role of teachers is shifting from traditional classroom instruction to a teaching style that inculcates 21st century skills necessary for preparing learners for the workforce. Teaching has become more intricate in nature because the world is driven by technological advancements and information which is readily available online (Nooruddin & Bhamani, 2019). Therefore, it is imperative that teachers become leaders of technology in the classrooms, in schools, and outside of

the school environment. Furthermore, technological change becomes successful when teachers become leaders (Doyle & Reading, 2012). Teachers are not expected to be skilled and proficient overnight - a change of this nature will take time, patience, and perseverance (Boyer & Crippen, 2014). As in the case of any form of leadership, teachers as technology leaders, need to learn, grow and develop skills, for effective leadership to take place.

Teacher leaders have the ability to extend their roles beyond the classroom and provide guidance and support to their colleagues and learners (Wenner & Campbell, 2017). Teacher leadership is a concept that has been widely researched and having multiple definitions mainly because teachers participate in a variety of leadership roles (Nappi, 2014). The new role of teachers involves the use of technology in their educational practices, thus making them technological leaders. However, teachers as technology leaders face many challenges. Teachers who are able to access a variety of technology tools and possess technological competencies, still find it challenging to implement technology in their teaching (Govender & Govender, 2014). Teachers may have teaching experience and technology skills; however, this does not necessarily result in a successful outcome when integrating technology into the classroom.

The teacher as a technological leader is hindered by personnel who are resistant to change, and have a negative perception towards using technology. This fear of change is a common human feeling that obstructs growth and development in schools. Teachers who are accustomed to doing things in a certain way may become frustrated and overwhelmed by technological change; this frustration leads them to shy away from the use of technology (Harrell & Bynum, 2018), resulting a low morale in the workplace. In Malaysia, one of the greatest challenges is to motivate teachers to adopt the 21st century style of teaching and to shift pedagogy to a point that will improve the quality of education (Raman et al., 2019). As life-long learners, teachers are required to embrace change. Regular professional development training is an essential component of the technology integration process as it assists teachers in bridging the knowledge gap (and skills gap) between what teachers know and what they are required to know when integrating technology into teaching and learning. Furthermore, professional

development allows teachers to collaborate, and a lack of professional development creates limitations and challenges for teachers when using technology in classrooms (Liu, Liu, Yu, Li & Wen, 2014). Teachers also need support from their principals and schools, schools should engage teachers in professional development to enhance their technological proficiency and competence (Hero, 2020). While professional development allows teachers to sharpen their skills and abilities, it also exposes teachers to relevant content and practices which allow them to expand their knowledge and teaching practices.

Teacher leadership requires astute managerial skills because one of the core functions of being a teacher is the ability to be a successful classroom manager. Moreover, teachers need to possess ICT management skills (Mama & Hennessy, 2013), which will enable them to manage technology effectively. Also, preparedness is an important factor for effective management (Bull et al., 2016). According to Hero (2019), some teachers demonstrate technological adeptness when they use technology in the classrooms as they consider the use of technology as an innovative practice. Hence, being prepared in using technology in teaching and learning requires training, self-learning and peer-learning. Technology cannot be effectively used by teachers if they lack the skills to use technological devices.

Therefore, the teacher, as a technological leader, embraces technological change and transforms pedagogy, all for the purpose of improving teaching and learning. Teachers need to align their use of technology with the learners' needs. Teachers should identify, evaluate and choose technological resources that are adequately suited for achieving learning objectives and effective pedagogy, as these assist teachers in lesson preparation and management of educational resources (OECD, 2021). Administrative tasks can be daunting and time consuming, but the use of technology saves teachers time and effort when completing their tasks. Through peer mentoring, teachers act as technology leaders by assisting their colleagues in finding simpler ways of completing administration tasks. Hence, teachers act as mentors and role-models of technological change in schools.

Further, teachers exercise their leadership functions by influencing parents and other stakeholders in education with their knowledge, legal and social responsibilities, and ability to reflect on their own progress and practices, and capacity to develop diverse views that enhance teaching and learning research (Martínez & Garcia, 2015). According to Cosenza's (2015:82) Teacher Leader Model, there are seven domains:

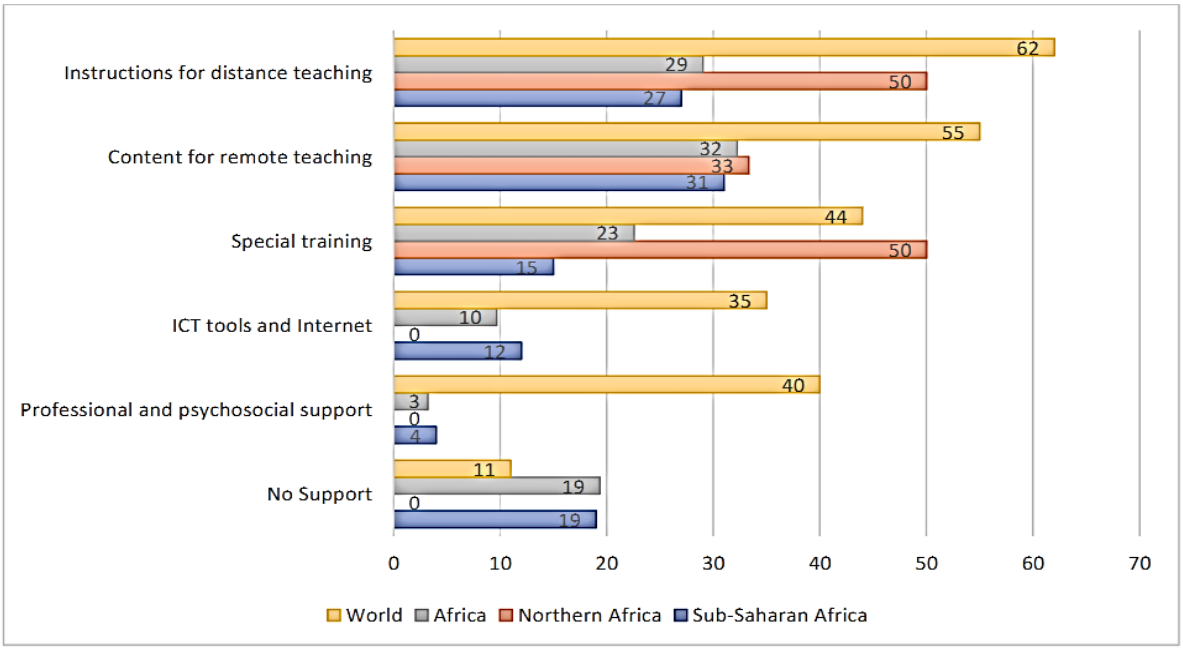
- fostering a collaborative culture to support educator development and learner learning;
- accessing and using research to improve practice and learner learning;
- promoting professional learning for continuous improvement;
- facilitating improvement in instruction and learner learning;
- promoting the use of assessments and data for school and district improvement,
- improving outreach and collaboration with families and community; and
- advocating for learner learning and for the profession.

Cosenza's (2015) noted that previously teachers had to separate themselves from routine classroom responsibilities in order to assume the role of leader; however, his study reveals that teachers can become leaders without leaving the classroom environment because of the variety of roles they engage in.

Teachers are considered leaders because they create a culture of learning as they lead pedagogy in their classrooms, and they are leaders of learning both inside and outside the classroom (Chan, López, Loria & Briceño, 2020). During the pandemic, teachers were pressed into leading themselves as technological leaders. This revealed that teachers do not need special titles to be leaders. A study by Chan, López, Loria and Briceño (2020) found that despite the impact of Covid-19, teachers still performed their leadership roles and promoted learning by displaying pedagogical development, influence, and action. It is imperative that teacher leaders upskill their technological knowledge and competency, this will enhance their role as educational leaders (Chan, Lopez, Loria & Briceño, 2020).

Figure 2.2 below graphically depicts the percentage of countries that offered support to teachers. Globally, 62 % of countries provided instructions for distance education - Africa contributed 29% of the percentage. The graph shows that ICT tools and internet platforms were not adequately provided, especially in Africa. Teachers in Africa were thrown into unknown territory when they had to shift from face-to-face teaching to remote teaching, which required the practice of different skills, expertise and pedagogical knowledge (UNESCO-UIS, 2021).

Figure 2.2: Percentage of countries that offered teacher-support (UNESCO, 2020)



Source: UNESCO/ UNICEF/ World Bank, 2020.

Considering the statistics included in Figure 2.2 above, it is evident that teachers are mainly faced with the challenge of the lack of resources in schools. During the Covid-19 pandemic, teachers required network data, access to Wi-Fi and technology devices - in most cases they used their own funds to purchase these resources. Consequently, teachers become demotivated because of poor infrastructure and a lack of technological devices which are barriers to learners receiving sound 21st century education (Harrell & Bynum, 2018). In sum, teacher technology leaders are essential for the success of technological integration into teaching and learning environments

because they play a critical role in the dissemination of knowledge and skills, despite their challenges.

2.5 PRINCIPALS AS TECHNOLOGY LEADERS

Principals play a pivotal role in the functioning of schools, especially in decision-making processes and policy implementation, specifically in the 21st century as technology is advancing rapidly. According to Veeriah, Chua, and Siaw (2017), effective and efficient principal leadership is integral to better academic performance. Therefore, the principal acts as a 'functional teacher' who possesses the necessary skills to lead a school (Amalia, Komariah, Sumarto, & Asri, 2020). Sterrett, William, Richardson and Jayson (2020) describe the fundamental role of the school principal as a leader who supports and nurtures the growth and development of others. Technological advancements have increased teaching and learning responsibilities, which implies that the principal assumes yet another role - the role of technology leader who should be in possession of knowledge and skills pertaining to technology in education (Papa, 2011). This means that the role of the principal is transforming from manager to instructional leader who must adapt to a supportive role regarding the introduction of innovative technologies in schools (Garcia, Abrego & Jauregui, 2019). These new roles include sourcing new technology for the purpose of teaching and learning, training and developing teachers for technology integration into the school curriculum, and inculcating leadership values in technology teachers (Hero, 2020). Principals need to become technological leaders who promote 21st century skills amidst the daunting task of integrating technology in their schools.

The principal's new responsibility is to ensure "technological resources are used efficiently and effectively to enhance learning experiences to get better results" (Fullan, 2001:65). Principals who are schools' role-models for transformation should display technology leadership to enhance teachers' professional development by continuously supporting the incorporation and integration of technology into education (Hero, 2020). In this regard, principals should also become skilled in technology use because this will motivate and encourage others.

A visionary technology policy plan with innovative strategies is vital when implementing technology in schools (Alghamdi & Prestridge, 2015). Principals, as decision-makers, must design policies and procedures that will provide guidance and direction to those involved in the technology integration process. A harmonious and cooperative principal-teacher relationship also determines the success of infusing technology in education. As such, the principal, as a technology leader, should know the needs, strengths and weaknesses of teachers. This knowledge will assist the principal in providing relevant professional development for teachers. Research indicates that there is a relationship between the principal's and teacher's vision for the use of technology in school, but this is dependent on the principal's leadership style and skills as a technology leader (Shattuck, 2010). Principals act as agents of change when they encourage technological use in schools because they inspire teachers to use technology themselves. Their support of professional development can improve technology integration in schools (Thannimalai & Raman, 2018). Since principals are not exempt from technological professional development, in order to implement 21st century education successfully in schools, they required training to become competent and adequately skilled in the utilisation of technology in schools (Roblyer & Doering, 2014). That is, principal's professional development should include 21st century knowledge and skills regarding technology leadership styles that promote the effective integration of technology in schools (Raman et al., 2019). The success of the teacher as a technology leader is greatly influenced by the astute technological leadership of the principal.

'Tech savvy' principals promote growth and development in others as they are constantly involved in innovation and learning, thus they assist teachers in viewing themselves as collaborators who contribute positively to learner-achievement (Sheninger, 2014). The function of the principal as a technology leader requires the principal to set technological goals and standards for the school. Furthermore, principals' knowledge, competence and technological abilities, determine the rate of success in the schools' involvement in the fourth industrial revolution (Hero, 2020). Accordingly, principals should acknowledge the importance of 21st century education as a foundation for the successful growth and development of the school environment.

Principals, as leaders, have the greatest influence in schools, thus they have a huge responsibility as ambassadors of change. Since they play an integral role in introducing technology, their perception, abilities, competencies, and acceptance or resistance of technology can have a great impact on the success or failure of technological integration in schools. Ultimately, the principal as a technology leader understands that a more interactive and collaborative approach to learning improves teaching and learning experiences for which benefits all stakeholders (Garcia, Abrego & Jauregui, 2019

2.6 EDUCATIONAL TECHNOLOGY LEADERSHIP, LEARNING OUTCOMES AND LEARNING ACHIEVEMENT

Digital technologies have transformed civilisation and are steadily entering the classroom too, even though education has been slow to adapt to new technologies (Schleicher, 2018). According to Simonson and Schlosser (2017), multiple studies have indicated that there is a correlation between leadership and school improvement. In the 21st century, educational technologies have radically transformed learning environments to produce effective teaching and learning outcomes (Male, 2018).

According to Marosan, Josanov and Savic (2015), new technology tools are being skilfully adapted by learners who explore creative methods of using technology in a variety of contexts. Technology should assist learners in successfully achieving learning outcomes which give them an indication of what is expected of them at the end lesson or programme; therefore, acting as a source to guide teachers and learners (Mahajan & Singh, 2017). Improved learning outcomes can be achieved when teachers provide adequate technologies and technological tools for learners (Daniela, 2019). The use of technology in education is needed to develop conceptual frameworks for pedagogy for purposeful learners learning that results in better learning outcomes (Ng, 2015). Ng (2015) identifies three areas for the inclusion of technology into teaching and learning: achieving successful learning outcomes by supporting learning, assisting in preparing learners for employment by equipping them with twenty-first century skills, and promoting learners to develop into digital citizens and lifelong learners. Therefore, technology leaders need to explore technology tools that enhance learners's practices

by achieving learning outcomes and providing performance feedback that will be beneficial for learners and teachers (Felder & Brent, 2016).

Technology has many positive effects on learners' performance. It enhances learner achievement as it supports classroom learning, and contributes to the decrease in the school dropout rate (Hamzah, Nasir & Wahab, 2021). There is also a greater expectation for learners to perform better in the classroom because they have access to various technological tools (Alghamdi & Prestridge 2015). Generation Z's exposure to technology demands that they be taught by using technology; however, education has been slow to meet these demands. The digital age permits learners to engage in the quest for knowledge using a variety of methods, which influence learning outcomes of learners (Wang, 2016). According to Yu and Prince (2016), multiple studies have shown that the implementation of technology in schools enhances teaching and learning and the quality of schools. The modern world that learners live in is ever-changing because of its interconnected nature, which can create multiple opportunities as well as challenges for learners (OECD, 2021). Furthermore, the demands of the modern world are rapidly filtering into classrooms.

According to Snead and Simms (2016), technological integration is not successful when it is integrated for the sake of it - the focus should be on how to use technology to improve learning. Educational technology leaders should be concerned about the relationship between technology and learners' achievement, as the main aim of integration technology in education is to ensure successful teaching and learning. The past decade has seen the rapid development of technology in education; however, the correlation between technological integration in education and learner performance still remains unclear. Hence, more research is needed to explore the way learner performance is impacted by the use of technology in the learning process.

Digital literacy goes beyond just knowing how to use technology - it prepares learners by giving them an insight into the digital environment by using 21st century skills that will equip them for the global working-world (Adams Becker, Huang, Liu, Gao, Cummins, Giesinger, & Shedd, 2017). Leadership plays an integral role in the integration of

technology which impacts learner achievement (Gupta, 2016). Therefore, technology leaders in education require leadership skills that align with technological expertise to create a culture that embraces technological change in schools.

Technology literacy promotes the acquisition of 21st century skills which are essential to function in the modern world. Basitere and Ndeto-Ivala's (2017) research reveal that the use of technology in learner learning positively affected learners' performance as it enhanced collaborative learning, and improved in learners' proficiency in technology. Technology integration in education demands the acquisition of information which must be used effectively. Technology is essential for uplifting learner performance, as it is a motivator for learner learning because learners learn better when they use technology, especially when they work in groups (Kör, Erbay & Engin, 2016). Learner motivation plays an integral role in their ability to learn using technology as their motivation will determine their willingness to engage in new learning experiences, and to work in collaboration with others when using technology (OECD, 2021). Apart from technology as a motivator, the technological leader should encourage learners to use technology as a beneficial learning aid.

The fundamental aim of integrating technology into teaching and learning is for the improvement of the quality of education, as it is predicted that the use of various technologies will only elevate educational success (Ozerbas & Erdogan, 2016). Technology stimulates the learning process because it is a learning tool that assists teachers with teaching lessons creatively (Aparicio, Bacao & Oliveira, 2016). However, school leaders need to observe how learners learn via technology, as learners need guidance to overcome the challenges that come with integrating technology into learning. Stošić (2015) highlights that technological education has three domains: the tutor, the teaching tools, and the learning tools. Technology as a learning tool fosters authentic learning experiences. Further, the availability of technology tools in schools is not enough to improve learner achievement; astute technological leadership is needed to manage technological resources to ensure that they are being used effectively to enhance academic performance.

2.7 CHALLENGES FACED BY TECHNOLOGICAL LEADERS

Globally, technological leaders face many challenges (Morote, 2013) that resulted in the slow pace of keeping up with technological changes. Major barriers to technology learning include the lack of infrastructure, insufficient technological devices, the negative attitude of some teachers towards technology integration (Emre, 2019). Thus, educational systems should prioritise overcoming such barriers if technology integration is to be successful. The use of technology tools is critical as a permanent feature of education (Harrell *&* Bynum, 2018*)* if we want to prepare our children to become contributing adult citizens. Although technology is advancing at an impressive rate globally, there are significant differences in technology availability as well as the quality of technology integration in different countries. According to UNESCO (2021), millions of learners in Africa were greatly impacted by the closure of schools during Covid-19 lockdowns, which further exacerbated inequalities present in vulnerable communities.

In South Africa, in particular, the equal distribution of technological resources poses another major challenge. Research conducted by Choung and Manamela (2018) revealed that in South Africa there is a huge difference in the use of technology between rural and urban schools. Schools in rural areas have limited funding for technological resources in comparison to urban areas which exposes major inequalities in the South African education system. Although the South African Government promotes the use of technology in education through policies and procedures (Mwapwele, Marais, Dlamini, *&* Van Biljon, 2019), these cannot be effectively implemented without access to technology and sound technological leadership. A lack of technological leadership can lead to misuse of resources, lack of direction for those using technology, resistance to change because of fear and absence of guidance, and overall failure in infusing technology in teaching and learning.

Continuous professional development plays a pivotal role in the success of technology integration in schools. A study by Kuranchie (2017) reveals that teachers in Ghana exhibited a lack of professional development which led to them being not fully prepared to use technology in the teaching-learning process. Even with the availability of ample

technological resources, the lack of professional development is a major hindrance to the implementation and progress of technological integration in schools (Harrell & Bynum, 2018*).* Another stumbling block is the resistance to change by personnel responsible for implementing new technologies in classrooms. Such technology leaders who are resistant to technology integration in schools possess deep-seated negative attitudes that are resistant to embracing change which can pose as a major challenge in an institution (Jin, 2019). This may be alleviated via professional development workshops which are essential to capacitate technology leaders such that they develop confidence to mitigate resistance.

According to Scanlon (2021), educational challenges can be solved via the use of technology. In 2020, the world was faced with major challenges as a result of the devastating effects of Covid-19. Technology has assisted education systems around the world with disseminating information to learners. Ironically, Covid-19 has promoted digital learning even in the face of inequalities (Unwin & Unwin, 2017). Teachers and learners with access to technology were the ones advantaged by the 'new-form' of teaching and learning. Unfortunately, many rural learners did not have access to technological devices needed for distance learning or blended learning.

The main objective of a country's educational technology policy should be to implement technology in education to boost the country at all levels, especially the main stakeholders in education such as school administrators, principals, teachers, parents and learners (Gibson, Broadley, Downie, & Wallet, 2018). UNICEF (2020) confirms that DBE is working towards massively upscaling e-learning in collaboration with their partners to produce new digital learning. However, UNICEF (2020) notes that although there are great efforts to integrate technology into learning, South Africa still faces challenges such as technology access as only 30% of households in urban areas have access to computer, and only 9% in the rural areas. Data costs also pose a huge problem for learners and vulnerable communities are placed at a disadvantage. Many countries have implemented technology for the purposes of extending learning outside the classroom, facilitating teacher professional development, and making learning a more personal experience for the learner (UNISEF, 2021). Technological leaders can

alleviate some challenges with the cooperation of their country's government and education departments; leaders play a supportive role, hence they also need support, guidance and direction from higher authorities.

2.8 THEORETICAL FRAMEWORK

This study aims to determine the role of technology leadership in the implementation of technology in teaching and learning. Successful technology integration enhances learner performance and learning outcomes. The researcher selected the Technological Pedagogical Content Knowledge (TPACK) framework which is appropriate for this study because TPACK guides technology leaders to effectively assimilate technology into teaching and learning by integrating technology knowledge, pedagogical knowledge, and content knowledge into curricula.

2.8.1 The Technological Pedagogical Content Knowledge (TPACK) framework

This study is underpinned by the Technological Pedagogical Content Knowledge (TPACK) framework which was chosen because it assists technology leaders in schools by providing them with insight and strategies on various approaches to deal with the intricacies of using technology in teaching and learning (Spires, Hervey, & Watson, 2013). The TPACK framework is an extension of Shulman's (1987) work which was based on pedagogical and content knowledge in terms of education (Hofer, Bell & Bull, 2015). It emphasises that content, pedagogy and technology are integrated for effective teaching through the use of educational technologies.

Further, "technological pedagogical content knowledge (TPACK) is an emergent model that goes beyond all three components: content, pedagogy, and technology" (Mishra & Koehler, 2006:1028). Hence, TPACK is relevant to this study because content, pedagogy, and technology knowledge are essential components when integrating technology into teaching and learning. Moreover, the TPACK framework should be used by school leaders when leading and effecting technological change in schools because it facilitates teaching and learning in a more effective manner. In other words, school leadership should focus on developing leadership that focuses on developing

technology, pedagogy, and content knowledge [TPACK] (Herring, Thomas & Redmond, 2014). This implies that TPACK encourages technology leaders (and teachers) to focus on being eclectic by integrating the three components of TPACK and not focusing on just one area.

Technological pedagogical content knowledge (TPACK) expands on Shulman's (1986) pedagogical content knowledge (PCK) which only included the relationship between pedagogy and content (Mishra & Koehler, 2006). Mishra and Koehler (2006) included the technology component, thus creating the TPACK framework which emphasises the interplay between technology knowledge, pedagogical knowledge, and content knowledge. "TPACK allows teachers, researchers and teacher educators to move beyond oversimplified approaches that treat technology as an 'add-on' instead [of focusing] in a more ecological way on the connections among technology, content and pedagogy as they play out in classroom contexts" (Koehler & Mishra, 2009:14). As such, TPACK does not only limit the technological user to knowledge of technology but also emphasises the importance of pedagogical techniques in relation to implementing technology into teaching and learning. In other words, this framework is centred on the connectedness of the three components technology, pedagogy and content, and its ability influence and support learners' learning. As learning content and pedagogy changes, teaching using technology is also changing (Hofer et al., 2015). The TPACK framework has developed over time into a model that describes various practices that help technology users understand the intricacies of teaching with technology (Hofer et al., 2015). In Figure 2.3 below, content meets pedagogy; this is content knowledge combined with the knowledge of how to appropriately administer content knowledge for better teaching (Mishra & Koehler, 2006).

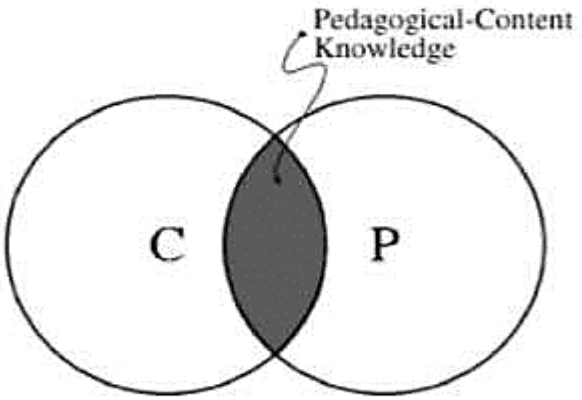


Figure 2.3: Diagrammatic representation of Pedagogical Content Knowledge (Mishra & Koehler, 2006:1022)

Figure 2.4 below depicts the integration of pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK) - when combined it forms the TPACK framework. The intersecting circles emphasise the correlation among technology, pedagogy and content. “The dotted line around the framework represents the various contexts that include learner background, subject matter, and available resources that can influence how TPACK is applied in a practical sense” (U.S. Department of Education, 2016:13). However, TPACK is not effective without the combined effort of teachers, community, and leadership (Liu et al., 2014).

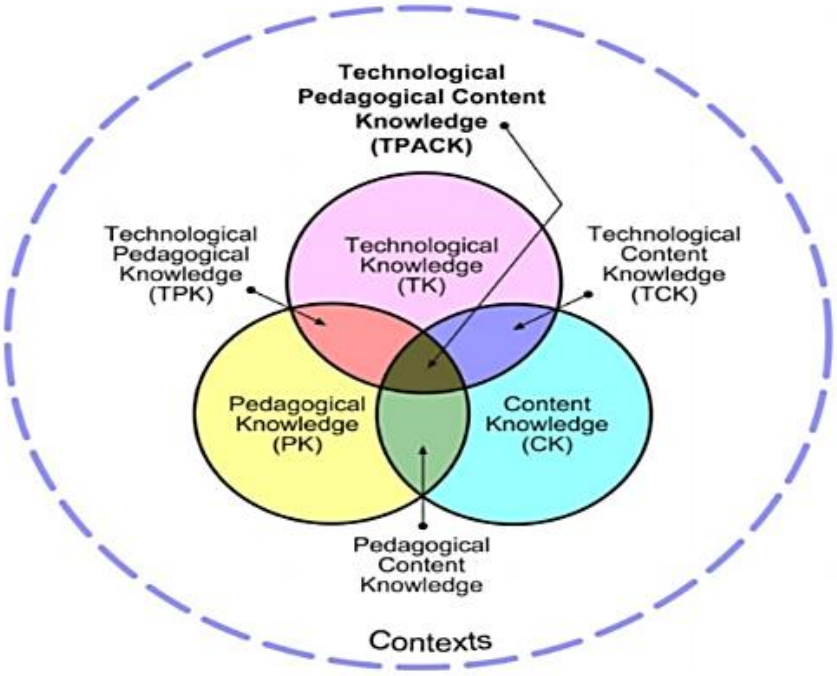


Figure 2.4: TPACK framework (Mishra & Koehler, 2009:63)

The TPACK framework involves the use of technology in a way that enhances learning for learners. Technology should not be perceived as an addition to current teaching and learning strategies - technology should be emphatically integrated into current teaching practice to better learners' learning experiences (Hofer, Bell & Bull, 2015). In this regard, TPACK gives learners s a more comprehensive learning experience that enhances their understanding and mastery of curriculum content (U.S. Department of Education, 2016). This includes the enhancement of learner learning practices, alleviation of challenges learners face when learning, and the identification of learning tools needed to achieve learning goals (Hofer, Bell & Bull, 2015). The TPACK framework demonstrates that the outcome of the integration of content knowledge, pedagogical knowledge, and technological knowledge, is effective teaching for effective learning (Hofer, Bell & Bull, 2015). Technology has become an essential part of teachers' and learners' lives, in ways that have changed the way they behave in technological environments (Baran, Chuang, & Thompson, 2011).

Although technology has conscientize us to the importance of learning content and school management skills, school leadership is still a vital contributing factor to improved learner outcomes (Lindqvist & Pettersson, 2019). Leithwood et al. (2006) highlight that school leadership is a critical factor in ensuring the effectiveness of innovative pedagogy. Technological leadership is needed to make critical decisions and provide support throughout technological integration in teaching and learning. However, TPACK should be integrated into teaching and learning in a more methodical manner, using strategy and leadership, whether in school or at university (Holland & Piper, 2016). Technological leadership influences TPACK because technology leaders are key role-players in technological transformation in schools. Previous research has established that recurring themes in TPACK include improved learner confidence in the use of technology, leadership and the modelling of technology integration in schools (Martin, 2015). Additionally, TPACK is used to guide technological leaders as it focuses on using appropriate pedagogical methods using technology to enhance the quality of delivering learning content. Moreover, TPACK allows technological leaders to view the integrating technology in learning as a holistic process which shifts the focus from only technology to the cohesion of all three components: curriculum, technology, and pedagogy. According to Hsu (2015), TPACK is most effective when teaching learning content while being cognisant of pedagogical requirements and use of technology for the benefit of holistic learner development.

Due to the ever-evolving nature of technology, technological leaders are faced with many challenges related to technological change, especially in organisational matters of the school. Thomas, Herring, Redmond and Smaldino (2013) formulated the *theory of action* that focuses on the relationship between change, leadership and TPACK. Figure 2.5 below, depicts the *theory of action* which shows how change is expected to occur, what the leader can control, and what they cannot control (Thomas et al., 2013). “This map identifies key areas that leaders should consider as they make plans for the effective integration of TPACK into their colleges” (Thomas et al., 2013:57). In sum, a *theory of action* is formed by the actions and consequences of technological leaders in education.

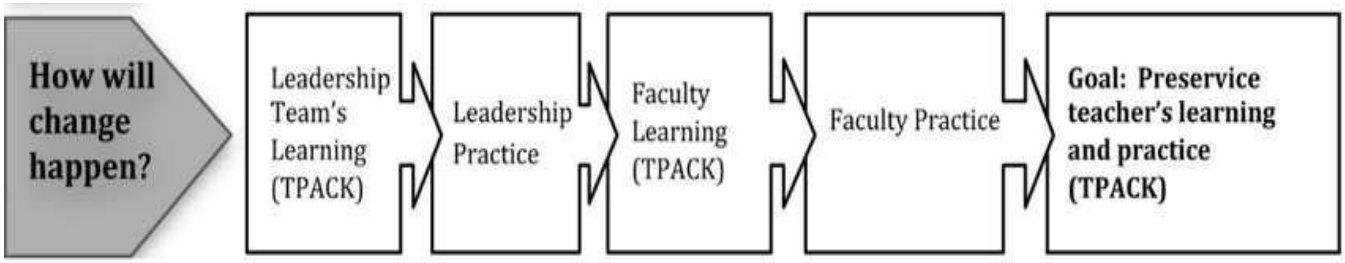


Figure 2.5: One component of the TPACK Leadership Theory of Action model (Thomas, Herring, Redmond & Smaldino, 2013:57)

Avidov-Ungar and Shamir-Inbal's (2017) study found that in addition to TPACK, leadership knowledge (LK) plays an integral role in the successful integration of technology into teaching. Knowledge about leading change include the systematic and responsible management of change, cultivating a leader's personality, possessing effective communication skills, together with the ability to lead others. Figure 2.6 presents four types of the required knowledge in a hierarchy used by agents of change when integrating technology in teaching and learning (Avidov-Ungar & ShamirInbal, 2017).

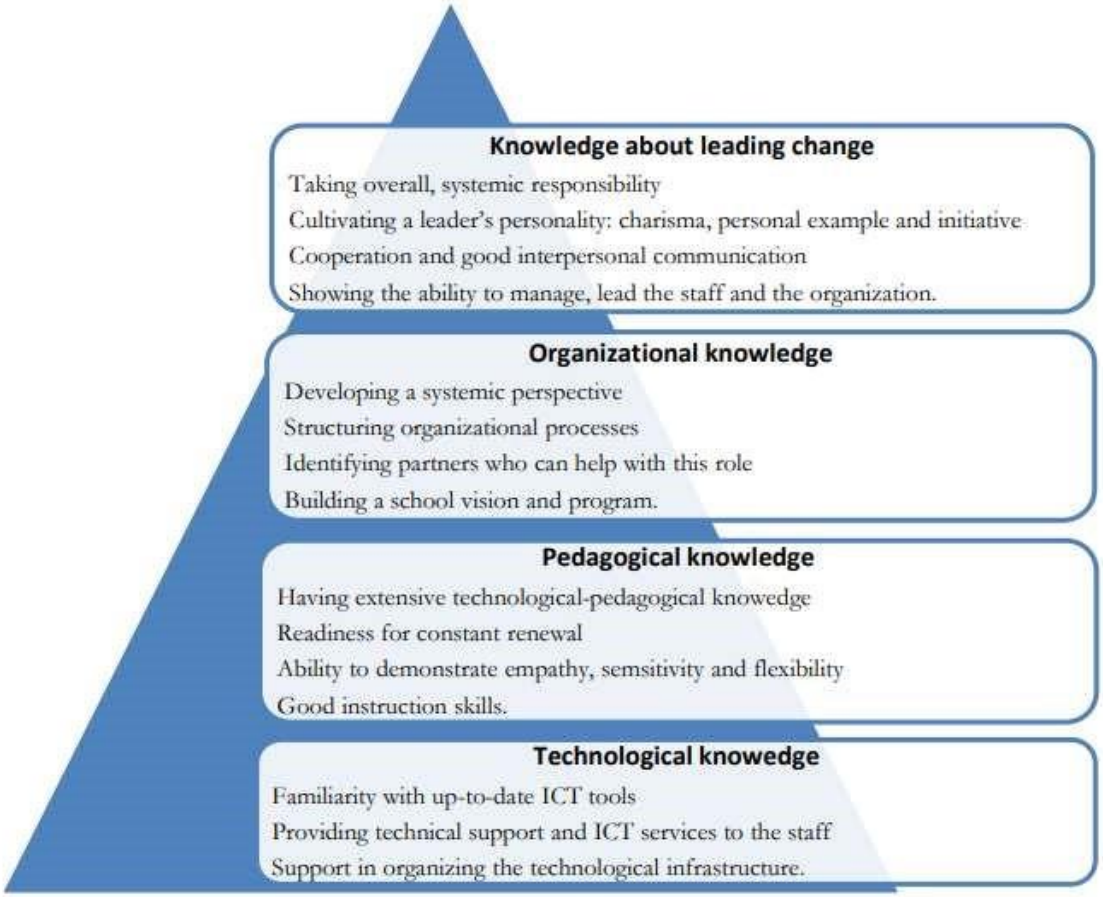


Figure 2.6: Hierarchy of the elements of knowledge (Avidov-Ungar & Shamir-Inbal, 2017)

Like any other framework, TPACK has its complexities; however, it is still widely accepted and used by both researchers and practitioners (Voogt, Fisser, Tondeur & Van Braak, 2016). The emergence of the TPACK framework has provided researchers with useful guidance when trying to understand the relationship between technology and teaching (Baran et al., 2011). However, as in many frameworks, TPACK has its shortcomings. One of the shortcomings is that the integration of technology in education presents various organisational and cognitive challenges which are not mentioned in the TPACK framework (Avidov-Ungar & Eshet-Alkalai, 2014). Furthermore, the TPACK model, although well-grounded in theory, lacks the understanding of the interaction between context, the development of knowledge, and instruction (Pareto & Willermark, 2019). Also, it focuses more on formal knowledge rather than contextual factors (Koh &

Chai, 2016). Despite its shortcomings, the emergence of the TPACK framework is relevant and practical because it can be adjusted to particular settings.

2.9 CONCLUSION

The process of technological development is on-going. The Covid-19 pandemic was a prime example of how technological innovation emerges from trying situations and crises. Technology learning and technology leadership became the 'new norm' (Sterrett et al., 2020). Technological leadership also entails the commitment of the leader to facilitating technology, whilst creating a supportive environment for the application of technology to teaching and learning (Ololube, Kpolovie & Makewa, 2015). A visionary technology leader promotes technology integration as an important part of teaching and learning (Bülbül & Çuhadar, 2012). Technology leadership is an evolving area of study because technology is evolving. Even though studies have emphasised that technology leadership is beneficial, technology leadership is lacking as schools are still faced with the challenge of implementing technology in an effective way (Pittman & Gaines, 2015).

Additionally, leaders in education must become technology leader. They must be prepared for the Fourth Industrial Revolution (4IR) and its challenges. They must also continue to transform and develop educational organisations to prepare learners to become 'digital natives'. The demands of technological leadership in education, therefore, pressurises educational leaders to adapt to the new roles of becoming technological leaders in the school environment. Moreover, diversification takes place in educational environments when technology is integrated to enrich learning content (Doğan, 2018). This does not come without challenges which require all educational leaders to embrace changes and advancements in technology. Technological leaders should also embrace these changes in education by upskilling themselves with the latest skills and knowledge in educational technology (Hero, 2020). Technology leadership is paramount to instil effective technological integration in schools; hence, technology leaders should have the ability to inspire and lead people and organisations to achieve their goals and desired outcomes. The desired outcome when incorporating technology into teaching and learning is improved learner achievements through the

use of technology integrated with appropriate pedagogy. Overall, there seems to be some evidence to indicate that there is a correlation between effective technology leadership and improved learner performance. However, the evidence for this relationship is not sufficient, thus more research is needed to determine whether technology education enhances learners' academic performance.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter (3) presents the research methods, data collection procedures, and data analysis processes of this research study. The researcher aimed to provide an incisive understanding of technological leadership when integrating technology into teaching and learning. The researcher also discussed the research design, research approach, and research paradigms relevant to this study. For data collection purposes, the samples in this research study included principals, teachers and learners. Trustworthiness and research ethics were also explained an important part of this research study.

3.2 RESEARCH DESIGN AND METHODOLOGY

3.2.1 Research paradigm

The research paradigm for this study followed the constructivist-interpretive approach. The beliefs and values of a researcher are reflected in research paradigms which impact the direction of the research study (Johnson & Christensen, 2014). Also, the worldview held by researchers based on assumptions, practices and values is called research paradigm (Johnson & Christensen, 2014). In addition, the interpretation of data in a research study is influenced by the research paradigm which involves ontology, epistemology, and methodology (Creswell & Poth, 2016). Ontology involves reality, and what the researcher knows about the reality (Creswell, & Poth, 2016). In this study, the researcher used her experience and background knowledge as a teacher in the school environment to enhance the quality of the research study. Epistemology is the theory of knowledge which is linked to the researcher's influence on the research study (Creswell & Poth, 2016). The researcher of this study, being a teacher, has certain beliefs and perspectives regarding education and technology; however, such views did not interfere

with the quality of the data collected as the researcher intended to avoid bias that might negatively impact the study. Researchers need to have an understanding of research paradigms because it forms an essential part of research, it serves as a compass to researchers as they navigate through the research journey.

Furthermore, the use of the constructivist-interpretive paradigm relies on “participants’ views of the situation being studied” (Creswell, 2003: 8). The researcher selected the constructivist interpretive paradigm approach because it involves human interaction with the real world. In the constructivist-interpretive paradigm the perspectives and views of the researcher shape the interpretation of the data analysis. The researcher selected the semi-structured interview technique which focused on the views of learners, teachers and principals. In the constructivist paradigm, participants' experiences are used to comprehend the phenomenon under investigation. (Leavy, 2017).

The interpretive paradigm highlights people’s behavioural patterns of interaction and the way they understand situations (Leavey, 2017). The constructivist-interpretive approach is a combination of two paradigms focusing on understanding human experiences. In addition, the constructivist-interpretivist paradigm allowed the researcher to explore experiences of principals, teachers and learners who use technology for the purpose of teaching and learning. The constructivist-interpretivist paradigm highlighted the perceptions and understanding of school leaders regarding technology integration in their secondary schools. Therefore, the constructivist-interpretive paradigm was suitable for this study.

3.2.2 Research approach

For the purpose of this study, the researcher chose the qualitative research approach as part of the research design. Qualitative research refers to the characteristics and descriptions of things (Lune, Hunter & Berg, 2017). Using qualitative research, the researcher was able to collect data based on naturally occurring phenomena which included the use of technology in schools. Qualitative research is exploratory and was used to effectively explore the role of technological leadership when infusing technology

into teaching and learning. Qualitative research also explores the deep understanding of phenomena from the perspective of the researcher and those involved in the research study (Bednarek-Gilland, 2016). Principals, teachers, and learners shared their experiences on using technology for the purpose of education and this provided the study with a greater insight into the world of technological leadership in integrating technology into teaching and learning.

By presenting phenomena in its natural context, qualitative research is able to contribute to the acquisition of comprehensive knowledge pertaining to the study (Śliwa, 2017). This study focused on the school context and therefore dealt with aspects pertaining to schools, more specifically secondary schools. Qualitative research as a "naturalistic inquiry" (Bednarek-Gilland, 2016:20), enlightened the researcher to understand the social world of principals, teachers and learners in their natural environment, by observing and interpreting experiences of groups (Salkind, 2010).

Due to qualitative research focusing on human experiences, the data generated from qualitative research is non-numerical in nature (Pathak, Jena & Kalra, 2013). Therefore, qualitative research is relevant to this study because it allowed the researcher to explore issues concerning the use of technology in schools which enabled the researcher to collect information-rich data by conducting in-depth interviews. The information that emerged from data collection contributed to new knowledge pertaining to technological leadership in education.

In recent years, qualitative research has become more and more complex (Creswell & Poth, 2016). Apart from being a "naturalist approach", qualitative research has the ability to "transform the world" (Creswell & Poth, 2016:7-8). In qualitative research there is the possibility for the quality of data to be inclined or declined by data collectors because they are actively contributing to the creation of the data they gather (Roller & Lavrakas, 2015). Also, the researcher opted for qualitative research because it allows for creativity and flexibility. The goal of qualitative research is to understand experiences of the participants which was suitable for this research study because the participants are the users of technology and are actively involved in teaching-learning situations.

3.2.3 Research design

Research design provides a framework for carrying out research studies (Sileyew, 2019). It involves the crucial decision of identifying the suitable research approach to use to investigate a topic (Creswell, 2014). In addition, a research design is responsible for determining relevant information to be included in studies (Sileyew, 2019) and it guides the researcher in data collection and data analysis. According to Kazdin (2021:7), research design is the "experimental arrangement or plan used to examine the question or hypothesis of interest". The research question for this study explores the role of technological leadership in integrating technology in teaching and learning which was answered by empirical evidence generated from the plan outlined by the research design. Research design placed the researcher in the empirical world connecting her with interpretive material (Denzin & Lincoln, 2018). Furthermore, the research design served as a blueprint for this research study as it outlined the researcher's strategy for the collection of data, the interpretation of data and the data analysis, while allowing the researcher to consider contextual factors in the school environment which influence the researcher's decisions.

Yin (2003:13) describes it as an investigative "empirical inquiry" that dissects real-life experiences and situations within its actual context, particularly when the distinction between the study object and context is unclear. The researcher used the case study method to investigate the role of technological leadership in integrating technology into teaching and learning and increase understanding of the research problem. Yin (2009:18) adds that "the case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points". The researcher followed the following guidelines prescribed by Yin (2009):

- Planning and designing: The researcher set out clear research questions and research objectives. The researcher selected the cases for the study, which are secondary schools with varying technological exposure, this provided insight into the various technological leadership practices.

- Preparing: The researcher needed to generate documentation to gain permission from relevant parties to conduct research in secondary schools. In addition, the researcher had to draw up interview guidelines and protocol.
- Collecting data: The researcher conducted interviews in four secondary schools, with principals, teachers and learners.
- Analysing data: The data was analysed using the qualitative method, thematic analysis.
- Sharing: The researcher will share the findings of this study on relevant platforms and ensure that the study is accessible for reading and review.

The researcher aimed to conduct an ethical case study by using honest and authentic real-life descriptive from parties involved in the research (Denzin & Lincoln, 2018). Interviewees were given copies of the interview transcriptions which allowed for member-check concerning the correctness of the audio-recorded and written information (McMillan & Schumacher 2010).

3.3 SAMPLING PROCEDURE

The process of selecting a sample from the population study is called sampling (Emmel, 2013). It involves “defining a population from which a sample will be drawn and of which the sample will be representative” (Emmel, 2013:1). The sample includes the participants in the research study. A sample represents the characteristics of the population where it comes from (Lapan, Quartaroli & Riemer, 2012). Sampling plays an integral role in research studies because the quality of the sample determines the quality of the research outcome. According to Salkind (2010), sampling allows the researcher to examine a sample (small group) representative of a larger group for the purpose of making a deduction that applies to the larger population. Furthermore, the sample choice depends on the research aim, objectives and questions (Baran, 2016). Hence, purposeful sample was suitable for this study because it allowed the researcher to explore the impediments and the best practices when integrating technology in teaching and learning.

3.3.1 Population of the study

Population refers to a group of people or events from which samples are drawn for the purpose of generating results (Macmillan & Schumacher, 2014). Morgan and Sklar (2012) describe population as a term used to refer to people used in a research study. The target population for this research study was selected from four secondary schools in Durban, KwaZulu-Natal.

3.3.2 Sampling method

The sampling method determined the quality of data collected (Lapan, Quartaroli, & Riemer, 2012). In qualitative research, the researcher can employ non-probability sampling techniques for the purpose of selecting participants (Wolf, Joye, Smith & Fu, 2016). The researcher chose non-probability sampling because it fostered the collection of information-rich data. Non-probability sampling is also known as non-random sampling, which requires the researcher to select participants for the research study based on particular characteristics (Johnson & Christensen, 2014). Non-probability sampling is a suitable option of sampling as long as the researcher acknowledges the limits that non-probability sampling places on the deductions made by the researcher (Gray, 2019). The researcher used non-probability sampling to acquire insight into the world of technology and education. Furthermore, the researcher hoped to explore the role and extent of technological leadership regarding teaching-learning practices.

Additionally, purposeful sampling was used because it was appropriate to qualitative research as it gave the researcher flexibility to choose suitable participants. It enabled the researcher to select participants in accordance with the research objectives (Vanderstoep & Johnson, 2009). In purposeful sampling, the researcher had the freedom to look for representative samples (Emmel, 2013). Good purposeful sampling is when the research questions are answered by the data (Tracy, 2013). In addition, purposeful sampling allowed the researcher to choose a sample “that fits the parameters of the project’s research questions and goals” (Tracy, 2013:155). Therefore, purposeful sampling was appropriate for this research study because it allowed the researcher to gather as much rich information as possible from the data collected.

3.3.3 Sample size

In qualitative research, there are no set rules regarding sample size (Nieuwenhuis, 2012). According to Johnson and Christensen (2014), the size of a sample is dependent on the goal of the study. The goal of this research study is to explore the relationship between education, technology and technological leadership. A significant period of time is needed to conduct each interview because interviews are extensive and in-depth in order to obtain information-rich data from participants. Since interviews were time consuming, a smaller sample size was appropriate for this study (Marshall, Cardon, Poddar & Fontenot, 2013). According to Macmillan and Schumacher (2014), a case study does not need many participants as it is a self-reliant study. The participants in this research study were selected from four schools in Durban, KwaZulu-Natal. Principals, teachers, and learners were included in the sample population. Principals are an important part of the study because they are the leaders of schools and they play an integral role in school decision-making processes and functions. Teachers form part of the core group of the teaching-learning process, without them teaching-learning cannot occur. Learners learning is impacted by technological integration in teaching and learning, therefore their experiences form an important part of this study. One principal, two teachers and two learners were interviewed from each school. There were twenty (n=20) participants in total. The researcher conducted a total of twenty in-depth interviews, using semi-structured interviews.

Lastly, this study drew samples from teachers and principals who use technology in schools, as well as those teachers and principals who do not use technology in schools. The sample of learners included those who are exposed to technology in schools, and those who are not exposed to technology in schools.

3.3.4 Data collection

Qualitative data collection included producing materials for the purpose of understanding and analysing phenomena in a particular field (Flick, 2018). For this study, the researcher chose to collect data through interviews. Interviews as a form of data collection is a characteristic of qualitative studies (Lodico, 2006). The process of

gathering and analyzing data is called data collection (Flick, 2018). An interview is a "purposeful conversation with a person or a group of persons" (Lodico, 2006: 121) which promotes the gathering of rich and in-depth data relevant to the study including allowing the researcher to explore 'hidden' information such as body language (Tracy, 2013). The face-to-face interview is not the only method of conducting interviews - interviews can be conducted via the use of technological devices such as telephones, cell phones and computers (Tracy, 2013). Due to the unpredictability of the effects of the Covid-19 pandemic, the researcher chose face-to-face interviews and online interviews such as *WhatsApp video call, Skype, Zoom,* and *Microsoft Teams.*

The type of interview used for data collection purposes was the semi-structured interview to collect primary data which allowed the researcher to explore the complexities of the research topic (Galletta, 2013). Semi-structured interviews allow for flexibility and "yield considerable and often multi-dimensional streams of data" (Galletta, 2013:24). The semi-structured interviews were designed in a manner that allowed participants to be comfortable with revealing their personality and views whilst the focus still remained on key areas of the research topic (Barrett & Twycross, 2018:63). The researcher of this study aimed to design questions that 'broke the ice' and allowed teachers and principals to express themselves freely and comfortably. Furthermore, learners needed to be comfortable to understand the interview questions in order to answer appropriately and correctly. Edwards and Holland (2013) state that research questions for interviews should always be appropriate for the study and participants.

In semi-structured interviews, in-depth responses are required to answer pre-planned questions from the prepared interview schedule to ensure quality engagement (Saunders, 2009). Semi-structured interviews permitted the researcher to prompt and engage with participants for information-rich data contribution. This probing allowed learners, teachers and principals to feel more involved in this research study because semi-structured interviews enabled the researcher to interact with participants in a manner that ensured a free and authentic data contribution to the study focus, in addition to elaborations and clarifications pertaining to certain responses. Although the ideal situation is for participants to respond to all the interview questions, it is still their

prerogative to decline answering any of the questions prepared by the researcher should they feel uncomfortable, hence the researcher aimed to be mindful and respectful of the rights, dignity and beliefs of all participants in this study.

An advantage of semi-structured interviews is that it can move from open-ended questions to more theoretically-focused questions (Galletta, 2013). The researcher chose semi-structured interviews because it explored the complexities of the aspect of technology integration in teaching and learning.

Interview consent forms were sent via email to the principals, teachers, and learners participating in the interview. The interview forms included information about the structure and process of how the interviews would be conducted. The researcher audio-recorded interviews with the signed consent of the participants. Also, the researcher used voice-recognition software to transcribe interviews with principals, teachers, and learners which allowed the researcher to record verbatim responses with accurate transcripts of the interviews conducted for the purpose of data analysis (Leavy, 2017). The researcher then carefully examined interview transcriptions and analysed the data for the purpose of answering research questions.

3.3.5 Data analysis

Thematic data analysis was used to analyse the data that was collected for the research for this study. The quality of results generated from a qualitative study is determined by data analysis (Flick, 2013) which is one of the most crucial and challenging phases of the research process (Taylor, Bogdan & DeVault, 2016). Qualitative data analysis includes the analysis of audio, visual or textual data (Paulus, Lester & Dempster, 2013). Azcárate (2012:24) states that a “clear description of the data analysis process allows us to judge whether or not the results are the fruit of a systematic and rigorous process”. That is, data analysis has a significant impact on the outcomes of the study. Data analysis as part of qualitative research aims at the incisive exploration of the research topic (Taylor, Bogdan & DeVault, 2016).

According to Creswell (2012), qualitative research requires interpretation of research and the description of data to categorise information into themes. Thematic analysis describes ideas within data; these ideas form themes (Guest, MacQueen & Namey, 2011). It is a method used for “encoding qualitative information” (Boyatzis, 1998: 6). As such, thematic data analysis involves coding and examination of meaning (Willig & Rogers, 2017). In thematic data analysis, codes are developed to identify themes to understand the data better (Guest, MacQueen & Namey, 2011). After the data was assembled, the researcher extracted themes from the data and then compared information (Guest, MacQueen & Namey, 2011).The researcher used coding to explore and interpret people’s perspectives, beliefs, judgments and experiences. Urquhart (2012) states that effective coding should be open which is “part of data analysis that focuses on the conceptualisation and categorisation of phenomena through an intensive analysis of the data” (Kuckartz, 2019:86). Furthermore, inductive coding was used because it is exploratory in nature and allowed the researcher derive codes directly from the data (Linneberg & Korsgaard, 2019). Thematic analysis aims to understand empirical phenomena by discovering and analysing patterns in data sets (Guest, MacQueen & Namey, 2011). Figure 3.1 below illustrates the basic process of how “codifying usually follows the ideal and streamlined scheme” (Saldaña, 2013:13).

Figure 3.1: A streamlined codes-to-theory model (Adapted: Saldaña, 2013)

Boyatzis (1998:29) identified three stages in thematic analysis: ‘Stage 1 - deciding on sampling and design issues; Stage 2 - developing themes and codes; and Stage 3 - validating and using the codes’. In the case of this study, the researcher thoroughly read and re-read through information garnered from each semi-structured interview. Thereafter, the researcher devised themes in the data by comparing similarities and differences among texts. The researcher then organised the themes for a deeper understanding of lived-experiences. Furthermore, the researcher was able to analyse and report on patterns that were found in data sets through the use of thematic analysis

(Braun & Clarke, 2006). In order to effectively comprehend the data themes, extensive information review was required.

3.4 TRUSTWORTHINESS

Researchers use the term trustworthiness to determine the authenticity and validity of qualitative research (Johnson & Christensen, 2014). This is confirmed when the researcher establishes ethical procedures of trustworthiness and credibility (Nathan, Enns & Williams, 2013). Trustworthiness provides confidence in the quality of the study (Pilot & Beck, 2014). Trustworthiness involved informing the reader and participants about the research processes which depended heavily on the honesty and integrity of the researcher (Nathan, Enns, & Williams, 2013). The researcher ensured trustworthiness of the study by being truthful by including correct non-biased information in the study. Furthermore, the researcher aimed to be transparent with the participants about what the study entailed and how the research would be conducted. The researcher avoided using bias, personal judgments and opinions to taint the information collected during the study. Data was presented in an honest and transparent manner. According to the Policy on Research Ethics at UNISA (2013:4), “Researchers may not commit plagiarism, piracy, falsification or the fabrication of results at any stage of the research”. Accordingly, the researcher avoided researcher’s bias that might jeopardise the quality of the research. According to Johnson and Christensen (2014), researcher’s bias is when the researcher obtains results of the study that he/she intended to obtain. The researcher of this study approached data collection and data analysis processes with an open-mind and aimed not to manipulate the data by adding incorrect information.

Lincoln and Guba (1985) identified four categories regarding trustworthiness: credibility, transferability, dependability and confirmability. The genuineness of data and the accuracy in which it is presented is called credibility (Polit & Beck, 2012). In qualitative research, trustworthiness and credibility should be achieved through openness and accessibility to the public (Maindonald, 2011). Transferability is the degree to which a research study can be used in other contexts (Braun & Clarke, 2022). The researcher

of this study aimed to enhance the transferability of this research study by using detailed descriptions of the research study via voice-recordings and verbatim transcripts of the semi-structured interviews.

There can be no credibility without dependability (Lincoln & Giba, 1985). Dependability is pivotal to trustworthiness, hence the researcher aimed to corroborate research findings with the raw data to ensure consistency of the research, enabling other researchers to repeat the study and reach a similar outcome. Dependability ensured the researcher used repeatable data; that is, the same context with similar participants should be used such that the same research outcome would be produced (Lincoln & Giba, 1985).

In confirmability, data is connected to their sources, allowing the reader to come up with further interpretations and deductions (Holloway & Wheeler, 1996). Results from this study have been related to a finding or result that may be followed and repeated. Furthermore, interviewees were given copies of the interview transcriptions which allowed for member-check concerning the correctness of the audio-recorded and written information (McMillan & Schumacher 2010).

In addition, transparency, accuracy, and adherence are three important aspects to the trustworthiness of the study (Yin, 2011). Audio-recordings were used as a means to assist the researcher in recording accurate information. However, Polit and Beck (2017:515) state that participants fear that interviews might be time-consuming, and they fear being recorded. Due to the topic being more professional than personal, the researcher found it appropriate to use audio-recordings (with permission) when conducting interviews. To avoid anxiety that could compromise the accuracy of the information collected, the participant was clearly informed of the interview's duration and expectations. The researcher aimed to produce dependable, credible, and trustworthy research by having prolonged and harmonious interactions with participants to build rapport and trust to gain rich data. The researcher made constant observations in the field (school) to identify aspects most relevant to the study. Also, the transcripts were re-read to authenticate the collected data. In addition, the researcher allowed all

transcripts of the interviews to be checked by the participants for accuracy and to provide feedback (member check).

3.5 ETHICAL CONSIDERATIONS

Ethics is a set of guidelines for what is regarded socially acceptable behaviour (Muzumara, 2018). Ethics involve the ability to decipher what is morally correct or incorrect. Legal rules usually govern human behaviour and are more formal in nature than ethics (Resnik, 2016). Ethics are informal in nature and rely on the person's moral beliefs and practices. Qualitative research involves human participants, therefore ethics is an important aspect of data collection (Flick, 2013). Muzumara (2018) emphasises that ethics involves honesty and fairness. Ethical research involves sound morals and values to ensure accurate and authentic collection of data (Denzin & Lincoln, 2018). Also, the researcher has ethical responsibilities towards research participants (Kazdin, 2021) by applying ethical research practices when dealing with learners, teachers and principals (Denzin & Lincoln, 2018).

Prior to the commencement of the research, the researcher applied for (and was granted) ethical clearance from University of South Africa Ethics Committee. In addition, the researcher approached the Department of Basic Education (DBE) to request permission to conduct research and interviews at four schools in Durban, Kwa-Zulu Natal. In addition, the researcher abided by the code of ethics and principles prescribed and applicable to schools and the field of education.

In addition, prior to the commencement of the in-depth interview process, the researcher provided each participant with consent forms which allowed them an opportunity to peruse the finer details of the research processes in order to grant their (signed) permission to participate in the study for the purpose of data collection. Furthermore, the researcher ensured the anonymity and confidentiality of participants (Flick, 2013) throughout the research study by protecting identities by using pseudonyms/codes. All information elicited from participants was stored in password-protected electronic files in the researcher's laptop accessible to only the researcher and the supervisor.

Participants were told that they could exit the research process at any stage without being penalised in any way.

There is a concern regarding honesty and integrity in the reporting of the data (Lune & Berg, 2017). According to Macmillan and Schumacher (2014), the researcher should not jeopardise the privacy of the participants by deceiving them in any way. When interpreting research results, the researcher should be as ethical and transparent as possible (Flick, 2013). The researcher ensured that every participant involved in the study was not at risk of harm, and not subjected to unethical treatment. Hence, ethical considerations are crucial in ensuring the successful collection of data without the infringement of human rights.

3.6 CONCLUSION

In this chapter (3), the research design, research approach, ethical considerations, research paradigm, sampling procedures, data analysis and data interpretation were discussed. The researcher explained the relevance of qualitative research to this study as it assisted in exploring technological leadership in education in the natural setting of the school environment which highlighted participants' lived-experiences. Principals, teachers and learners were selected as the participants because they are involved in the use of technology in the teaching and learning process. The researcher used semi-structured interviews to collect data which was then analysed and interpreted using the thematic data analysis approach. The researcher adhered to the conduct and procedures of ethical research in line with ethical guidelines provided by the University of South Africa's (UNISA) policy on research ethics. Lastly, the research methods applied in this study where chosen to enable the researcher to answer the research questions and sub-questions.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

4.1 INTRODUCTION

In the previous chapter (3), the researcher presented the research design and research methodology of this study. A brief description of the data collection process was also provided. Qualitative data collection methods were used to gather information-rich data. The researcher focused on population selection, sampling techniques, and data collection instruments used in this research.

In this chapter (4), the researcher presented the analysis and discussion of the data collected from semi-structured interviews conducted in four secondary schools in KwaZulu-Natal. Twenty participants participated in semi-structured interviews: one principal, two teachers, and two learners from each school. Each interview was audio-recorded and thereafter transcribed and analysed, using the thematic analysis procedure. The researcher generated codes from the data after member-checking, and then rigorously reading through the transcriptions (Braun & Clarke, 2006). Thereafter, the researcher identified themes that are discussed later in this chapter.

This chapter also provided an overview of the research process used in this study. Through data collection, analysis, and interpretation the researcher aimed to realise the objectives of the study, which included:

- understanding the benefits of effective technological leadership in schools;
- determining the technological impediments in integrating technology in teaching and learning; and
- exploring the best technological leadership practices and strategies suitable for effective integration of technology in teaching and learning.

4.2 THE RESEARCH PROCESS

4.2.1 Introduction

Semi-structured interviews were conducted with learners, teachers and principals from selected schools in the KwaZulu-Natal Province of South Africa. The aim of the interviews was to gain valuable data to answer the research question: *What is the role of technological leadership in integrating technology into teaching and learning in selected secondary schools in Kwazulu-Natal?*

The researcher obtained permission from all the relevant authorities to conduct research in the selected schools. A participant information sheet with all pertinent information about the study, particularly the interview process, was distributed to each participant. The participants were informed that although they would be audio-recorded their anonymity would be maintained throughout the study. The interviews were then transcribed verbatim to ensure authenticity, accuracy, and the elicitation of information-rich data. The open-ended interview questions allowed the participants to elaborate on their responses when questioned. The research paradigm of the study was the constructivist-interpretive approach which relied on “participants’ views of the situation being studied” (Creswell, 2003: 8). The researcher has selected constructivist-interpretive paradigm approach because it involves human interaction with the real world - in this context, the real world is the school environment.

4.2.2 Data collection method

The researcher gained permission from the relevant Circuit Office and from the KwaZulu-Natal Department of Education to conduct research at four schools and to interview a total of 20 participants (principals, teachers, and learners). For the purpose of anonymity, the schools were labelled as School 1, School 2, School 3 and School 4.

The principal’s interview schedule consisted of twelve open-ended questions that allowed the principals to reflect, elaborate and clarify in detail their responses. The principals’ responses were longer and more detailed than those of learners and teachers. The teachers were given ten questions that focused on their experiences with

technology integration in teaching and learning. The learners were required to answer six questions – their responses were succinct and they did not elaborate as much as the teachers and principals.

The researcher conducted sixteen face-to-face interviews and four interviews via video calls. All audio-recordings were transcribed and they were transferred to *the cloud*, *Onedrive*, for storage purposes. All transcriptions were sent to the participants for verification. This contributed to the transparency and validity of the data. The researcher then read the transcripts several times to familiarize herself with the data (Braun & Clarke, 2006). Codes were generated and themes were identified.

4.2.3 Challenges experienced during data collection

Due to the fast-paced nature of the school environment, arranging interviews with the participants was challenging. Principals stated that they were extremely busy due to DoE's deadlines for submission of documents. Learners were apprehensive to participate in the study because the topic seemed unfamiliar, thus they felt anxious, not confident, and uncomfortable to be audio-recorded. Providing the participants with the interview schedule in advance decreased their anxiety towards the interview process. Furthermore, assent needed to be granted by parents prior to conducting the interviews became challenging as the parents/guardians delayed the signing and returning of forms resulting postponements in conducting the interviews with learners. The teachers were more accommodating and willing to participate in the interviews, but they also indicated that time was a constraining factor due to their teaching commitments. Some participants agreed to a virtual method of interviewing via *WhatsApp Video Call* because they were not available during school hours. Others were still concerned about the effects of Covid-19; hence, Covid-19 protocols were strictly adhered to whilst conducting face-to-face interviews. Despite the challenges, the researcher was able to gain information-rich data that revealed valuable experiences which contributed to the findings of this study.

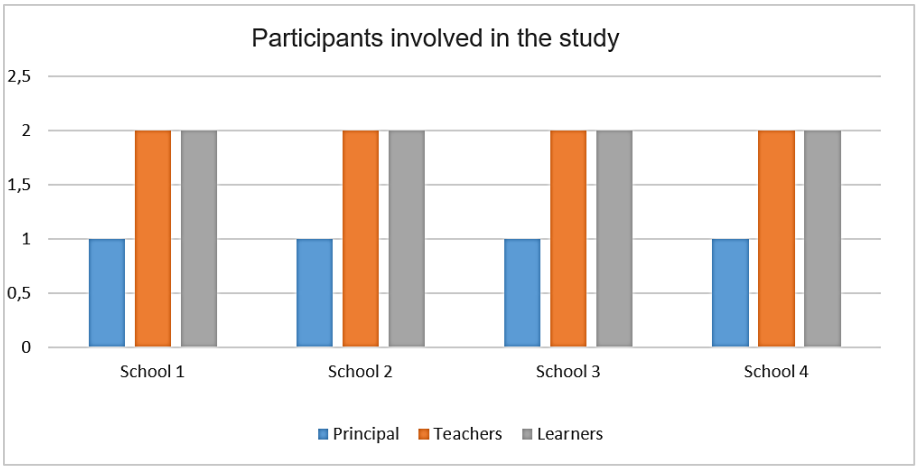
4.2.4 Positive aspects experienced during the research process

Most participants stated that the interviews were an enlightening experience. During the interviews, the participants seemed genuine and comfortable when sharing their own views and experiences. Participants were able to reflect on their practices and interactions with technology during the interviews. They were not afraid to share their fears and challenges pertaining to the use of technology. Overall, the participants were accommodating and interactive, as they made the interview process enjoyable as they shared their authentic experiences. The researcher appreciated the honesty of the participants as it contributed greatly to the credibility of the findings of this research study.

4.3 CHARACTERISTICS OF PARTICIPANTS

Twenty in-depth interviews were conducted in selected schools. At each selected school, one principal, two teachers and two learners were interviewed (Figure 4.1). The researcher conducted semi-structured interviews at four schools. The researcher selected the number and type of participants. The study consisted of in-depth semi-structured interviews with four principals, eight teachers, and eight learners. Participants were randomly chosen and the conducting of the interviews depended on the availability of the participants.

Figure 4.1: Participants involved in the study



The bar graph below (Figure 4.2) indicates the gender of participants. Three out of the four principals were male, which could reflect that principals' posts are male dominated. Seven female teachers and one male teacher were interviewed. It was noted that female teachers were more comfortable to participate in the interview. Some male teachers declined to participate in the interviews. As in the case of learners, male learners were also reluctant to participate in the study. Seven female learners and one male learner participated in semi-structured interviews. The researcher also noted that some male learners indicated that they did not feel comfortable to participate in the interviews.

Figure 4.2: Gender of participants

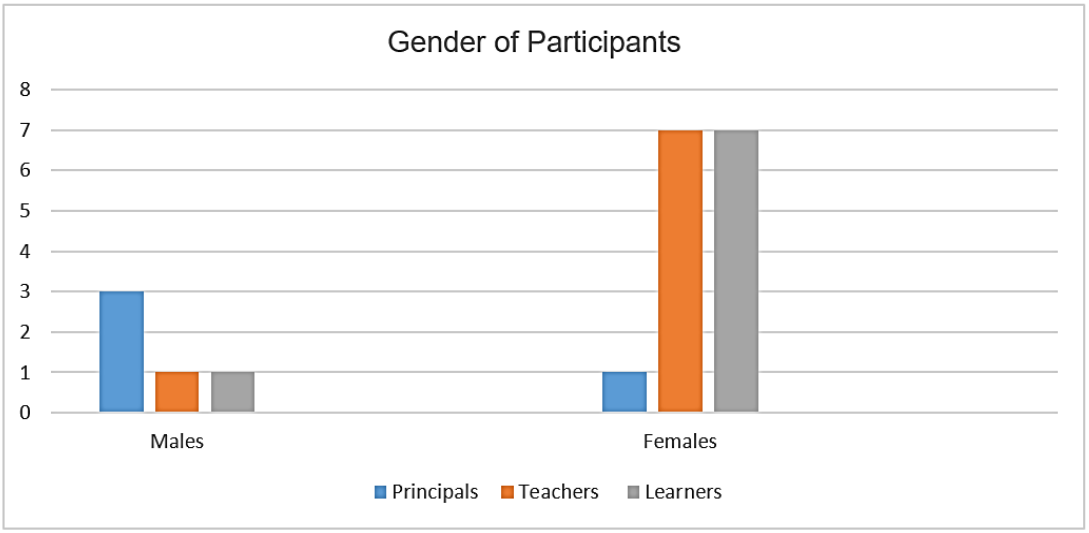
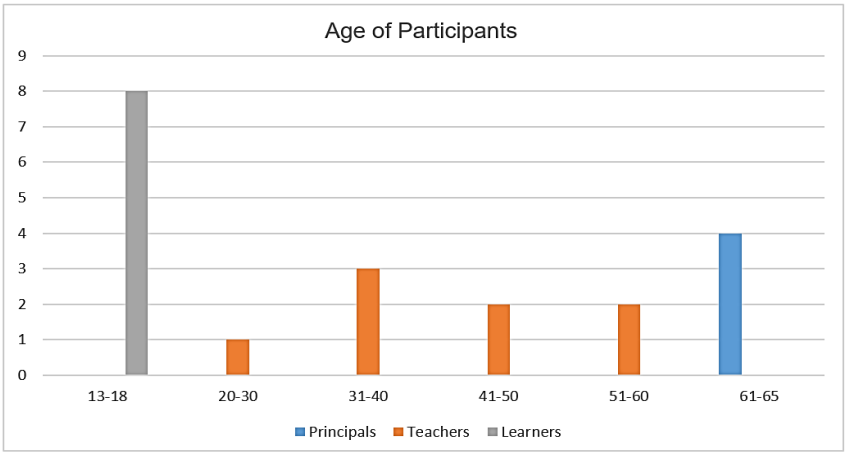


Figure 4.3 below, shows the age range of the participants. The researcher noted that principals were older than the teachers. All four principals who participated in this study were over the age of 60. This was probably because principals are required to possess certain levels of maturity and a number of years of experience to equip them for the challenges that come with leading a school.

Figure 4.3: Age of participants



Teachers were between the ages of 25 and 60 years. The learners were between the ages of 15 and 17 years. The younger learners were apprehensive to participate in the study. This could be because they lacked the confidence and felt intimidated by the interview process.

4.4 PARTICIPANT CODES

The participants were given codes to protect their privacy and anonymity. The codes below were used in this study to refer to participants responses.

Table 1: Participant codes

Participant	Code
School 1	
Principal	P1
Teacher	S1.T1
Teacher	S1.T2
Learner	S1.L1
Learner	S1.L2
School 2	
Principal	P2
Teacher	S2.T1
Teacher	S2.T2
Learner	S2.L1
Learner	S2.L2

School 3	
Principal	P3
Teacher	S3.T1
Teacher	S3.T2
Learner	S3.L1
Learner	S3.L2
School 4	
Principal	P4
Teacher	S4.T1
Teacher	S4.T2
Learner	S4.L1
Learner	S4.L2

4.5 DATA PRESENTATION AND DISCUSSION OF FINDINGS

The rigorous process of thematic analysis produced themes and patterns that are discussed in this section. Five themes emerged from participant-interviews:

- Theme 1: Technological leadership in schools
- Theme 2: The use of technology in teaching and learning.
- Theme 3: School support structures for the use of technology.
- Theme 4: The need for professional development when integrating technology in teaching-learning.
- Theme 5: Factors prohibiting the use of technology in schools.

Figure 4.4 below depicts the themes that were generated from the thematic analysis of semi-structured interviews.

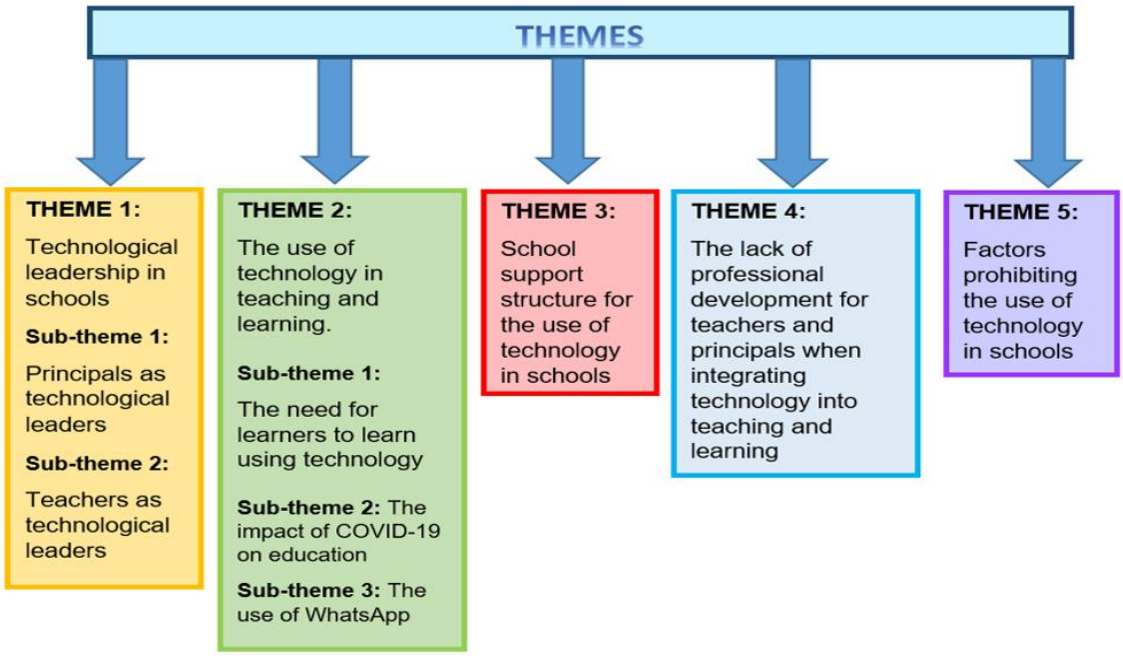


Figure 4.4: Themes and sub-themes

4.5.1 Theme 1: Technological leadership in schools

The roles of principals and teachers are vitally important when integrating technology into teaching and learning. As mentioned in chapter one, for the purpose of this study, teachers and principals were referred to as technological leaders. Research by scholars Raman et al., (2019) state that effective school leadership necessitates the inclusion of technological knowledge and skills. Therefore, teachers and principals play an integral role as school leaders in the transformation of teaching and learning by integrating technology in education.

4.5.1.1 Sub-theme 1: Principals as technological leaders

The term *technological leadership* in education is understood differently by different people. Technological leadership in education focuses on collaboration, development and implementation of the vision of technological transformation in schools (Gulpan & Baja, 2020). The first type of participants to be interviewed at each school involved the principals. The data generated from the semi-structured interviews with principals indicated that principals had a basic understanding of the term *technological leadership* but not an in-depth understanding of the concept. The principals were asked the

question: *What do you understand by the term 'technological leadership', and explain why you think such a term is applicable in the school context?* Participant P1 from School 1 related technological leadership to leadership which included technology as the focal area.

Participant P1 articulated her understanding of technological leadership as:

> *… embracing technology, advocating for it, promoting it. And, you know, sort of motivating people, teachers in particular, because we're talking about a school context, to actually use technology to enhance teaching and learning, and also the admin part of the school.*

Participant P1's response included the function of technological leadership as *"…motivating people"*. This is supported by Burns (1978) who identifies motivation as a characteristic of transformational leadership. Burns (1978), adds that a transformational leadership style involves transforming others' beliefs, behaviours and attitudes. This finding corroborates with the assertions of Sikhakhane, Govender and Maphalala (2021) who explain that transformational leadership leads to positive outcomes when using technology to enhance the curriculum delivery. Participant P1 had a deeper understanding of technological leadership than the other three principals. Although the participant (P1) did not elaborate much, she understood the basic concept of technological leadership and its relevance to the school context.

Participant P2 shared a similar understanding of technological leadership to P1.

Participant P2 described technological leadership as:

> *… someone leading in a technological way. And obviously moving the school forward technologically, quite difficult… moving forward in that direction.*

P3 and P4 related technological leadership to the general use of technology.

Participant P3 explained technological leadership as:

… the leader, like a principal, being able to get across to teachers, especially now if you are having a staff meeting instead of it being the traditional boring meeting where you are just speaking, you could be doing PowerPoint presentations and then obviously in PowerPoint presentations you could have nice diagrams, charts, bar graphs, you know, it will get the attention of the teachers more than just sitting in front and speaking to them.

Participant P3's response concurs with Hero's (2020) explanation that principals should model technology leadership as an avenue for the enhancement of teachers, and demonstrate continuous support for the incorporation of technology in the education. Participant P3 also focused on the general use of technology such as the use of Microsoft PowerPoint, the Schools information management system such as SASAMS (South African Schools Administration and Management System) and TRIPLE D. Additionally, P3 associated administrative-related duties with the use of technology such as the designing of mark sheets, tracking and managing teacher and learner attendance, and submitting documents to the Department of Basic Education (DBE). Webster (2017) highlighted that technological leaders were pressurised to keep abreast with technology which resulted in leaders purchasing and administering technology without setting educational goals, thus technology was implemented just for the sake of it.

Participant P4's response concerning the understanding of technological leadership was as follows:

Technological leadership to me would mean mainly the use of computers, multi-media technologies, like smartboards, projectors linked to your computers and submission of documentation to the Department all via the electronic media. That's my understanding of technological leadership, where you can access everything.

P4 did not relate technological leadership to leadership but rather to the ability to use and access technology. P4 further went on to state:

I think it's linked to the Triple D system that the Department has actually initiated with us. In a way it is good but…is it applicable to my school context? It's quite difficult because we do not have and are not exposed to the equipment to get each and every educator onto or responding to the technology that's required.

Participant P4 believed that technological leadership was not applicable to his school.

Participant P4's focal point of discussion was the challenges present at the school instead of the concept of technological leadership.

In order to establish the correlation between technological leadership and school performance, the principals were asked whether their leadership styles embraced technology and does it impact on school performance. Participants P1 and P3 responded:

P1:

Oh certainly, you know, I've been advocating for the use of technology for a long time. And it does impact on school performance, because you get learners that, you know, learn in different ways. And many of our learners, I think learners in general, are more receptive to visual stimuli. And, yes, there's also the ability to provide greater interaction with the learners to promote diversity and creativity, and innovation. And I think, to secure the attention of the learner today, teachers have to resort to using technology.

P3:

To a large extent, I think my leadership style will embrace technology because if you are looking at our presentation at staff meeting, it is using technology, using a data projector, presenting graphics on a screen…you know. Actually looking at…I have attended a workshop let's say on Triple D or I attended a workshop on curriculum monitoring and development, so let's say I have a slight access to a slide

presentation I make it accessible to all my members of staff, you know where I give it to my departmental heads, I tell them to go through and use this slide presentation in their subject committee meetings and make it available to staff. So they are also kept abreast and remember my intention is to build capacity among my level ones.

Participants P1 and P3 believed that their leadership styles embraced technology, therefore it impacts on the school performance. However, they did not elaborate on how their leadership styles influenced school performance. Participant P2 felt that his leadership style pertaining to technology, did not have an impact on the school's performance.

P2:

…it's very difficult to say, because I don't see myself from outside in. My management team or my teachers or kids would have better answers. I mean, the school will probably be running, well without me anyway.

Participant P4 alluded to the fact that without technology, one cannot lead technology integration.

P4:

…if you got no computers… you got one, then what do you then do? It's the secretary, they are sitting with the secretary and doing it. You know, it's like a ripple effect. We don't have the physical equipment to make sure each one can come and do it.

Participant P4's response is reinforced by Harrell and Bynum (2018) who state that motivation is lost because of a lack of infrastructure and technological devices in schools, as this can also serve as barriers for learners to receive the 21st century education. The research finding of this study show that principals' leadership style impacts on the success of technological integration in schools. As highlighted by scholars Veeriah, Chua, and Siaw (2017), effective principal leaders promote better

school performance. Therefore, principals play a vital role in the success of the integration of technology in teaching and learning environments.

4.5.1.2 Sub-theme 2: Teachers as technological leaders

The teachers who participated in the study were asked a similar question as the principals: *What do you understand by the term technological leadership?*

Their responses, were less comprehensive than those of the principals. Teacher-participant responses were as follows:

Table 2: Teacher responses to the meaning of technological leadership

PARTICIPANT	RESPONSE
S1.T1	*It's not a familiar term.*
S1.T2	*It was my first time hearing the term technological leadership so I had to Google.*
S2.T1	*… we as educators and individuals, we are the ones who actually need to promote the use of technology in a setting, in a school environment. It's about, you know, integrating this technology within the school system*
S2.T2	*I am not sure if this is correct, it would be like handling your class WhatsApp group. I don't know if this is correct but this could be a form of technological leadership.*
S3.T1	*…that one I actually had to google.*
S3.T2	*So I would think, basically …how we are equipped to handle the technology that's out there in the world, using programmes, using software, using equipment to direct, like in our case the school and in education.*
S4.T1:	*Leading using technology I think. Using technology to enforce discipline, maybe the rules at school, even to facilitate learning in the classroom.*
S4.T2:	*I am not familiar with this term. I like to learn more about it.*

Of the eight teacher-participants who responded to this question, three understood the concept of technological leadership in education. Almost two-thirds of the teacher-participants (63%) alluded to the fact that they were not familiar with the term technological leadership.

Participants S1.T2 and S3.T1 stated that they had to consult *Google,* regarding the topic*.* Technological leadership in schools involves transforming teaching and learning, therefore the concept of technological leadership inculcates characteristics of teacher leadership. This is supported by Doyle and Reading (2012) who state that technological change becomes successful when teachers become leaders. The findings indicated that most teachers were not familiar with the term 'technological leadership'. There is a need for teachers to explore the use of technology in schools because teachers are the main facilitators of learning in the classroom.

This is reinforced by Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework which emphasises the interaction between technology knowledge, pedagogical knowledge, and content knowledge. Research by scholars Avidov-Ungar and Shamir-Inbal's (2017) found that in addition to TPACK, leadership knowledge (LK) plays a pivotal role in the successful integration of technology into teaching. Therefore, teachers also need to understand their role as technological leaders. Although most teachers were unclear about the concept of technological leadership, they understood that it was a concept that was not specific to principals and SMTs (School Management Teams). Teacher participants were asked whether they thought technological leadership is only relevant to the principal and SMT. Their responses were as follows:

Table 3: Teacher responses

PARTICIPANT	**RESPONSE**
S1.T1	*…well in terms of them organising it, creating a budget for it, I think that comes first, they are…they would help start the process of having technology in school but it's also for the educator to request that it be included in the budget.*

S1.T2	*Not at all, with my understanding of it, it is actually largely involves teachers because we are leaders in our own classrooms, so we can all engage with technology, whether it's by using it to execute a task or getting learners involved or when they are at home we can use that technological platforms to interact with our students. So it's not only for the management, it also relates to us.*
S2.T1	*No, I don't think…I think that, you know, every teacher should be encouraged…and we need to support the use of technology, the use of technology in schools. And I think by doing this, you know, we actually, we have a shared vision about the use of technology.*
S2.T2	*I feel it is more relevant to them, only because the department sends them the information or the data, whatever it is to be captured and they obviously cascaded down to management and obviously to the teachers. Actually that word 'only' I don't think that it is only relevant to them because staff can also be in charge of specific departments… But I do feel it is more relevant to principals and senior management only because they get directive from higher up.*
S3.T1	*No not at all. Technological leadership does not only mean its limited to management, in my opinion. It's also your teachers, your level one educators that would actually form a huge part of it because we are the ones who deliver in the classroom.*
S3.T2	*No, I think the entire school population, both educators and learners should embrace this and we all should be involved in using technology in schools. Everyone needs it, management needs it for administrative purposes, educators need it to deliver their lessons, learners need to communicate and get clarity in answers.*

S4.T1	*No, I think that it filters down through the levels, even level one educators could be open to technological leadership because we lead in our classrooms.*
S4.T2	*I think that technology shouldn't only be to the principal and senior management, members of all staff should be using technology.*

Of the eight teacher-participants, seven disagreed that technological leadership was only relevant to principals and SMT members. These findings are in agreement with Cosenza's (2015) research which states that teachers can become leaders without leaving the classroom because of the variety of roles they shoulder. Cosenza (2015:82) also developed a *teacher leader model*, which includes seven domains: fostering a collaborative culture to support educator and learner development; accessing and using research to improve practice and learner learning; promoting professional learning for continuous improvement; facilitating improvements in instruction and learner learning; promoting the use of assessments and data for school and district improvement; improving outreach and collaboration with families and community; and advocating for learner learning and the profession. Therefore, teachers are technological leaders because they improve learning outcomes by embracing technological change and transforming pedagogy to a more 21st century style.

Participant S2.T2 felt that technological leadership was only relevant to principals and SMTs because principals and SMTs receive directives from 'higher up'.

Participant S1.T2 also regarded technological leadership as being relevant to learners.

S1.T2 indicated that:

> *Even the learners can be leaders of their own technological process. When they are doing their assignment, they choose to do it in a certain way that uses technology.*

In this study, it was evident that teachers were not aware of their influence regarding leadership, especially technological leadership. Teachers are leaders in the school environment because they have the potential to influence the behaviours of others. Teacher leadership is not only the influence that teacher leaders have on fellow teachers, but also their ability to influence the entire school community (Wenner & Campbell, 2017). Therefore, technological leadership is relevant to teachers because they are leaders in their classrooms, thus they have the potential to successfully integrate technology into teaching and learning.

4.5.2 Theme 2: The use of technology in teaching and learning

4.5.2.1 Sub-theme 1: The need for learners to learn via technology

According to Rickes (2016), Generation Zs are known as 'digital natives', who are multitaskers, achievement-oriented, and sheltered. Learners learning needs have evolved and there is greater pressure on schools to use technology in teaching and learning. Learners were asked the question: How do you feel when you are exposed to technology for the purpose of learning? Some learner responses included the words: excited, comfortable, interested, and easier.

Participant S1.L1 articulated:

> *Personally when exposed to technology, I feel excited but depending on the use of technology but in this wise, learning wise, I enjoy it because it makes learning fun and exciting. It also makes learning easier because if you do not understand something, Google can help instead of asking your teacher.*

Participant S1.L2. echoed a similar response:

> *Well, I feel quite excited. I feel like I have all the information I need. Whether, even if I don't understand anything, I know I am definitely hundred percent going to get what I want and what I need as long as I got my internet, as long as I got technology with me, in the presence of me.*

Participant S2.L1 also referred to learning by using technology:

…an easy way to learn.

Participants S2.L1 and S2.L2, both from the same school, stated that they felt 'comfortable' learning using technology. The learners attended School 2 which is regarded as an ex-model C school, hence they were more exposed to the use of technology in teaching and learning.

The above responses suggest that technology is essential for upgrading learner-performance, mainly because it is a motivator for learners' learning as they learn better when they use technology (Kör, Erbay & Engin, 2016). Learners are the recipients of learning, therefore their learning needs are vitally important.

Learners were asked how they felt about the way subject content was presented in the classroom. The learners who were not exposed to technology for the purpose of teaching and learning responded as follows:

S3.L1:

It's not interesting as the teachers explain in a boring way. It's just worksheets.

S3.L2:

It's boring. There's no fun.

S4.L1:

…there is room for improvement in the teachers and the learners because some teachers prefer to just give the work and not explain it properly.

S4.L2:

It's kind of poor because instead of learners actually learning, there's more noise, and learners are doing their own thing.

The learners who were exposed to technology at schools differed in their responses to the question: What do you think about the way learning content is presented in the classroom? Their responses were as follows:

S1.L1:

…it's appropriate, good and understanding. Our teachers have used a more 21st century approach whereby the teacher presents work in a manner in which learners understand, therefore if the learners do not understand something they do not have to hesitate to stop the teacher and ask for clarity, so therefore I agree it is appropriate.

S1.L2:

…well learning content is fun. It's a fun experience as long as the teacher is there…The use of a chalkboard, some technology, and books are required for us to proceed with learning and I really love it, and it's quite fun there.

S2.L1:

I think it's done well. It's mostly on the projectors. We can see everything and it's easy. I think I understood that right.

S2.L2:

I do think it is presented in a good way.

The learner responses suggested that those who were exposed to technology in the classroom had a more positive outlook of the presentation of the learning content than

learners who were not exposed to technology. These findings are consistent with the notions of Sladek and Grabinger (2014) recommend that in order to engage Generation Z gainfully in the teaching and learning process, learning should have a digital presence. Therefore, the way learning content is presented to learners impacts their response to learning. Participant S1.L2 described learning in the classroom as being 'fun'. This could be attributed to the fact that School 1 and School 2 had more access to technological resources than School 3 and School 4. However, the majority of the learners felt that technology would have a positive impact on learning.

Learners were asked if they thought that the frequent use of technology would influence their performance at school. The learners responded as follows:

S1.L1:

Yes, it does as learners tend to pay more attention to what is taught using technology, rather than paying attention to a textbook.

S1.L2:

I do think frequent use of technology does influence students' performance in a very positive way because without or with a teacher, a learner could excel in her studies and improve in her grades. When a teacher explains to him or her, if she does not understand then she can rely on the use of technology to improve her understanding and her way of working out something in whatever subject it is.

S2.L1:

I personally find it easy and sometimes it's not always reliable, but it's always in a sense easy.

S3.L1:

Yes, more children would want to work and learn with technology. It's more interesting, we can actually like get answers and stuff. You are more involved in the work.

S4.L1:

I think it will improve the performance of some learners at school because, like I said previously, for me it helps a lot when I study. It's easier, I can get the information easier and it's easier for me to learn it.

Of the eight learners who participated in this study, six learners believed that technology will improve their performance at school. These findings are in accordance with Basitere and Ndeto-Ivala's (2017) research which reveal that the use of technology in learners' learning positively affected their performance as it enhanced collaborative learning which led to an improvement in learners' proficiency in using technology.

Research by Yu and Prince (2016) indicate that multiple studies provide evidence on the implementation of technology in schools in terms of improving the quality of teaching and learning. The findings are also congruent to the TPACK framework which suggests that the outcome of the combination of content knowledge, pedagogical knowledge, and technological knowledge, is effective teaching for effective learning (Hofer, Bell & Bull, 2015). Therefore, it is imperative that these 'knowledges' are integrated to enhance curriculum delivery.

Teachers were asked how they felt about using technology at school. Most responses showed an acceptance towards the general use of technology.

S4.T2 stated:

We are living in the technological age and we should be moving in that direction.

The majority of the teachers' responses included learners being more 'engaged' and 'interested' in lessons, as indicated below:

S1.T1:

It's very important because we have a new generation of learners now who are interested in technological devices.

S1.T2:

I think technology in the classroom is a very creative way to keep learners interested. It keeps them engaged because we are in an era that revolves around technology.

S2.T1:

…it encourages active participation in the classroom and also since learners are involved with technology it is something that they can relate to. I feel that they will automatically be interested in the content that is being taught in the classroom.

S4.T1:

…could really enhance learning.

S3.T1:

I am someone who is comfortable with the use of technology.

S3.T2:

I'm completely comfortable in us using it.

S2.T2 [differed]:

Just with my subject in particular, I feel I don't use it as much in the classroom.

The above evidence suggests that teachers are willing to use technology in teaching and learning. According to Lanbon, Chea and Siaw (2020), schooling is improved when technology is integrated into learning and school management by increasing the quality of the schooling experience. Furthermore, teaching has become more intricate in nature because the world is driven by technological advancements (Nooruddin & Bhamani, 2019). In addition, the TPACK framework does not only limit the technological user to knowledge of technology but also emphasises the importance of pedagogical techniques in relation to implementing technology into teaching and learning (Koehler & Mishra, 2009:14). Therefore, teachers need to re-evaluate and transform or adapt pedagogical methods to foster technological change in education.

Furthermore, the purpose of technology leadership in school is to integrate technology into teaching and learning with the aim of improving learner-performance (Al-Hariri & Al-Hattami, 2017). The findings are consistent with those of Hamzah, Nasir and Wahab (2021) who state that the use of technology bridges the gap in terms of learner-achievement, it supports classroom learning, and it is a contributing factor to the decrease in the school dropout rate. Hence, the improved learner-performance is promoted by effective technological leadership in schools.

4.5.2.2 Sub-theme 2: The impact of Covid-19 on Education

Learners' learning had been greatly disrupted during the Covid-19 pandemic lockdowns as there was a huge loss of learning time and schools had to devise new strategies for curriculum coverage (Tarkar, 2020). This is confirmed by UNESCO (2021) which stated that millions of learners in Africa were greatly adversely impacted by the closure of schools. Participants reacted to the closure of schools during Covid-19:

P2:

It was interesting with Covid-19. Quite a few staff who didn't really use laptops, now had to use laptops. We were running lessons. We had to do team training and everyone started sending each other messages and learning how to use technology. All the staff were forced to use technology so they are into it now. It took them out of

their comfort zones. And now they're using this and they see the benefit. So yeah, that that in a lot of ways, almost forced most of my staff to get into it.

P3:

Especially with Covid-19, you know you could do an online lesson, and you don't have to physically be there. You know if someone even has the virus and they are at home, you can do an online lesson and all kids will be on par.

The above principals' responses are aligned to research conducted by Sterrett, William, Richardson and Jayson (2020) who highlighted that the Covid-19 pandemic was a prime example of how technological innovation comes to the fore during a crisis. Teachers also agreed that technology had a huge role to play during the pandemic. The teachers articulated the following regarding the effects of Covid-19 on teaching and learning:

S2.T2:

Especially during COVID, we've noticed that it assisted. With regard to teaching using technology, it is still a problem in our country as not everyone has access to technology as much as we would like them to. So internet access, computers, laptops at home and things like that are useful. With regards to administration purposes, I think that it's very beneficial, it really helps us a lot…what Covid-19 actually did for our school in particular was it made… us learn a little more regarding tools like Microsoft and online teaching. Like now I feel a bit more confident if I have to do an online class lesson because I know how it works. Before you knew of Zoom or SKYPE or whatever, but you'd only use it if you know someone you needed to SKYPE with or to Zoom with. But here it forced us into a situation, so we had to learn. So I think in that way, yes, it has developed our skills and I feel so much more confident that we can learn what we don't know.

S3.T1:

…when COVID hit, I was at my previous school where there was a need for it [technology] because we were required to design online lessons and stuff, which I did land up doing.

The above findings confirm Chan, López, Loria and Briceño's (2020) findings which revealed that despite the negative impact of Covid-19, teachers still performed their leadership role by promoting learning through displaying innovation, pedagogical development, influence, and action. Prior to the Covid-19 pandemic, many principals and teachers were unfamiliar to using technology but were 'forced' in some way or the other to include technology in teaching and learning. The advent of virtual platforms was beneficial to teachers and principals as they now began to explore online platforms such as *Zoom, Skype, TeamViewer,* and *WhatsApp* with the intention of delivering lesson content.

4.5.2.3 Sub-theme 3: The use of WhatsApp

According to participants' responses, *WhatsApp* and *WhatsApp group chats* played a major role in communication, especially during the Covid-19 pandemic. Research findings by Sari and Putri (2019) indicate that learners found *WhatsApp Group Chats* to be user-friendly and easy to manoeuvre. Participant S2.T2 highlighted (below) that one form of technological leadership could be the managing of *WhatsApp groups*.

S2.T2:

So one form of leadership, I am not sure if this is correct, would be like handling your class WhatsApp group. I don't know if this is correct but this could be a form of technological leadership to make sure that it is not abused because a lot of bad things can come out of messages.

S3.T1:

The other thing is that because paper is such an issue, you know it's a costly factor, then we set up lots of WhatsApp groups per grade, per class, where if the learners

write a test then instead of rolling off the memo I will sent it on the group, so that they will have access to all those resources when studying or using to revise.

S3.T2:

…you need some knowledge about the Smartboard, about PowerPoint, about WhatsApp groups, at least most of us know that quite well so that helps us in communicating with parents.

WhatsApp has become an essential online tool and a source of accessing knowledge, thus it would be beneficial to principals, teachers and learners. These findings are in accordance with the TPACK framework which includes technological knowledge (TK), which refers to knowledge of a variety of technologies and tools to be incorporated into teaching and learning (Mishra & Koehler, 2006). Technology knowledge (TK) in the TPACK framework, is mainly influenced by how society adapts to various technologies and how they use these technologies in a variety of teaching and learning contexts (Mishra & Koehler, 2006). Teachers also found *WhatsApp* to be useful when communicating with parents and learners. In addition, they incorporated it into teaching and learning by sending learning content via *WhatsApp* groups. The following excerpts bear testimony to the benefits of *WhatsApp*:

S4.T1:

…during the lockdown, I used technology quite a bit because I made videos of myself teaching a poem, and I sent it to the learners via WhatsApp.

S4.T2:

In terms of using WhatsApp, we send notes and exercises to learners because we don't have textbooks at school; all homework is sent via WhatsApp.

S4.L2:

We do not use technology in class, but they do take out the pictures of the work that they [teachers] want us to do at home, and they send it over to our WhatsApp group.

In supporting the responses of teachers (above), principals as key participants, also added their voices on the benefits of *WhatsApp*. In the main, their views were cementing what other participants stated. They highlighted that *WhatsApp* played an integral role in their schools. A principal of a school that has both the primary and high school sections commented on the advantages of the *WhatsApp* group:

P1:

We are all on WhatsApp groups - the high school, primary school and JP are all on different WhatsApp groups.

P3 [differed]:

We are on the back foot because if you do not have certain technologies, hence teachers do not have online tools. How then do we communicate with learners if we do not have technology?

P4:

What has helped me a great deal in terms of technology is one of the WhatsApp platforms because I can send messages to my management, if I am having a meeting, or anything I want, I send it to teachers and other parties. But that's as far as it goes.

Participant P3's views are congruent to Du Plessis and Mestry's (2019) research findings which revealed that many countries are faced with the challenge of under-resourced classrooms and are far from integrating technology into teaching and learning. However, the majority of the participants in this study, irrespective of the socio-economic position of the school, had access to *WhatsApp,* and they have used *WhatsApp* in some way for the purpose of learning. Therefore, *WhatsApp* is an essential

technological tool that is beneficial for disseminating information and enhancing teaching and learning.

4.5.3 Theme 3: School support structures for the use of technology

In order for technology to be effectively integrated into teaching and learning, schools require structures to be in place to support the use of technology. The findings indicated that participating schools had access to WIFI. This is a positive aspect considering that two of the four schools were under-resourced schools. Principals identified the access to WIFI as an essential part of the functioning of schools. All principals had indicated that the DBE encourages schools to communicate and submit documents via e-submissions. This requires the use of computers and access to the internet. The following responses provide evidence of support for the use of technology:

P3:

Everything is about technology. Our communication with the Department is via the email system. As a secondary school we had to submit relevant documents on Thursday. Our Term 2 analysis no longer requires us making copies for submission - it's now an e-submission… when you learn and start doing it, you will realise this is much easier than what you were doing before.

P4:

The Department now sends things to us electronically.

Principals were asked about the structures they have in place for the use of technology in schools. The principal from School 1 had a committee called the 'Fourth Industrial Committee'. Participant P1's response was as follows:

P1:

Firstly, we do have the Fourth Industrial Committee. And, essentially, they are tasked with researching technology that can be used to enhance teaching and learning in the context of our school. Also, you know, we have discussions at SMT level, and I'm always encouraging my managers to, again, investigate the type of resources that would be appropriate, of course, within our budgetary constraints. And then, we also have a data capturer, who can provide support.

The principal from School 1 also encouraged the SMT to check for relevant resource technologies for the enhancement of their departments. She promoted and supported the integration of technology in teaching and learning. In addition, the learners from the same school had a more positive outlook on learning than learners from other schools. The learners from School 1 responded as follows:

S1.L1:

…appropriate, good and understanding. Our teachers have used a more 21st century approach where the teacher presents work in a manner in which learners understand. Therefore, if the learners do not understand something, then they do not hesitate to stop the teacher and ask for elaboration and clarification.

S1.L2:

…fun, it's a fun experience as long as the teacher is there…The use of a chalkboard, some technology and books are required for us to proceed with learning which I really love as it's quite fun.

A teacher-participant from School 1 articulated:

S1.T2

School does provide us with technological support. We do attend workshops on how to use technology and on how it can benefit learning.

School 2 also had structures in place to support staff in the use of technology. The principal and teachers at School 2 stated the following:

P2:

…the company that subcontracts to us, comes in two days a week, Tuesdays and Thursdays, to make sure our systems are up and running. We obviously have a server that controls the system. And then we've got two computer rooms. We have primary school contractors, and those for the WiFi, or just to keep the network up and running. So they maintain any part of the network, the internet.

Participant from School 2 remarked:

S2.T1

I have mentioned earlier we have access to technology, and in the event of something not working properly and we are experiencing technological glitches in our school, then we do have tech support. We do have someone coming in and sorting out, WIFI or whatever it is.

S2.T2:

We have an SMT member who's actually in charge of technology in school. She will make sure that we have internet access …If there is any training that we need to go for, they're always willing to send us.

The above responses are in line with Hero's (2020) research findings which revealed that teachers need support from their school, which should provide professional

development to enhance the technological competence of teachers. Of the four schools that participated in this study, two schools (1 and 2), were regarded as privileged schools since they had access to television, projectors, WIFI, computer rooms, and other technological services. Thus, the principals of School 1 and School 2, were more amenable to the use of technology and the changes that it brought about. The learners in these schools had a positive outlook on learning content via technological devices, and enjoyed the way teachers taught in the classroom.

Research conducted by Choung and Manamela (2018) revealed that in South Africa, there is a huge disparity in the use of technology between rural and urban schools. School 3 and School 4 were under-resourced schools, but both schools had access to WIFI. Participants indicated the following:

P3:

We have internet for them, uncapped, so they are at liberty to use it. If they are in the office area, then they do have the access code to use it. We have a separate Telkom internet service here.

P4:

We have uncapped WIFI and all the teachers are aware about that.

S3.T3:

The school does support us to the extent of affordability. In terms of what they have given us, we do have access to WIFI in our library. We do have quite a nicely set-up library that has a printer, a scanner, there's a school computer. There's also a school email system that's set up. If you want to email any documents to yourself or to official departments then there's an email facility, instead of using your personal one. And in terms of SASAMS we don't capture our marks by ourselves, like a lot of schools would.

The data showed that the schools did have technological support; some schools had more support than others. Technological leaders in education play a vital role in supporting technological change in schools because they encourage and create technological support structures. This is reinforced by Doğan (2018) who states that technology integration goals are met by technological leaders who inspire, direct and support technological change. In addition, technological leadership entails the commitment of the leader to create a supportive environment for the application of technology in teaching and learning (Ololube, Kpolovie & Makewa, 2015). Therefore, support structures for the use of technology in schools are vitally important for the success of technological integration, thus sound technological leadership is necessary to provide guidance and support in this regard.

4.5.4 Theme 4: The need for professional development

Professional development enhances the professional and personal growth of principals and teachers, especially when leading the use of technology in schools. Research conducted by Thannimalai and Raman (2018) indicated that professional development capacitated principals to manage and lead teachers in technology integration. Teacher-participants in this study were asked the question: *Have you tried to develop the technological skills that you are not proficient in?* Teachers articulated the following:

S1.T1:

…there's a lack of skills-training by the Department. I have not developed it, so no. And I need training. On a personal capacity, there is no time.

S1.T2:

I'm the guilty party, I have to say no. I have not tried anything so far. We have been provided with workshops in the school but I haven't gone that extra mile; I guess I need that little push. It's the time-constraints, the busy schedules, and sometimes you lose focus when wanting to finish curriculum coverage within a certain time-limit.

Participants S1.T1. and S1.T2 indicated that they 'time' was a restrictive factor in the development of their technological skills. Teachers' adaptation and skills development in technology will take time, patience, and perseverance (Boyer & Crippen, 2014). However, teachers are burdened with many overwhelming administrative duties that they do not get the time to participate in professional development workshops. The following responses are pertinent:

S2.T1:

I watch You-tube videos in order to gain knowledge on how to do a particular thing. As I said, I might not be as tech-savvy as the younger generation, but I use You-tube and I Google stuff.

S3.T2:

I am fairly clued up with technology but if I don't know anything, I Google and that will teach me everything.

S4.T2:

I've learnt more by asking others.

Participants S2.T1 and S3.T2 stated that they consulted 'Google' whenever they needed assistance with technology. This finding supports the view of Webster (2017) whose research findings show that the users of technology in schools had to figure out their own ways of using technology.

It is evident that professional development is lacking regarding the integration of technology into teaching and learning. This is a major hindrance to the progress of technological integration in schools (Harrell & Bynum, 2018*).* Teachers lacked training which could assist them in gaining confidence when using technology for the purpose of teaching and learning. This finding is confirmed by Liu, Liu, Yu, Li and Wen (2014) who maintain that professional development allowed teachers to collaborate, but a lack

of professional development creates limitations and challenges for teachers when using technology in classrooms. In addition, professional development sessions should include applying 21st century knowledge and skills, in addition to instilling technology leadership styles that promote the effective integration of technology in schools (Raman, Thannimalai & Ismail, 2019). Therefore, the prioritisation of professional development for principals' will enhance their role as technological leaders and equip them with the necessary skills needed for effective technological integration in schools. Principals responded as follows:

P3:

I have attended a workshop on Triple D, and I attended a workshop on curriculum monitoring and development, so I have access to slide presentations which I make accessible to all my members of staff and departmental heads, I tell them to use the slide presentations in their subject committee meetings and make them available to staff.

P4:

I think a lot of training has to be done…people must be fully au fait with the system.

In order to implement 21st century education in schools, principals as technology leaders must be knowledgeable and adequately skilled on the use of technology (Roblyer & Doering, 2014). Technological integration has exerted pressure on teaching and learning. This means that principals must assume the role of technology leaders who should possess knowledge and skills pertaining to technology and education (Papa, 2011) - this knowledge can be gained through professional development. Hence, it is in the best interest of technological leaders to attend and organise workshops and training programmes on an ongoing basis.

4.5.5 Theme 5: Factors prohibiting the use of technology in schools

South Africa faces many challenges pertaining to integrating technology into teaching and learning. Although there is a demand for technology to be integrated into teaching and learning, many countries are confronted with the challenge of having under-resourced classrooms (Du Plessis & Mestry, 2019). The participants were asked about the prohibiting factors when integrating technology in schools. The one major prohibiting factor mentioned by all the participants was finance and resources. The principals' responses were as follows:

P1:

I would say the first one is certainly budgetary constraints. You know, it would be exciting to have labs and all kinds of sophisticated equipment, but the budgetary constraints do not allow it.

P2:

The key thing will probably be costs.

P3:

I think prohibiting is something that would be preventing us from embracing technologies…I would say is finance. We are in a school where our school fee is R1800 a year. If we get 25 % of school fees, I would be surprised, we don't. So we got to rely on sponsors.

P4:

Teachers are willing to learn. The fact is that they are using their own resources to integrate a little bit of technology into their work with the little resources that they have, but other than that, it's about money.

Many schools have financial constraints. The above evidence confirms the view of Emre (2019) who emphasises that a lack of infrastructure (for which finances are needed) is a major barrier to technology learning. Furthermore, although Covid-19 has promoted digital learning, it has also exposed the inequalities in educational systems (Unwin & Unwin, 2017). It is challenging for technological leadership to be impactful in schools with limited technological resources.

Safety and security also posed as a concern for the use of technology in schools. The increase in the crime rate in South Africa is a reality for schools and precautionary measures are costly. Schools have to endure added costs to secure technological resources. The principals expressed the following views:

P1:

Our school is located in a very high risk zone. So there are safety concerns…So when we do install a TV in a classroom, we first have to ensure that it has security. It's fully secure. So, there's actually a double cost involved here.

P3:

We've had numerous burglaries. We've had this office area broken into, we've had computers stolen from here. So we put those burglar guards there. So what we've also done is…we have two night guards… we put sensors in the ceiling and we have armed response, we pay every month for armed response.

The provision of data was also mentioned as a prohibiting factor when integrating technology into teaching and learning. Two teachers commented:

S3.T2:

The crime levels in the area and the accessibility of data to children and the availability of data to schools themselves become prohibiting factors.

S2.L1:

… the WIFI doesn't always work.

Without access to the internet, information cannot be retrieved, thus the effectiveness of technological integration into teaching and learning becomes limited. In addition, computers are expensive to purchase and maintain for principals, teachers and learners. This finding is aligned to the statistics provided by UNICEF (2020) which stated that in South Africa, 30% of households in urban areas have access to computers, while only 9% have computers in rural areas. Moreover, the high and rising data costs are a constant challenge for learners which places vulnerable communities at a disadvantage. Furthermore, technology is not always reliable as they can malfunction and/or become outdated, in addition to purchasing new software regularly to keep up with new and faster programmes. These factors pose as challenges for technological leaders to effectively integrate technology into teaching and learning.

4.6 CONCLUSION

In this chapter (4), the data was analysed and discussed. The thematic analysis approach was used to analyse the interview transcripts. Codes were generated and themes were identified.

After the analysis of data, the researcher interpreted the data to answer the research questions posed in chapter one. This study concludes that effective technological leadership is needed for the effective integration of technology in teaching and learning. The study suggests that principals and teachers can be regarded as technological leaders in schools. Principals who employed a transformational leadership style were more effective in integrating technology in their schools. This study also found that the success of technological integration into teaching and learning depended on the financial capacity of the school. Since technology tools and its maintenance are costly, much financial outlay is needed. However, a lack of finances was identified in this study as a prohibiting factor of integrating technology in schools. It was also evident that

teachers and principals needed professional development to enhance their technological skills. Chapter 5 summarised the study, presented the findings, and suggested relevant recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter four (4) focused on the analysis of the data gleaned from semi-structured interviews conducted in four secondary schools in KwaZulu-Natal. The data was analysed, presented and discussed. This chapter (5) presented the summary, findings and the recommendations of the research. The study focused on the role of technological leadership in integrating technology in teaching and learning in selected secondary schools in Kwazulu-Natal. The main objectives of this study included:

- To understand the benefits of effective technological leadership in secondary schools;
- To determine the technological impediments in integrating technology into teaching and learning at the selected secondary schools; and
- To explore best practices and strategies for the effective integration of technology in teaching and learning.

5.2 SYNOPSIS OF THE STUDY

This section outlines the main aspects of the study (chapters 1 to 4). The aim was to explore the role of technological leadership in effectively integrating technology into teaching and learning. This study explored the main research question: *What is the role of technological leadership in integrating technology into teaching and learning at selected secondary schools in KwaZulu-Natal?* Emanating from the main research question, were the three sub-questions:

- How does technological leadership benefit teaching and learning in secondary schools?
- What impediments do technological leaders, at the selected schools, encounter when integrating technology into teaching and learning?

- What are the best technological leadership practices and strategies for integrating technology in teaching and learning?

Chapter 1 provided the background to the phenomenon, the problem statement, the research questions, aim and objectives, an overview of the methodology, and the review of literature. Also, it mentioned how the study will contribute to the field of education. Importantly, it introduced the concept of technological leadership in schools and its relevance to teaching and learning.

Chapter 2 presented the literature study which focused on technological leadership in teaching and learning. Further, it explored the concept of educational technology, the correlation between educational technology, leadership, and learner performance, including the role of teachers and principals as technological leaders. Moreover, the literature discussed the theoretical framework of this study which was underpinned by the Technological Pedagogical Content Knowledge (TPACK) framework designed by Mishra and Koehler in 2006. This framework emphasises the concept of knowledge that is interconnected to three primary fields: content, pedagogy, and technology (Mishra & Koehler, 2006: 1025). The chapter (2) concluded that technology leadership is paramount to effective technological integration in schools.

Chapter 3 explained the research design and research methodology of this study. The researcher discussed the qualitative nature of this study which facilitated the collection of data from a naturally occurring phenomenon - the use of technology in schools. Additionally, in chapter (3) reasons for using semi-structured interviews such as that it allowed the researcher the flexibility to prompt, probe and interactively engage with the participants to garner in-depth information-rich data via open-ended prepared questions are outlined. Lastly, chapter (3) outlined the researcher's strategies to ensure trustworthiness and the adherence to ethical principles whilst conducting this research study.

Chapter 4 described, analysed, and discussed the research data. Also, the data collection methods used in this study, were explained. The demographic information of

participants was also provided. The data was then analysed using thematic analysis, codes were generated, and themes were formed, and then discussed. The chapter then ended with the interpretation of the data by focusing on the objectives of the study.

5.3 SUMMARY OF THE FINDINGS

5.3.1 Technological leadership in schools

The results of this inquiry revealed that teachers' and principals' understanding of technological leadership varied. It was noted that principals and teachers did not fully understand their roles as technological leaders. Technological leadership is understood as being proactive in the technological transformation of schools, particularly in teaching and learning (cf. 4.5.1.1). It thus means that teachers and principals should be school leaders who actively transform a school by using technology. This investigation found that teachers were not familiar with the concept *technological leadership* and they could not adequately define the term in relation to education. Furthermore, this study noted that teachers did not explore their own roles as technological leaders. In order for teachers to be effective leaders they must possess sound technological knowledge and skills (cf. 1.6.3). It was established that although teachers did not understand the scope of technological leadership, they acknowledged that technological leadership also include teachers. As such, teachers are technological leaders because they provide and improve learning instructions (cf. 4.5.1.2), thus making it imperative for them to understand their role as technological leaders to successfully effect technological integration in teaching and learning.

The findings of this study revealed that principal-participants understood technological leadership to involve the use of technology in executing administrative tasks. However, this study also revealed that, as in the case of teachers, principals were not fully acquainted with the term *technological leadership*. Principals failed to see the connection between technology and teaching-learning situations as they mainly focused on the administrative functions of schools. The emphasis of technological leadership in schools should be the transformation and advancement of teaching and learning (cf. 4.5.1.2). Therefore, technological leadership should prioritise the

enhancement of curriculum delivery to attain better standards of academic performance in terms of learner-assessments.

Additionally, it was found that principals' leadership style has a definite impact on the success of technological integration in schools. It was noted that principals who employed a transformational leadership style when integrating technology in teaching and learning, elicited positive outcomes (cf. 4.5.1.1). It also emerged from the findings that principals who practised aspects of transformational leadership motivated learners and teachers to display a more positive outlook in teaching-learning spaces and in the school environment as a whole. These principals who embraced technology and promoted its use in the classroom, create a progressive teaching-learning platform that lead to quality academic results. Hence, this was linked to one of the objectives of this inquiry which was to understand the benefits of effective technological leadership in schools. This study found that there was a correlation between school performance and sound transformational practices in leadership that led to overall school improvement (cf. 2.6). In sum, the findings presented thus far are supported by the premise that effective integration of technology in teaching and learning is dependent on effective technological leadership.

5.3.2 The use of technology in teaching and learning

This inquiry demonstrated that the current generation (Generation Z), are digital natives who work and learn best by using technology. Furthermore, this study revealed that technology enhances learner-performance because learners enjoy learning by using technology. The enhancement of learners' learning is vitally important because they are the recipients of learning; therefore, teaching and learners should be centred on their learning needs (cf. 4.5.2.1.). This study noted that learners learning needs has transformed and there is greater pressure on schools to use technology in teaching and learning. This reinforces the view that technological leadership is needed in schools to manage and lead this technological change. The findings of this study further revealed that learners responded positively to learning content when they are exposed to technology in the classroom. On the other hand, learners who were not exposed to technology for the purpose of learning, do not have a positive outlook on curriculum

delivery and learning in general. Therefore, the use of technology improves the quality of education at schools.

The findings also revealed that teacher-participants are willing to use technology in teaching and learning. Teachers embrace technological change and agree that it is beneficial in the school context. It was further established that there was a need for pedagogical change because teaching has become more complex as a result of global technological change. Moreover, this study noted that there is a need for teachers to explore their ability as technological leaders in schools because they are the main facilitators of learning in the classroom who have the ability to transform teaching and learning. In addition, teachers, as technological leaders, should promote 21st century learning which includes the integration of technology into teaching (cf. 4.5.1.2).

Furthermore, this study's findings revealed that learners' learning had been greatly disrupted by the Covid-19 pandemic, thus schools used technology to limit learning-time losses (cf. 4.5.2.2). It emerged that during the pandemic, teachers and principals adapted to leadership roles which required them familiarising themselves in the use of virtual platforms to disseminate information, especially subject content. In addition, they promoted learning by transforming pedagogy, using their influence, and executing lesson delivery in creative ways. It also emerged that prior to Covid-19, many schools did not utilise technology (cf. 4.5.2.2) but the advent of Covid-19 compelled and hastened the use of technology in education. Furthermore, the findings of this study revealed that the use *WhatsApp*, augmented communication and curriculum delivery during and after the lockdowns.

It emerged from the findings that the virtual platform *WhatsApp* played an important role as a tool of teaching and learning. *WhatsApp* is user-friendly, and WhatsApp groups channel information to many people at once (cf. 4.5.2.3). One participant highlighted that technological leadership is required for the implementation and management of WhatsApp groups. Furthermore, *WhatsApp* has become an educational tool; however, principals, teachers and learners, require knowledge of the use of the application (cf. 4.5.2.3). In addition, the findings of this study revealed that learners found *WhatsApp*

easy to use and in some cases, *WhatsApp* was the only form of technology they were exposed to in schools. Furthermore, teacher- participants acknowledged that WhatsApp was a useful tool when communicating with learners and parents, especially during the pandemic. It was also noted that principals rely heavily on the use of *WhatsApp* to communicate with staff as they use WhatsApp to communicate with SMTs, teachers, parents and the DoE officials, among others (cf. 4.5.2.3). It was further established that irrespective of the socio-economic position of the school, all participants had access to *WhatsApp* for the purpose of learning, making *WhatsApp* an essential technological tool for the enhancement of teaching and learning.

5.3.3 School support structures for the use of technology

In order for technology to be effectively integrated into teaching and learning, schools require structures to be in place to support the use of technology (cf. 4.3.3). It emerged from the findings that the level of support structures for technology in schools depended greatly on the schools' financial resources. Some schools could not implement support strategies because they did not have access to technological resources as a result of being financially constrained. However, schools who were regarded as privileged had implemented strategies to support the use of technology in schools such as the employment of IT specialists to assist with technical difficulties, WIFI throughout the school, and technological devices that enhanced teaching and learning.

Moreover, the findings revealed that teachers who were employed at these schools felt more supported and motivated when using technology to teach. Also, learners who attended these schools, had a positive outlook during the delivery of learning content. In contrast, learners from under-resourced schools had a negative view of the way learning content was presented to them. However, despite the socio-economic conditions of the school, all participant schools had access to WIFI.

One of the objectives of this research inquiry was to investigate which technological leadership practices and strategies were best suitable for the effective integration of technology in teaching and learning. It was noted that sound and innovative technological leadership is required to design strategies for the effective implementation

of technological support structures in schools (cf. 4.5.3). Furthermore, it was noted that technological leaders should promote and support the integration of technology into teaching and learning. This study found that most participants were supported by their school leaders to some degree; however, as mentioned previously, technological support was minimal due to limited technological resources.

5.3.4 The need for professional development

This inquiry found that professional development was needed as a form of support to empower principals and teachers (cf. 4.5.4). Also, professional development enhances principals' and teachers' professional and personal growth (cf. 4.5.4). However, the lack of professional development hinders the progress of technological integration in schools (cf. 4.5.4). It became clear that some principals and teachers were not able to participate in professional development sessions because of time-constraints - participants felt overburdened with administrative functions, therefore they did not have the time to participate in professional development workshops. In addition, teacher-participants believed that it was the responsibility of schools or the DBE to provide professional development, instead of some skilled technology teachers.

In addition, it was found that teachers and principals had to investigate on their own on how to use technology for the purpose of lesson-delivery. However, some teachers and principals felt overwhelmed and demotivated to use technology because they lacked the necessary knowledge and skills. Some teachers and principals 'Googled' for guidance in using technology. Also, some principals relied on administrative staff to assist with tasks that required the use of technology. A major cause of the reluctance to use technology could be obviated through engaging in professional development workshops where experts in the field of technology could train teachers and principals in a professional way such that they grasp the essentials of using technological devices for lessons in and out of classrooms. Since the world is changing rapidly and all role-players require 21st century 4IR skills in order to promote the effective integration of technology in teaching and learning (cf. 4.5.4).

5.3.5 Factors prohibiting the use of technology in schools

One of the objectives of the inquiry was to investigate the impediments of integrating technology into teaching and learning. This study noted that some schools are under-resourced as a result of financial constraints (cf. 4.5.5). The lack of financial resources at some schools limited the purchasing of technological resources for the integration of technology. It was further noted that the Covid-19 pandemic exposed the inequalities in the education system (cf. 4.5.5). Principal-participants were mainly concerned about the financing of technology tools and were disappointed about the fact that they could not fully integrate technology into the school curricula. Some teachers even used their own technological resources (such as data and laptops) when integrating technology in teaching and learning. Further, new software was expensive to purchase when replacing some obsolete technology programmes. In addition, this study noted that technology was not always reliable as there is the possibility of technological devices malfunctioning, and repairs and replacements are expensive (cf. 4.5.5).

Moreover, evidence from the results of this study found that the cost of data is also a prohibiting factor when integrating technology into teaching and learning. Without internet access, information cannot be retrieved, such that the effectiveness of technological integration into teaching and learning becomes limited (cf. 4.5.5). Also, some schools had access to WIFI only in the area surrounding the administrative office block. Some participants mentioned that WIFI was costly and posed a challenge for schools – some teachers used their own data for teaching purposes.

Another concern that was extracted from the evidence was the aspect of safety and security in schools which affected the use of technology. The crime rate in South Africa is high and precautionary measures are costly (cf. 4.5.5). Some principal-participants shared their experiences of burglaries in their schools resulting in incurring major costs to secure their technological resources by hiring private security, installing electronic security systems, and replacing stolen equipment. In addition, this study also found that some teacher-participants were also victims of theft, and had their own resources stolen from them.

5.4 RECOMMENDATIONS

The expected outcome of the findings was to influence the DBE to promote the use of technology in teaching and learning, and to emphasise the role of technology leadership in schools. The following were recommended:

5.4.1 Recommendation 1: Digital skills training for principals and teachers

The Department of Basic Education (DBE) should promote technological leadership in schools by providing skills training to principals and teachers. The DBE should provide principals and teachers with workshops that focus on leading and managing technology in schools. Teachers and principals who are technological leaders should be creators and managers of change in their schools by capacitating others to use technology effectively. This would be possible through training sessions for principals and teachers in technological leadership and in the use of technology. This means that principals and teachers should be given practical training on how to use technological devices for administrative and teaching and learning purposes.

5.4.2 Recommendation 2: Short learning programmes

Tertiary education for trainee teachers should include programmes on the use of technology and technological leadership. Also, modules should include the exploration of teachers' role as leaders of change in their schools. Institutions of higher learning in partnership with DBE and schools, should provide practising teachers with short learning courses in digital literacy to upskill them. Teacher training should also explore the TPACK framework because it integrates technological knowledge, content knowledge, and pedagogical knowledge.

5.4.3 Recommendation 3: Technological skills for learners

Learners also require training programmes, and this could be done in the form of fun interactive videos or apps that attract learners' attention. This will be a cost-effective approach, and would not interfere with learners' out-of-curriculum coverage time.

5.4.4 Recommendation 4: Data provision

The need for the provision of data has become essential for principals, teachers and learners. The DBE should work on partnering with private companies and telecommunications service- providers for free data or reduce the costs of data packages to learners, teachers and principals. Affordable packages will enhance learners' access to much-needed resources such as e-books, audiobooks, *PowerPoint* slides, *YouTube* learning content, among others.

5.4.5 Recommendation 5: DBE-industry partnerships

The DBE, in partnership with the business sector, should provide for the acquisition of technological resources in schools by using equitable criteria. They should investigate affordable technologies such as Bluetooth speakers, access to *WhatsApp* for the purpose of learning, smartboards, and projectors. It is recommended that the DBE should provide schools with a budget for the safety and security of technological resources. Schools can also partner with local police stations, security companies, and communities to help combat crime in schools. Also, the DBE could employ their own security companies and dispatch them to various schools depending on the need.

5.4.6 Recommendation 6: The use and promotion of data-saving apps for effective learning

Principals and teachers should explore and promote Apps that learners use regularly, especially Apps that require low data usage such as *MS Teams, WhatsApp,* and *Tiktok.*

5.4.7 Recommendation 7: Infrastructural technological support

Schools need to create support structures for the implementation of technology in teaching and learning. Some of the support structures include committees consisting of teachers, parents and learners whose functions would be support and promote the use of technology in schools, develop technological policies and guidelines pertaining to the individual school context, provide technical support, build facilities to house technological equipment, and encourage technological leadership in schools.

5.5 LIMITATIONS OF THE STUDY

Most research studies have limitations that are out of the researcher's control. Although useful research findings emerged from this research study, the study was still confronted with limitations. The limitations identified in this research study are outlines as follows:

- The study was limited to schools located only in the Durban area, and this was not an adequate representation of the rest of KwaZulu-Natal and South Africa.
- The study was limited to four Government secondary schools. Had more school been included in the study, additional conclusions could have been derived.
- The study was limited to public secondary schools as the inclusion of private schools would have exposed the research study to a different context and thus the research aim and objectives would have been different.
- Due to the nature of the data collection instrument only 20 participants were interviewed. Had more participants participated in the semi-structured interviews, the researcher could have obtained richer data, additional themes could have been derived, and more accurate results could have been elicited.

5.6 SUGGESTIONS FOR FURTHER STUDY

It emerged from the findings of this study that principals and teachers were not familiar with the term *technological leadership*; hence a further study could be conducted to explore this concept incisively in a larger context. Although this research represents an initial effort to examine the role and effects of technological leadership in integrating technology in teaching and learning, a more intensive study is needed because all aspects of the topic were not fully explored. In addition, the researcher only used one data collection method, which was semi-structured interviews. In order to enhance this study's results, additional data collection methods would be required when conducting further research studies with a similar topic. Additionally, this study only included learners, teachers and principals as participants; it would have been appropriate to include SMT members, SGB members, and parents in the study because they would possibly provide valuable and relevant information that would enhance the research

study. Further research could also explore the correlation between technological leadership and learner-performance. This possible research, if conducted in line with the above suggestions, could contribute greatly to the field of education.

5.7 CONTRIBUTIONS OF THE STUDY

Throughout the study, the focus area was on determining the role of technological leadership in integrating technology in teaching and learning. The results of this study indicated that technological leadership was not fully applied at secondary schools in KwaZulu-Natal. The findings of this study can be used for future studies using a similar topic. Future studies should consider the significance of the TPACK framework and its relevance to technological leadership in education. This study emphasises the importance for learners to learn by using technology because it improves learner-performance. Further, the study provides incisive insight for the need for technological leadership in schools. Also, teachers and principals could obtain valuable understanding on their role as technological leaders in schools. Moreover, the study created an awareness among officials of the DBE to place more emphasis on technological leadership, to provide technological resources, to train teachers and principals on the use of technology, and to promote the implementation of technology in teaching and learning – all of which are urgently needed at schools. In sum, the study aimed at also contributing to the body of literature pertaining to technological leadership in education which is imperative for the successful integration of technology in teaching and learning.

5.8 CONCLUSION

This research study provided an insight on the role of technological leadership in integrating technology in secondary schools of KwaZulu-Natal. The study highlighted that technological leadership is essential for the effective integration of technology in teaching and learning. The literature review emphasised the need for learners to learn using technology as it improves their academic performance. In addition, the literature indicated that global technological advancements increased pressure for technology to

be integrated in schools. The study emphasised that technological change in schools requires sound leadership and management. The reviewed literature indicates that teachers and principals should assume roles as technological leaders in schools. In addition, the research findings indicated that the Covid-19 pandemic hastened the need for technological leadership and the use of technology in education. The overall findings of this study point to the fact that effective technological leadership is beneficial for schools because it supports, promotes and improves learning. To expand on the chosen topic, recommendations were made based on the research findings. These recommendations are aimed at promoting and supporting technological change in schools, thus they should receive serious and expeditious deliberation from the relevant authorities, and all role-players in general. Areas for future research were recommended to help improve our knowledge and understanding of technological leadership in schools. If the recommendations gleaned from this investigation are considered seriously, then the integration of technology into schools would be a smooth process.

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APPENDIX A: ETHICAL CLEARANCE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2022/05/11

Ref: **2022/05/11/43812902/04/AM**
Name: Mrs SE Naicker
Student No.:43812902

Dear Mrs SE Naicker

Decision: Ethics Approval from 2022/05/11 to 2025/05/11

Researcher(s): Name: Mrs SE Naicker
E-mail address: suzanne.naicker@outlook.com
Telephone: 0814099186

Supervisor(s): Name: Prof S.S. Khumalo
E-mail address: ekhumass@unisa.ac.za
Telephone: 012 429 6839

Title of research:

The role of technological leadership in integrating technology in secondary schools of Kwa-Zulu Natal

Qualification: MEd EDUCATION MANAGEMENT

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2022/05/11 to 2025/05/11.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2022/05/11 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX B: PERMISSION FROM KWAZULU-NATAL HEAD OF DEPARTMENT: EDUCATION

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 392 1051
Email: Phindile.duma@kzndoe.gov.za

Enquiries: Mrs B.T. Ntuli
Ref.: 2/4/8/7299

Mrs Suzanne Emily Naicker
6 Burne Groove
Morningside
DURBAN
7500

Dear Mrs Naicker

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"THE ROLE OF TECHNOLOGICAL LEADERSHIP IN INTEGRATING TECHNOLOGY IN SECONDARY SCHOOLS OF KWA-ZULU NATAL:"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from **06 June 2022 to 31 March 2025.**
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UMLAZI DISTRICT

Mr GN Ngcobo
Head of Department: Education
Date: 06 June 2022

GROWING KWAZULU-NATAL TOGETHER

APPENDIX C: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT SCHOOLS

ATT: Principal
Durban North College
25/26 Prospect Hall
Durban North
4051

Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY AT DURBAN NORTH COLLEGE

My name is Suzanne Emily Naicker and I am doing research under the supervision of Professor S.S. Khumalo, a professor in the Department of Educational Leadership and Management. I am undertaking this study as part of my master's research at the University of South Africa. *The role of technological leadership in integrating technology in secondary schools of Kwa-Zulu Natal.* The main purpose of this study is to explore the role of technological leadership in effective integration of technology in teaching and learning.

To complete this study, I need to conduct interviews of approximately 20-30 minutes in duration with the principal, two teachers, and two learners at your school. These interviews will be audio-taped for verification of findings. The possible benefit of the study is the improvement of teaching and learning through the use of technology. The long-term benefits are that the research findings will be used to formulate guidelines for effective technological leadership in schools.

There are no potential risks to participating in this study. There will be no reimbursement or any incentives for participation in the research. Participation in the study is voluntary. Furthermore, participants can withdraw consent and discontinue participation at any time without prejudice. The information gathered from the study will be stored securely on a password-locked computer in my locked office for five years after the study. All recordings will remain confidential and participants will remain anonymous.

If you have questions about this study please ask me or my study supervisor, Prof. S.S. Khumalo, College of Education, University of South Africa. My contact number is 0814099186 and my e-mail is suzanne.naicker@outlook.com. The e-mail of my supervisor is ekhumass@unisa.ac.za.

I trust this request will receive your favourable consideration. Thanking you in advance.

Yours sincerely

SE NAICKER (MRS)

RESEARCHER – B.ED (HONS)

SS KHUMALO (PROF.)

SUPERVISOR

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APPENDIX D: PARTICIPATION INFORMATION SHEET

UNISA university of south africa

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number: 2022/05/11/43812902/04/AM

Date: _____

Title: The role of technological leadership in integrating technology in secondary schools of Kwa-Zulu Natal

Dear Prospective Participant

My name is Suzanne Emily Naicker and I am doing research with Professor S. S. Khumalo, a professor in the Department of Educational Leadership and Management towards a M.Ed at the University of South Africa. We are inviting you to participate in a study entitled: *The role of technological leadership in integrating technology in secondary schools of Kwa-Zulu Natal.*

This study is expected to collect important information that could improve teaching and learning through the use of technology. Furthermore, research findings can be used to formulate guidelines for effective technological leadership in schools.

You were chosen because your school meets the criteria of what the study requires. Your information was obtained from the school. There are 20 participants in total, from four schools.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

You are required to take part in an interview. The interview should be between 20-30 minutes, depending on the responses. You will find a copy of the questions attached. All interviews will be audio recorded. All recordings will remain confidential and the learner will remain anonymous. Responses will not be linked to your name or the school's name in any written or verbal report based on this study. Such a report will be used for research purposes only.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

There are no potential risks to participating in this study.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorder anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research OR your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

The anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings.

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HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard/filing cabinet in the researcher's private study for future research or academic purposes; electronic information will also be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

There will be no reimbursement or any incentives for participation in the research.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Suzanne Emily Naicker on 0814099186. Should you require any further information or want to contact the researcher about any aspect of this study, please email suzanne.naicker@outlook.com.

Should you have concerns about the way in which the research has been conducted, you may contact Professor S.S. Khumalo on 021- 429-6839.

Thank you for taking time to read this information sheet and for participating in this study.
Thank you.

Suzanne Emily Naicker (Mrs.)

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX E: INFORMED CONSENT FOR LEARNER PARTICIPANTS

ASSENT FROM LEARNERS IN A SECONDARY SCHOOL TO PARTICIPATE IN A RESEARCH PROJECT

Title of research: The role of technological leadership in integrating technology in teaching and learning: A case of secondary schools in KwaZulu-Natal

Dear _____ Date _____

I am doing a study on the role of technological leadership in integrating technology in teaching and learning, as part of my studies at the University of South Africa. Your principal has permitted me to do this study so that I can find ways that your teachers and school management can use technology in education better. This may help you and many other learners of your age in different schools.

This letter is to explain to you what I would like you to do. There may be some words you do not know in this letter. You may ask me or any other adult to explain any of these words that you do not know or understand. You may take a copy of this letter home to think about my invitation and talk to your parents about this before you decide if you want to be in this study.

I would like to interview you about learning using technology. Answering the questions will take no longer than 30 minutes.

I will write a report on the study but I will not use your name in the report or say anything that will let other people know who you are. Participation is voluntary and you do not

have to be part of this study if you don't want to take part. If you choose to be in the study, you may stop taking part at any time without penalty. You may tell me if you do not wish to answer any of my questions. No one will blame or criticise you. When I am finished with my study, I shall return to your school to give a short talk about some of the helpful and interesting things I found out in my study. I shall invite you to come and listen to my talk.

The benefits of this study are personalized learning opportunities for learners and a more technologically integrated approach to learning.

There are no potential risks involved when participating in this study.

You will not be reimbursed or receive any incentives for your participation in the research.

If you decide to be part of my study, you will be asked to sign the form on the next page. If you have any other questions about this study, you can talk to me or you can have your parent or another adult call me at 0814099186. Do not sign the form until you have all your questions answered and understand what I would like you to do.

Researcher: Suzanne Emily Naicker

Phone number: 0814099186

Do not sign the written assent form if you have any questions. Ask your questions first and ensure that someone answers those questions.

WRITTEN ASSENT

I have read this letter which asks me to be part of a study at my school. I have understood the information about my study and I know what I will be asked to do. I am willing to be in the study.

_____ _____ _____

Learner's name (print): Learner's signature: Date:

_____ _____ _____

Witness's name (print) Witness's signature Date:

(The witness is over 18 years old and present when signed.)

_____ _____ _____

Parent/guardian's name (print) Parent/guardian's signature: Date:

_____ _____ _____

Researcher's name (print) Researcher's signature: Date:

APPENDIX F: INTERVIEW QUESTIONS

UNISA university of south africa

PRINCIPAL INTERVIEW QUESTIONS

1. What do you understand by the term “technological leadership” and explain why you think such a term is applicable in the school context?

2. Do you think technology plays an integral part in managing your school? Why do you think so?

3. Do the teachers in your school use technology to enhance teaching and learning? If so, in which ways?

4. Does your school have a support structure for the use of technology? If so, what systems do you have in place?

5. Does your leadership embraces technology and does it impact on school performance?

6. How do you feel about technological change?

7. Do you have staff at your school who you would regard as technological leaders? If so, compare their work performance with those teachers who do not use technology in teaching and learning.

8. How do you, as a principal, deal with the issue of resistance to technological change among teachers and staff?
9. What systems do you have in place to manage technological resources at school?

10. Do teachers have equal access to available technology at school? Explain.

11. When you plan as the school management team, do you embrace technological integration to enhance teaching and learning? Explain

12. What are some of the prohibiting factors surrounding the integration of technology at your school.

TEACHERS

1. How do you feel about using technology at school?

2. What do you understand by the term ‘technological leadership’?

3. Do you think that technological leadership is only relevant to the principal and senior management team? Explain.

4. Do you use technology to plan and execute your lessons? If so, in what way do you use technology?

5. Has technology assisted you in your administrative functions? Explain.

6. What are some of the factors prohibiting you from using technology in teaching and learning?

7. Do you think the use of technology in the classroom improves learner performance? Explain and provide an example from your own experiences.

8. Does your school provide you with technological support? Discuss. Explain.

9. What technological skills do you think are necessary to function at school?

10. Have you tried to develop the technological skills that you are not proficient in? If yes, state in which ways you have developed your technological skills. If no, provide a reason for not developing technological skills.

LEARNERS

1. What do you think about the way learning content is presented in the classroom?

2. Describe the way you use technology for the purpose of learning, whether at home or at school.

3. Do your teachers use technology when teaching in the classroom? If yes, in which ways.

4. How do you feel when you are exposed to technology for the purpose of learning?

5. Do you think frequent use of technology will influence students' performance at school? Explain why you think so.

6. What factors do you think limit the use of technology in schools?

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDICES G1-G6: RESEARCH INTERVIEW TRANSCRIPTS

Interviewees: Twenty participants were involved in the study.

Interviewer: Suzanne Emily Naicker

Periods of Interviews: July – August 2022.

Transcribed by: Suzanne Emily Naicker

Edited by: Not edited

APPENDIX G1: SCHOOL 1 PRINCIPAL'S INTERVIEW QUESTIONS

I: What do you understand by the term "technological leadership" and explain why you think such a term is applicable in the school context?

P1: Okay, so I think technological leadership would be about embracing technology, advocating for it, promoting it. And, you know, sort of motivating people, teachers in particular, because we're talking about a school context, to actually use technology to enhance teaching and learning, and also the admin part of the school.

I: Do you think technology plays an integral part in managing your school? Why do you think so?

P1: I would say definitely, think if we look at our particular vision and mission, it's all about the 21st century skills. So for me, particularly, I think it's absolutely significant. Teachers would be able to realise our vision and mission by employing technology to enhance not just teaching and learning in the classroom, but I think, in all areas of the child's life, and it's also very significant when it comes to the administration. You know, the recording of marks the data analysis, and I think, you know, I'm not 100% sure, but I think we are one of the first schools to actually employ the finance section of SAMS to capture our data and do the necessary analysis. So I would say it has far reaching implications on teaching and learning, administration and any kind of support can be enhanced by technology.

I: Do the teachers in your school use technology to enhance teaching and learning? If so, in which ways?

P1: Definitely a yes. And I think, we've seen the momentum grow in the last few years, basically, as a response to COVID. But at our school, we have been trying to implement, very diverse ways of teaching. So, if we want to talk about the ways, clearly, we have access to Wi-Fi throughout the school, although I must admit, at times, it is problematic.

But you know, that's the basis, we do have Wi-Fi so teachers can access, you know, lots of resources. We also have TVs, I think there's what eight TVs, really not sufficient, but at least we've started the process. We also have laptops, which teachers use their data projectors. And of course, our Department of Languages, has the Digibooks programme. And I am sure that in addition to the Digibook many teachers are accessing the electronic text. So it's a work in progress. We are getting there. But we definitely are engaging in you know, they're still WhatsApp groups. Not just between teacher and child, but every department has the WhatsApp group so often, you know, members of staff, including myself, we can communicate in real time. So, and I'm very guilty of that too. I mean, I'm chatting to my management, im communicating with them even on the weekends. So I would say that we certainly engage in it. But it's work in progress, certainly I would, you know, encourage and promote on a greater scale.

I: Does your school have a support structure for the use of technology? If so, what systems do you have in place?

P1: Firstly, we do have the Fourth Industrial committee. And, essentially, they are tasked with researching technology that can be used to enhance teaching and learning in the context of our school. Also, you know, we have discussions that SMT, and I'm always encouraging my managers to, again, investigate the type of resources that would be appropriate, of course, within our budgetary constraints. And then, we also have a data capture, who can provide support who does provide support. And lastly, I managed to secure the EduNova programme. Clearly, the Department's mission was to introduce it in our work to the primary schools, but I did motivate and we were fortunate to secure the services. It doesn't depend on funding from the Department but it's a project in conjunction with the Department. But they initially targeted primary schools. But I thought, you know, being a disadvantage school in many respects, that our girls should never be disadvantaged, and move off fortunate to secure it, and they are making a difference. And the programme continues till the end of September. And some of our girls will be certified, others have learned some skills. So they certainly a benefit when we partner with outside organisations, to empower our girls.

I: Does your leadership style embrace technology and does it impact on school performance?

P1: Oh certainly, you know, I've been advocating for the use of technology for a long time. And it does impact on school performance, because you get learners that, you know, learn in different ways. And many of our learners, I think learners in general, are more receptive to visual stimuli. And, yes, there's also the ability to provide greater interaction with the learners is also you know, diversity and creativity, and innovation. And I think, to secure the attention of the learner today, teachers have to resort to using technology. You know, I'm not saying we do away with the chalkboard, it will always have its place. But I think teaching can be taken to a whole other level, once we introduce technology, which we have done at our school. So even you know, when we talk about you talk about embracing technology, I think that's very evident, again, you know, our mission and vision because, you know, the use of technology is a skill that is not restricted to school. If we really want our girls to succeed in the world out there. It's…it's really very fundamental that they acquire the skills at school, because irrespective of which field they go into, they will be engaging with technology. So I think it's our responsibility, first and foremost, to empower them in the use of technology.

I: How do you feel about technological change?

P1: For me personally, I'm quite exciting. I mean, you know, I mean, clearly technology, it's led to so many advancements, its increased communication, and it's made the world a much smaller place where you can communicate with people all over the world. And if you look at technology, even the home front, you know, it's making work more efficient, more effective, and more exciting. I think technology is really something that we all have to embrace. It is, it's not the future, it's actually the present, which is developing, you know, into the future. And so perhaps we're going to see artificial intelligence, right, in our very homes. So for me, it's quite exciting. But I would say we need to use it responsibly. So, yes, it's great. It's exciting. It's going to change the world, the world's becoming so dynamic and interesting. But there's a responsibility behind the usage that I would always advocate.

I: Do you have staff at your school who you would regard as technological leaders? If so, compare their work performance with those teachers who do not use technology in teaching and learning.

P1: Um, yes, we do have teachers that use technology. And yes, we definitely have teachers that I would regard as technological leaders. And if I had to compare their work performance with those teachers who do not use technology, there is definitely a huge difference. They are accessing learners' attention. The learning is definitely increased. But I'm also going to say that the majority of our teachers, of course, to different levels, do use technology. And the one thing that I advocate for, and I've been doing this for a long time, is where we engage in a lot of cross generational mentoring. And one of my purposes of encouraging the cross generational mentoring was actually to bring on board the more experienced teachers, because the younger teachers, the millennials, you know, I mean, they are native when it comes to technology. So I thought that they were they are, they definitely are, you know, they're more comfortable with the use of technology. And fortunately, we have a team that works together. And they definitely have seen signs of the cross generational mentoring. And I think it's a wonderful concept at our school. I've also encouraged teachers to, you know, sit in on lessons. So that certainly helps. But to answer the question, again, the performance of the educators, while including technology are definitely you know, engaging in lessons that are more creative, innovative, and we need to do this because that's what attracts the current learner. You know, I think, and more importantly, education is about application of the knowledge that children can access. So I think that answers that.

I: How do you, as a principal, deal with the issue of resistance to technological change among teachers and staff?

P1: I think I already touched on this little bit, but generally, I haven't seen much resistance. What I would say the transition is probably more gradual with some educators. But I wouldn't say resistance. How do I deal with this? Definitely, with the millennials, and the younger teachers, you know, who like I said, when naturally be

drawn towards using technology. So, at our school in particular, it's this kind of interest in technology that I would like everybody to engage in. So, you know, really what I'm talking about here, again, is the cross generational mentoring, because one can never take away experience. So the younger teachers do learn and do develop skills and professional development from their seniors, who are their mentors, their coaches but at our school we deliberately ensured that the more senior teachers, then, you know, I expose to technology by the younger teachers. And I think that's happening wonderfully. Well, I mean, in the Languages Department, we do have Microsoft Teams, and I'm sure even teachers who have never access this facility before I actually doing it.

I: What systems do you have in place to manage technological resources at school?

P1: Essentially, it's the departmental heads that have to manage the resources. But once we sit at management meetings, and we discuss because my idea is for my managers to actually investigate, do some research and come up with ideas as to what they require. And recently, I'm so excited, because I've seen an upsurge of this for example, I mean, the languages team wanted that Bluetooth speakers they wanted their own data project, which we have purchased. And so I would say yes, initially, the bursar records everything and maintains it, but managing the usage is done essentially by the Departmental Head, and also the Fourth Industrial committee, because that is fundamentally their duty. So not only would they advise on the procurement, but they also need to look at the upkeep and maintenance and safety.

I: Do teachers have equal access to available technology at school? Explain.

P1: Yes. Whilst I would say that it's a dream, to have a television for example, in every classroom, we are bound by certain criteria. So, currently, there are about eight TVs, they are shared between the departments. And of course, the Departmental Heads, again, can share your lessons where all teachers have access. So the resources are there, it just means a little bit of logistics to ensure that they can reach out to them. I mean, the laptops available to everyone. So other resources are able to access… the

only thing that is fixed, are the TVs for security reasons, of course, but nobody, you know, is prevented from using any technology that's available at school. And like I said, if any teacher has identified technology that would enhance his or her teaching and learning and if it is within our budget, we certainly purchases. I think recently we had requests for digital visualizers. And we are in the process of purchasing it.

I: When you plan as the school management team, do you embrace technological integration to enhance teaching and learning? Explain.

P1: Yes, I do. Think this one I've already touched on as well. So when managers are discussing, of course, two most important things are the curriculum management and the assessment. But related to curriculum management, is the provision of LTSM. So, you know, Departmental Heads are encouraged to collaborate with their teams consult with their teams, and identify resources, tech tools. And, you know, if it does within the budget, of course, it's purchase. And, again, I must say that I have seen that DHS are taking an interest. They are consulting with teams, and we are purchasing, you know, more tech tools to enhance teaching and learning.

I: What are some of the prohibiting factors surrounding the integration of technology at your school?

P1: I would say the first one is certainly budgetary constraints. You know, it would be exciting to have labs and all kinds of sophisticated equipment, but the budgetary constraints do not allow it. This second factor is that, you know, our school is located in a very high risk zone. So the safety concerns are very, very important considerations. So when we do install a TV, in a classroom, we first have to ensure that it has security. It's fully secure. So, you know, there's actually a double cost involved here. So we have to secure the rooms, and then we install the TVs. Also, you know, to ensure that teaching and learning is continuous. It's important for learners to have some from the appropriate devices and the data. So yes, I think most children do have cellphones. But the problem is that they don't have the data. So whilst the educators are in a position, because we do have Wi Fi at school, to engage in sort of a hybrid learning or blended

learning, and many teachers are doing this. But for it to be done on an on a on a huge scale, is a bit of a difficulty simply because our girls don't have access to the data. I mean, we've had sponsorships, the matrics had sponsorships for data. You know, I did secure sponsorships for data for them for the last two years over a 12 month period. But that's the matrics. So I mean, some of our teachers have even conducted zoom lessons. And the exciting thing is that, you know, we do have a programme DUT programme and they engage in online lessons. And what I'm noticing is that I'm seeing actually a growing number of learners responding. So perhaps in time, more learners will have access to the appropriate devices and data so that our vision and mission can certainly go further in the accomplishing things. Those are the three main factors that hinder our progress in technology. Thank you.

APPENDIX G2: SCHOOL 3 PRINCIPAL'S INTERVIEW QUESTIONS

I: What do you understand by the term "technological leadership" and explain why you think such a term is applicable in the school context?

P3: I think technological leadership is basically for the leader like a principal being able to get across to teachers, especially now if you are having a staff meeting instead of it being the traditional boring meeting where you are just speaking you could be doing PowerPoint presentations and then obviously PowerPoint presentations you could have nice diagrams, charts, bar graphs, you know, it will get the attention of the teachers more than just sitting in front and speaking to them. So I'd say even if at now at us we have what we call the Triple D dashboard, where every Friday we submit attendance of teachers, attendance of pupils and all marks that are captured in a week, so that means that this Friday, the departments will have access and the SEMs will have access and the director to everything from the first day of school to everything right up until this Friday. So we do that every Friday. When it becomes available to us in the weekends, and if you are looking at this its so helpful to us because you don't have to sit and do analysis because Triple D is such a beautiful programme, it will give you everything it will give you analysis. It will actually tell you, normally I will set aside Sundays about an hour to go through Triple D, like yesterday I had gone through it. It will tell you in Grade 12 these are your risk learners in terms of academic performance, I'm just taking Grade 12 for example, in Grade 12 these are your risk learners in terms of drop outs because of their attendance and obviously when you are capturing attendance you are capturing with reasons, so if it's being captured and the child did not furnish with good enough reason to be absent then you see their names will come up as possible drop outs, so you don't have to sit and look at the register and go figure out who are your possible problem cases, you don't have to sit with an entire marksheet and try and figure out whose passing whose failing because technology, we have this technology now because Triple D will give you everything. So it makes life easier, so then also it can assist us in improving results, you find that at school level Triple D is not only accessible to the principal, see we have log in credentials as recent as two months ago, the DP

and the Departmental Heads have their own login so they can go into it. So and I'm saying the Departmental Heads and the DPs also in their fortnight meetings can use Triple D to do presentations and there's a variety of reports that's accessible. We've given access to all departmental heads, it's beautiful, I will put in on for you before you leave and you can have a look. Even if you are looking at teacher attendance, it will highlight to you for example a teacher which was absent three times, they are absent on a Friday and a Monday, it will come up to watch this person. Its like a pattern developing. You don't have to just sit and paper, paper.

I: Do you think technology plays an integral part in managing your school? Why do you think so?

P3: I think all that I said in the first question are good enough reasons for technology, that is the future for schools.

I: Do the teachers in your school use technology to enhance teaching and learning? If so, in which ways?

P3: Unfortunately not many, of the cuff if I think of my staff, think one…two…three…people that are using data projectors. The rest have not reached that level I think the reason being is that we are a very poor school, we don't have the resources, we don't have the funds, to set each class, which would be an ideal situation…you know. Especially with COVID, would have been an ideal situation where you would have had each class set. You know you could do an online lesson and you don't have to physically be there, you know if someone even has COVID and they are at home, you can do an online lesson and kids will be on par. No definitely, I wish we were in a situation where we could provide the necessary resources to all the teachers at school to basically start using technology in their teaching and learning. Actually, we resort to…we don't even have textbooks for our learners. So we rely totally on running out worksheets and that like 99 percent of our teaching is via those worksheets.

I: Does your school have a support structure for the use of technology? If so, what systems do you have in place?

P3: Actually I will be lying to you if I say we have a support structure but we have one venue at school. We don't even have a computer centre because of finances but we have one venue, our library where we have a data projector, so when teachers want to use it when they are free they book the period so we don't have clashes but its just one place, we got.

I: Does your leadership style embrace technology and does it impact on school performance?

P3: Too a large extent I think my leadership style will embrace technology because if you are looking at our presentation at staff meeting, it is using technology, using a data projector, presenting graphics on a screen…you know. Actually looking at…I have attended a workshop let's say on Triple D or I attended a workshop on curriculum monitoring and development, so let's say I have a slight access to a slide presentation I make it accessible to all my members of staff, you know where I give it to my departmental heads, I tell them to go through and use this slide presentations in their subject committee meetings and make it available to staff. So they are also kept abreast and remember my intention is to build capacity among my level ones, that we are getting older so when we leave this school there are people who have enough capacity to take over and the school doesn't struggle you know. If you look at timetabling, we have a programme, so if I am doing a timetable I will tell staff, if anyone is interested to come and join, learn how to do splits and combinations, learn how to use the timetable programme that we've bought. Gone are the days where we use colour cards and do a timetable and punch everything and within half an hour you have a timetable and also what I am looking to doing now, actually that's my main project for this term. I managed to get some laptops, about five, I'm going to network out SASAMS. So I found a venue safe burglar guarded and then I'm putting in five laptops, one per Grade, so once it's networked it will make the process of capturing for SASAMS much, much more faster and also it's going to build capacity among the teachers, so that they use this

programme. You know some of them hear about SASAMS but they never ever saw it or used it because again here's SASAMS which is another beautiful programme if it is used the right way.

I: How do you feel about technological change?

P3: Personally, I feel we got to embrace it, if we are not going to embrace it, with the fourth industrial revolution, you definitely will fall behind because if you are looking at robotics, it's now becoming a very popular career path now because some of the primary schools are being piloted for robotics. I think Palmview Secondary are fortunate, I think they got it at Grade 8 level. Unfortunately, we were not selected because we don't have IT as a subject because we don't have computers and if there is a day we can source some computers, we would love to introduce IT to our children. So you know what…you've got to…because everything is about technology. If you look at now our communication with Department, like we had to submit, for a secondary school we had to submit on Thursday. Our Term 2 analysis is no longer making copies and submitting analysis, it's now we got to do an e-submission, you can't say no…no…I am not doing it, you got to learn and got to be able to do it. And you find that when you learn and start doing it, you realise this is much easier than what I was doing because what you were doing was taking more time. If you want to send it to your circuit manager, you want to send it to EMS, all you so is identify them on that e-submission and you send it. It takes like seconds. I say you got to embrace technology and change, otherwise you are going to fall behind. Even at my age I say, you got to. You can't be stubborn and say I'm still the old fashion and do things the old fashioned way.

I: Do you have staff at your school who you would regard as technological leaders? If so, compare their work performance with those teachers who do not use technology in teaching and learning.

P3: I would say you know what, I can't see much difference in terms of results, to be honest with you. But what my observation is that learners tend to enjoy lessons when technology is being used. I think they don't get bored with the monotonous way of

teaching, that if a person is teaching one way. I don't know if I should be saying this but they don't even get up from a table, You know something that I cannot tolerate because I teach, Maths and Physics and if it's a fifty-five minute period, atleast if it's forty to fifty minutes, I'm on my feet and I'm on the ball. And you got to have that interaction with pupils. So the people who are using technology are performing, they have the children interested in the lessons but noticing any difference in the results…I can't really say. Even those guys without technology are doing the best they can and they are producing the results.

I: How do you, as a principal, deal with the issue of resistance to technological change among teachers and staff?

P3: I've addressed one or two with regards to their lessons because obviously complaints will come to me. I mean, I was just earlier in a class and the class is just telling me, and I am curious. I just take a walk. And now that my Physics teacher is sick, I am teaching 10, 11 and 12 Physics so it's taking a lot out of me. I mean she is not going to be here six to eight weeks and I was speaking to some of the learners and they were saying to me Sir, and I looked at the results like Grade 10 out of thirty two, four passed. These children I was shocked you know, they were saying they don't understand. When we put our hand up we are being shouted down. And I said as the Principal of the school, you are Physics learners you are supposed to be the brighter learners, you supposed to come to me because nobody should be shouting at you. I told them, I will be teaching you from today, you can ask one hundred questions. So that's one of my teachers that I have addressed on methods of teaching. Some of them are stubborn, especially the older ones, you do get resistance. In fact I have not been able to convince her yet, to change her methods of teaching but when she gets back I will have to call the subject advisor in and addressing because they are still using that old fashioned transparencies. You are sitting at a table you got transparencies, you are killing that subject, it's a beautiful subject and you are not giving that opportunities for questions and you are destroying those poor learners and it's showing in the results. I mean I'm looking at my Grade 12 Physics results, normally in Grade 12 the learners perform much better in Physics than in Pure Maths, I'm seeing it the other way in my

school. Children are getting As in Maths. My highest mark for Physics is 60 percent. So it straight away tells me that something is not right and I started teaching them last week. So I'm giving them the first test tomorrow. I am telling you now, the results are going to be good because you can see the difference now. So some are stuck, no matter what you say, they won't change. I always tell them to teach a child as though it's their own child. For me, you got to teach from the heart, children's eyes must light up when they are in the class, they must show that interest, otherwise I wouldn't want to be in a class. I say, that if I walk into a class just for the sake of it, I must pack my bags and go off. I must enjoy what I'm doing. Passion…you must be passionate.

I: What systems do you have in place to manage technological resources at school?

P3: We don't have much technological resources…we have the library and burglar guards. We've had numerous burglaries. We've had this office area broken into, we've had computers stolen from here. So we put those burglar guards there. So what we've also done is…we have two night guards. We haven't had a burglary since last year and maybe the alarm also, now that we resituated our sensors, so what was happening, they were coming through the ceiling. So we put sensors in the ceiling and we have armed response, we pay every month for armed response. So they've come and rattled the burglar guards here, once or twice, and I think the sensors detected the motion, it triggered and they were gone. So by the time the security came they were gone. I hate it when they break in.

I: Do teachers have equal access to available technology at school? Explain.

P3: You see… whatever we have, you see a few years ago we were given tablets. You know…we were given by MTN, if my memory serves me correct. We were given a data projector which we mounted, we were given a white electronic board which we have in the library but the tablets, we didn't store it away for it to collect dust. What we did is we got each teacher to sign for it and we use it. I believe if its available let them use it, I'm not going to put them in a stock room and find after a few years it's no use, so every

teacher besides myself, because we were one short has a tablet that was given at that stage. We were given 23. And then at school, I have a printer, a high performing printer A3 and A4. We have two desktops set for teachers in the library, so they can use it for whatever work they want to do. Also we don't allow them to use the office printer because that's got some personal things and sensitive information…you know. So, they not prevented to use. Whatever they want to use and we can provide it, we will find the means to provide.

I: When you plan as the school management team, do you embrace technological integration to enhance teaching and learning? Explain.

P3: You see I think like now that now that when we…let's say that I am meeting with my members of management. So there's not a single meeting where we don't have a PowerPoint presentation. So we are hoping that…I want that to rub onto my Departmental Heads and I got them now also, when they have their departmental head meetings, they must do these presentations where I said we have the facility in the library and they must use it, I mean, you take me for example, I just got a message now, on Wednesday, I'm attending a principals meeting. Ten high schools in our circuit, will be given ten minutes to do a PowerPoint presentation of the Term 2 results and what strategies they are going to put in place to improve the results, which I need to sort out by tomorrow.

I: What are some of the prohibiting factors surrounding the integration of technology at your school?

P3: I think prohibiting is something that would be preventing us from embracing technologies…I would say is finance. We in a school where our school fees is a thousand eight. If we get 25 % of school fees, I would be surprised, we don't. So we got to rely on sponsors. You won't believe it if you come to the school, that we are such a poor school, I mean that most of the things that we do at the school, we rely on ex-students, we rely on family members, you know who ever we can get to sponsor us and make school look nice. So finances is one of our bigger issues but fortunately now, in

the last month we got classified as Quintile 4, so obviously as quintile five we get r190 per pupil in our school. With Quintile 4 we get triple that amount but those funds are not coming but I'm saying things can become better for us, going into the future because at the moment, just security and water and lights, we need minimum r60 000 a month just for us to be able to pay those two bills, leaving the rest of the bills that we have. Now you got to pay your municipal bills. You heard what happened on Thursday, many schools are in arrears. We for such a poor school we are on par. We make it priority to pay but we are battling, I mean I just paid r26 100 for water and lights, that's our average for a month and r3800 for refuse, so you looking like you need r30000. So I wish we had the money, I wish somebody could come and say here's a sponsor of 3 or 4 million for our school. I wish I could catch the lotto and say here's the school, here's 10 million, it will be such a beautiful thing. So, we've battled over the years, so you will see, for a poor school, a poor area, we are a high performing school. You will see our pass rates, you will see in the past twenty years we have never been below 80%. Also we have been in the nineties. I'm saying, I don't know. Just say, we blessed with the little we have we are able to manage. I wish we had, it's hard to get sponsors with the current economic climate now, it's so difficult because businesses are also struggling now. But we will keep on trying. As I said to a parent, come and give me half a ream of paper, I am eternally grateful, it's half a ream I didn't have. So we get people coming in and it's shocking and sometimes we get a poor parent and somehow they found that R75 bought a ream and they brought it. I makes my day because it's for their children, it's not for me.

APPENDIX G3: SCHOOL 2 TEACHER INTERVIEW QUESTIONS

I: How do you feel about using technology at school?

T2: I feel it is very beneficial, especially for communication with management and with staff and with learners. Especially during COVID, we've noticed that it has assisted. With regard to teaching using technology it is still a problem in our country, not everyone has access to technology as much as we would like them to, so internet access, computers, laptops at home and things like that but with regard to administration purposes, I think that it's very beneficial, it really helps us a lot. With teaching in regard to my subject, I think it is subject related, a lot of maths teachers use technology, I feel that I don't, I use my whiteboard. The kids, they like to see you physically writing out the sums. But I know with other subjects such as EGD, where they show you diagrams and things or like drawing. For languages, you know if you have to play an audio or video and things like that, it will assist even with the slides, lots of the other subjects. Just with my subject in particular I feel I don't use it as much in the classroom.

I: What do you understand by the term 'technological leadership'?

T2: My understanding, I don't know if it is correct, it's just how we manage technology. So one form of maybe a leadership, I am not sure if this is correct, it would be like handling your class WhatsApp group. I don't know if this is correct but this could be a form of technological leadership, to make sure that it is not mishandled because obviously a lot of bad things can come out of messages. So we'd have a person at admin and make a broadcast only so we don't have any issues with regard to bad things being sent on groups. Another form of technological leadership can be like with regard to SASAMS, for example, when we use for admin purposes, we've now made it management only and the reason for that is so that we don't have marks that are entered incorrectly and so on. So we have someone that is in charge of that entire administrative process and obviously that will filter down to from the principal to the deputy and then to the SMT and we will obviously ask the staff for certain things in a

different way. So leadership in that way where there is someone that is in charge, that's my understanding.

I: Do you think that technological leadership is only relevant to the principal and senior management team? Explain.

T2: Okay, so I feel it is more relevant to them, only because the department sends them the information or the data, whatever it is to be captured and they obviously cascaded down to management and obviously to the teachers. Actually that word 'only' I don't think that it is only relevant to them because staff can also be in charge of specific departments. And as I said the WhatsApp group, the class WhatsApp group, if that's what technological leadership is then a class WhatApp group for example, then you do have staff. But I do feel it is more relevant to principals and senior management only because they get directive from higher up.

I: Do you use technology to plan and execute your lessons? If so, in what way do you use technology?

T2: Okay, so, no…I'm still a little bit old school, I think it will take me many years before I get to that level. Planning, I do type out my lesson plans. I do use resources from the internet and so on. But executing my lessons is old school, I use a whiteboard and whiteboard markers but the planning, I use technology because the media and whatever is out there for us because there's always new things all the time.

I: Has technology assisted you in your administrative functions? Explain.

T2: Okay, one hundred percent, would regard to marks, so we would use excel, the spreadsheets, it obviously makes things quicker with formulas. Entering in marks into the system for SAMS or whatever system any school is using. Administrative…our school they don't use the front office app for where you can do things online, you don't have to physically have paper work, our school is still a little bit behind in that where we

have to take the register in the morning and things. So, it has assist, I think a lot but not fully.

I: What are some of the factors prohibiting you from using technology in teaching and learning?

T2: It can sometimes be a little bit scary. I would like to use certain new things that are out there for maths. It is a little bit expensive so cost is a big factor. They are a lot of things out there for Maths, now that I think about it, there's ones where you can sit at your desk and draw shapes and things, your smartboards. Cost, everything relates back to cost, cost is one of the major things. Second on the list would be time, so that's why it's just so much better to open up a book and start teaching. So planning, it's a lot of pre-planning if you want to use technology in your lessons.

I: Do you think the use of technology in the classroom improves learner performance? Explain and provide example from your own experiences.

T2: Okay, so I don't think it improves learner performance, I do think we get them to engage more in the lesson because it's something they relate to, the youth. Again it's also like social background so obviously the school that we are in, we do have a little bit of kids that are from little bit of a privileged background so they constantly on their cellphones, they do have laptops and so on. So yea, so if you use technology in the classroom I think they like that, its things they are used to. It's not as boring as writing on the bored. An example, an example from your own experience, when I used to lecture we used to do, we used to try and incorporate as much technology as possible, they'd actually say, in a lesson you must, you should use something as social media, you have to use powerpoint slides, some sort of audio-visual description in your lesson and something interactive, technology wise interactive and you notice that the kids do get more involved and I just feel in our country as a whole, we are looking at it from a very small point of view, in a larger scale of things, I feel it does. When we were in university we hardly had access to past year papers and now the kids have access to past year papers. And now the children can just go onto google and type 'Grade 12 past

year papers Maths exams' and you'd have like hundreds that come up, in that sense I think it does improve learner performance.

I: Does your school provide you with technological support? Discuss. Explain

T2: Yes, our school does, we have an SMT member that's actually in charge of technology in school. So she will make sure that we have internet access that we have a laptop that everything is working on the laptop. If there is something that we don't know how to do then we can go to her. And our school, I there is any course that we need to go for, they're always willing to send us.

I: What technological skills do you think are necessary to function at school?

T2: Okay, to use the laptop, to be able to use WORD, Powerpoint, Excel. I think those three are the most important, to set your papers, to enter in marks and to set out like your lessons, for other subjects. To have access to a computer, to know how to switch it on. To know certain functions of the keyboard and to know how to be able to access information that you require for your subject like be able to use GOOGLE, Youtube and all those things.

I: Have you tried to develop the technological skills that you are not proficient in? If yes, state in which ways you have developed your technological skills. If no, provide a reason for not developing technological skills.

T2: So the only issue I have is Excel. And I think that because we mainly use it towards the end of the term when it comes to the marks. So formulas are a big thing, so I started writing down the formulas that I'm going to be using for different types of things. And that I will ask whoever knows Excel and know the formulas, I will get them to help me, so I'm not afraid to ask. Uhmm…I do feel I can learn a little bit more, so what COVID actually did for our school in particular was it made, us learn a little more in regard to Microsoft and our online teaching. Like now I feel a bit more confident if I have to do an online class because I know how it works. Before you knew of Zoom and you knew of

SKYPE or whatever but you'd only use it if you know someone you needed to SKYPE with or to Zoom with. But here it forced us into a situation, like where we had to learn. So I think, in that way, yes and it has developed our skills and I feel so much more that we don't know that we can do.

APPENDIX G4: SCHOOL 4 TEACHER INTERVIEW QUESTIONS

I: How do you feel about using technology at school?

T1: I think that technology could really help our learners because they have so little access of it at home. Unfortunately, we have limited access at school as well, so the teachers may have their own laptops and their own devices but the learners don't have it. The learners are restricted in a sense that they don't have data so they are unable to use technology to the fullest. So we find that, personally I bring my own modem to school, give them the code, then get them to bring their devices to school and get them to use their devices that way but it's very restrictive. I love it, I think that it could really enhance learning but it's not happening in government schools.

I: What do you understand by the term 'technological leadership'?

T1: Leading using technology I think. Using technology to enforce discipline, maybe the rules at school, even to facilitate learning in the classroom.

I: Do you think that technological leadership is only relevant to the principal and senior management team? Explain.

T1: No, I think that it filters down through the levels, even level one educators could be open to technological leadership because we lead in our classrooms. So, while the principal governs the entire school, so to does the senior management but educators are leading in the classroom so it's relevant to us.

I: Do you use technology to plan and execute your lessons? If so, in what way do you use technology?

T1: Yes, as far as tourism is concerned we make use of the videos online, where the children can actually walk through an icon, so I try to expose them to those and also global events. So a learner who do not know what a Tsunami is or may not even be

able to visualise gets to see it. We make use of the projector and where we are able to actually show them the movie of Hamlet, you know…the set works in English. So yes we use technology.

I: So you have a projector or is it the school's projector?

T1: Yes, it's the school's projector, so we us that in the classroom. Also during the lockdown, I used technology quite a bit because I mad videos of myself teaching a poem and I sent it through to the learners via WhatsApp and email, so that helped us.

I: Has technology assisted you in your administrative functions? Explain.

T1: Yes, definitely when it comes to planning of lessons, when it comes to marksheets, Excel, programmes have definitely helped us to generate the marksheets, generate the statistics et cetera.

I: What are some of the factors prohibiting you from using technology in teaching and learning?

T1: The main factor is the accessibility for learners. So while we are able to use it how do we filter it down to the learners when they don't have access to it. So I feel there is so many wonderful resources out there that learners can access but they are disadvantaged because they don't have access to this.

I: Do you think the use of technology in the classroom improves learner performance? Explain and provide example from your own experiences.

T1: I think it can improve learner performance because it enhances what you taught them in the class. It's additional to what you've taught especially when you are studying for examinations and then they find that they cannot remember a poem or they do not understand how a Maths some is done on the board but if they have a video at home it's as though they have a teacher in the classroom, so it definitely can improve. Once

again my teaching the learners line by line, it's done in the classroom but I also do it on video where I underline the words and I explain it to them on video. And so when they are learning, revision is easier because it is just as though they had the lesson before they had written the paper.

I: Does your school provide you with technological support? Discuss. Explain

T1: As far as finances go, our resources are very limited. We have WIFI at school which all educators are able to access. We do not each have our own computer. We buy our own laptops. There are computers which are available for us to use at school. Again, we are restricted because we can only do so during free periods and so on. So most of the time the technology that we use is our own and not the school's.

I: What technological skills do you think are necessary to function at school?

T1: I think training in basic programmes, like WORD, Excel, how to do spreadsheets, Powerpoint presentations. How to do a powerpoint presentation because many of us are self-taught, we've never had that training and I think that could really help us. It will help us to structure of lessons differently and to even facilitate the teaching and learning differently.

I: Have you tried to develop the technological skills that you are not proficient in? If yes, state in which ways you have developed your technological skills. If no, provide a reason for not developing technological skills.

T1: Yes, I did go for a training programme for Excel and Word, within the first 10 years of my teaching career. Then now I think I've learnt more by asking others especially my daughter because she is very technologically inclined. Powerpoint and how to put together a video and movie et cetera she basically has taught me.

I: And the course that you went for was it your own personal course or was it something the Department sent you for?

T1: I think it’s something the Department sent all of us for.

APPENDIX G5: SCHOOL 1 LEARNER INTERVIEW QUESTIONS

LEARNER 2

I: What do you think about the way learning content is presented in the classroom?

L1: So basically in my personal opinion, it's appropriate, good and understanding. Our teachers have used a more 21st approach whereby the teacher presents work in a manner in which learners understand, therefore if the learners do not understand something they do not have to hesitate to stop the teacher and ask if they do not understand, so therefore I agree it is appropriate.

I: Describe the way you use technology for the purpose of learning, whether at home or at school.

L1: In school we use technology to better understand the topic being taught or to find meaning of words, however, we don't only use it for this purpose, for children who cannot purchase the set books for subjects such as English and Zulu, in this way a pdf document is sent to all learners thereafter teaching is being preceded in a well-mannered way. At home we use technology to help us, to aid in research purposes, assignments and to help with speeches.

I: Do your teachers use technology when teaching in the classroom? If yes, in which ways.

L1: Technology is used in our school for strictly learning purposes only and we are able to watch videos, short clips and movies so that it could help us understand better and give us more options and opinions.

I: How do you feel when you are exposed to technology for the purpose of learning?

L1: Personally when exposed to technology, I feel excited but depending on the use of technology but in this wise, learning wise, I enjoy it because it make learning fun and exciting. It also makes learning more easier because if you do not understand something google can help instead of asking you teacher.

I: Do you think frequent use of technology will influence students' performance at school? Explain why you think so.

L1: Yes, it does as learners tend to pay more attention to what is taught using technology, rather than paying attention to a textbook, however, some learners take advantage of being able to use technology. So whenever a teacher might step out they use it for their own purposes resulting in poor academic performances.

I: What factors do you think limit the use of technology in schools?

L1: Some schools may not have proper facilities to accommodate for some technological equipment. Some schools do not have enough money to purchase technology and not enough qualified educators to teach children how to use technology.

APPENDIX G6: SCHOOL 4 LEARNER INTERVIEW QUESTIONS

LEARNER 1

I: What do you think about the way learning content is presented in the classroom?

L1: Honestly, I think it's okay but there is room for improvement, in the teachers and the learners because some teachers prefer to just give the work and not explain it properly. That's what I think.

I: Describe the way you use technology for the purpose of learning, whether at home or at school.

L1: Technology can be helpful at home and at school…and…I use it mainly when I am doing my research and other assignments as well that regard school work. But mainly I think the school can be a little bit more technology to help us improve in our studies and work.

I: So, you mainly use it at home or at school?

L1: At home.

3. Do your teachers use technology when teaching in the classroom? If yes, in which ways.

L1: Sometimes they do, for example if they are giving us assessments they may show us examples by Googling something or showing us a previous example of maybe a learner from another school who has also done it, with their cellphones or other devices.

I: How do you feel when you are exposed to technology for the purpose of learning?

L1: Technology is very, in my opinion, is a great way to learn because it's easier for me to learn using technology. I know that some learners don't find it easier but for me it is.

I: Do you think frequent use of technology will influence students' performance at school? Explain why you think so.

L1: I think it will improve the performance of some learners at school because like I said previously, for me it helps me a lot when I study. It's easier, I can get the information easier and it's easier for me to learn it. But in some cases some learners prefer to be told like for a teacher for example, they prefer someone to stand in front of them and teach and tell them what to do. So yes, in my opinion, yes I think it will improve the student performance in schools.

I: What factors do you think limit the use of technology in schools?

L1: I think limits the technology is the rules, for example they say cellphones are not allows but Grade 10, 11 and 12 learners need cellphones every day to do our assessments and general schoolwork. We need technology. I think that some of the teachers prefer to limit the use of technology for their protection. Learners like to take videos and pictures and post them online without their consent. That's what I think limits the use of technology in school

APPENDIX H: DECLARATION OF PROFESSIONAL EDITING

590 Miami Road
Hillberdene
KZN
4220
Cell: 0842648401
brian.naidoo25@gmail

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THE ROLE OF TECHNOLOGICAL LEADERSHIP IN INTEGRATING TECHNOLOGY IN SECONDARY SCHOOLS OF KWAZULU-NATAL

Suzanne Emily Naicker

MASTER'S IN EDUCATION

University of South Africa

TO WHOM IT MAY CONCERN

This certificate confirms that the above-mentioned student submitted his draft master's dissertation to me for language-editing, which included correcting in-text citations and the mistakes in the list of references. This was duly edited by me and sent back to the student for revisions as per suggestions from me. I make no claim as to the accuracy of the research content. The text, as edited by me, is grammatically correct. After completion of my language editing, the student has the option to accept or reject suggestions/changes prior to re-submission to the supervisor who will check the content and instances of plagiarism, if any.

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084 264 8401
brian.naidoo25@gmail.com

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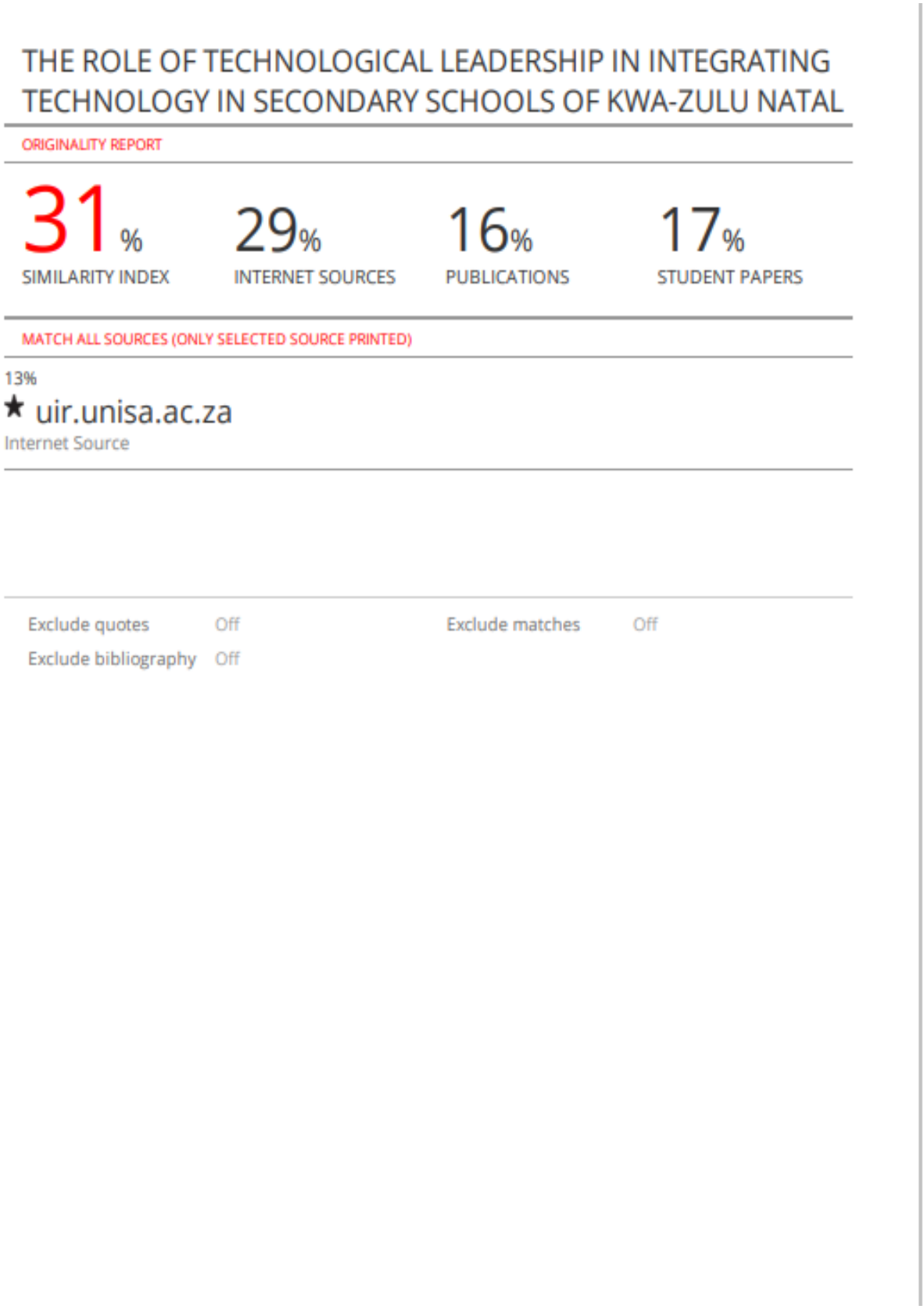
APPENDIX I: OVERVIEW OF THE TURNITIN SIMILARITY REPORT



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