LEARNING DYNAMICS IN THE 21ST CENTURY: CHALLENGES OF AN UNDER-RESOURCED HIGH SCHOOL IN RURAL SOUTH AFRICA

by

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DECLARATION

I, Unathi Gqontshi, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my opinions and not necessarily those of the Cape Peninsula University of Technology.

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ABSTRACT

Technology has transformed education at all levels, from primary to tertiary education worldwide. Educators and learners in most schools rely less on traditional face-to-face classroom interaction, but more on digital educational platforms and tools. However, developing countries like South Africa face a major challenge as some schools have access to advanced technological tools while others do not. While learners from well-resourced urban South African schools benefit from this digital transformation, there is no evidence that learners in under-resourced communities like rural areas benefit from digital resources on the Internet. The research objective was to understand how learners in under-resourced communities cope with learning in a knowledge economy driven by digital transformation. To understand this phenomenon, the e-learning readiness assessment factors of Đurek and Ređep (2016) formed the theoretical basis for this study and serve as guidelines for data collection and analysis. Quantitative data was collected from an under-resourced school and analysed using statistical methods. The unit of analysis was high school teachers in respect of the school's e-learning readiness.

The study explored teaching and learning challenges of rural high schools and identified ways of introducing new learning methods to enable rural learners and educators to cope with the demands of the technological revolution. The findings were that rural high schools do not engage in digital transformation. Recommendations from the case study are deemed to apply to all under-resourced schools in rural South Africa.

Keywords

ICT, twenty-first century learning, online learning resources, previously disadvantaged, teaching and learning, under-resourced schools, well-resourced schools.

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Clarification of basic terms and concepts

Application – program or group of programs designed for end users

Digital competence – refers to technology-related skills and knowledge

EC – Eastern Cape

ICT – Information and Communication Technology

ICT Skills – refer to technology-based skills and knowledge

CHAPTER 1: INTRODUCTION

The Internet is a source of learning resources at all levels, from primary to tertiary education. It is one of the potential drivers of good-quality education as it offers access to digital education resources like e-learning, m-learning, blended learning, distance learning, etc. Turban et al. (2017) define e-learning as educational methods and material delivered online to fulfil learning, training and teaching needs; it is also used for knowledge acquisition accessed at different locations. It constitutes distance learning as education conducted from anywhere, at any time, through the use of digital technology. M-learning comprises e-learning through the use of handheld devices like smartphones and tablets. According to Van Oordt and Mulder (2016), blended learning is a combination of traditional face-to-face with online technology-based learning.

These digital educational resources mentioned above have revolutionised the learning process by making it easier, faster and easily accessible. This increases student interest in learning and results in improved student engagement. The Internet and computers also offer other advantages to teaching and learning, such as the ability to store information in computers and making backups, teachers being able to prepare for class through the use of slides and email communication, and teachers being able to communicate with the Department of Education (Lindberg et al., 2017). This makes it vital for every twenty-first century learner and educator to have access to the Internet and good digital skills to be able to participate in the benefits of the digital revolution.

While learners from well-resourced urban schools have access to the Internet and good facilities, learners from under-resourced rural schools are still without access to the Internet and computers. For these under-resourced learners, going to school is all about sitting in a traditional classroom, listening to a

teacher, and reading and writing. They have no access to digital learning resources such as the Internet and computer-based tools that can aid in their career growth and future development (Conger et al., 2016).

This research seeks to analyse the challenges that under-resourced rural schools face and the impact these challenges might have on teaching and learning.

1.1   Background to the research problem

South African education is evolving, and schools at all levels, from primary to tertiary level, are adopting the Internet. Educators in most schools no longer depend on traditional face-to-face classes to interact with students. They make use of digital educational tools. This creates a number of benefits for schools that have access to the Internet, while schools without Internet access are excluded from the benefits that internet access offers (Lindberg et al., 2017).

According to Duffett (2017), almost every twenty-first century learner owns a smartphone and uses it for social networking on Facebook and WhatsApp. Some of these learners are unaware that they can use the same devices to access learning resources and improve their performance and engagement.

Most countries in the world have adopted the use of digital technologies in their schools and enjoy the benefits that these technologies offer. Bothun (2016) argues that African countries are still behind when it comes to internet access and computer literacy. This is a disadvantage for learners and educators in these countries, as the Internet can benefit learning communities.

1.2   Statement of research problem

The digital revolution has transformed many sectors of the global economy, including education. In developing countries like South Africa, learners in urban areas benefit from the digital revolution through access to online learning resources, electronic classrooms, hybrid learning platforms, etc. (Lindberg et al., 2017).

However, there is no evidence that learners in under-resourced communities like rural areas benefit from digital resources that are on the Internet. Although smartphones enjoy widespread use in South Africa and in the developing world in general, there is no evidence that high school learners are using them for learning or that they are computer literate (Conger et al., 2016; Bytheway, 2017). This research therefore seeks to understand how learners in under-resourced communities cope with learning in a knowledge economy driven by digital transformation.

1.3   Aim and objectives of the research

The research aim is:

To explore the challenges that schools from under-resourced communities face owing to a lack of access to digital learning resources. The study will also examine the impact that these challenges may have on teaching and learning.

The research objectives are:

1. To determine educators' and learners' awareness of digital learning resources in a selected under-resourced high school.
2. To determine the level of ICT access in a selected under-resourced high school.
3. To determine the learning challenges that a selected under-resourced high school faces.

4. To determine the impact of the challenges on teaching and learning

1.4   Research questions

From the research problem stated in Section 1.2, the main question that has emerged is:

How do high school educators and learners in under-resourced communities in South Africa cope with teaching and learning challenges in the digital era?

To address the main question, the following secondary questions are derived:
1. What is the educators' and learners' awareness of digital learning resources in a selected under-resourced high school?
2. What is the level of ICT access in a selected under-resourced high school?
3. What learning challenges does the selected under-resourced high school face?
4. What is the impact of the challenges on teaching and learning?

1.5   Significance of the research

The study is expected to make three contributions to rural high schools. Firstly, the study will raise learners' and teachers' awareness of digital learning tools and their importance in teaching and learning.

Secondly, this study will contribute to the school's knowledge of ways to gain ICT access and skills as these are crucial for the success of any individual in this digital age.

Thirdly, this study will raise awareness of the difficulties that under-privileged schools face because of a lack of ICT access.

1.6   Dissertation outline

The dissertation structure is as follows:

Chapter 1: Introduction

This is the first chapter and introduces the study, it outlines the background to the research problem and the statement of the research problem that led to this study. It further discusses the research aims and objectives, and main and secondary questions. Lastly, it looks at the significance of the research.

Chapter 2: Literature review

This chapter reviews the work of scholarly authors to explore the problem and examine findings from other research studies. It considers the underpinning theory and how the theory will guide the rest of the study.

Chapter 3: Research design and methodology

This chapter discusses the research design and methods used to conduct the study. It further looks at the research methodology. Lastly, it discusses the issues of reliability and validity, presents a delineation of the study, and addresses the ethical considerations for the study.

Chapter 4: Data analysis and findings

In this chapter, the researcher analyses the data collected and presents the data through the use of data-presentation tools like graphs, tables, etc. This is the most important chapter of the study as it contains information that can be used to solve the research problem.

Chapter 5: Discussion of findings

This chapter discusses the findings of the research extrapolated from the data analysis and interpretation. It also presents the insights of the researcher.

Chapter 6: Conclusion and recommendations

This chapter gives a summation of all research chapters, states contributions made by the research, indicates research limitations, and makes suggestions for further research. It further furnishes recommendations to rural high schools and lastly presents concluding remarks.

CHAPTER 2: LITERATURE REVIEW

2.1   Introduction

The purpose of this chapter is to present the literature review for the study. It critically analyses the work done by scholars in this research area. It commences by taking readers through the search strategy for the literature. It then discusses the digital revolution in South African education, educators' and learners' perceptions of technology, ICT access in urban and rural high schools, digital learning resources, and types of online learning software. The underpinning theoretical framework of the literature is addressed, and the researcher creates a conceptual framework for the study from the theoretical framework.

2.2   Explanation of search strategy for the literature

Digital revolution, online learning resources, online learning platforms, twenty-first century learners, under-resourced schools, well-resourced schools, ICT access, technology challenges, learning & teaching, and smartphones for learning.

2.3   South African education landscape

According to Spaull (2012), after 1994 democratic elections, the South African government changed policies and processes across its sectors in an attempt to fight inequalities. The education sector was among the prioritised sectors in the new political, economic and social dispensation. The South African Department of Education introduced new policies to address inequalities in education. A requirement was made where all schools are expected to participate in the digital transformation by integrating ICT into their curricula (Dzansi and Amedzo, 2014; Mathipa and Mukhari, 2014). However, there are still educational and infrastructural inequalities within South African schools. Urban high schools have access to ICTs and government support. They prepare their learners well for tertiary studies and the workplace. They offer

subjects like Information Technology and Computer Applications Technology (CAT) at high school level. This is not the case for rural high schools. Rural high schools still perform poorly because of a lack of proper infrastructure, unskilled teachers, lack of access to ICTs and finance constraints (Spaull, 2012; Engelbrecht, 2015; Nnadozie, 2015; Mesfin et al. 2018).

South African government makes use of school districts as a link between the Provincial Department of Education and schools. Schools are managed at the school level by the principal and school governing body. The school principal reports to the education school district which serves as a link between the school and the Provincial Department of Education. It is the school district's responsibility to ensure that schools have access to good quality education (Engelbrecht, 2015; Vandeyar, 2015; Moorosi and Bantwini, 2016).

2.4   Digital revolution in South African education

The twenty-first century ICT advancement has been a catalyst for change in many sectors of the global economy. Virtually everything has changed from manual to online through the use of ICTs like computers, mobile devices, etc. This makes ICT skills a very important aspect of life. The education sector is also participating in this digital transformation. According to Ghavifekr et al. (2016), schools in the Western and developing countries started to adopt the use of computers for teaching and learning in the early 1980s and computers have become an essential part of education. Mdlongwa (2012), cited by Dzansi and Amedzo (2014), reveal that South African schools also started using computers in the 1980s, but these were mainly private and well-resourced schools. Dzansi and Amedzo (2014) and Mathipa and Mukhari (2014) state that after 1994, the South African Department of Education introduced ICT to all schools. This was reported in the White Paper release (Department of Education, 2004) to transform the education sector by introducing an equitable education system in all South African schools. This required all schools to integrate ICT into the curriculum and also to use ICT for administration purposes. The Department of

Education also promised to provide internet connectivity and support to schools.

However, not all schools have implemented ICT in their curricula for various reasons such as a lack of computers, no internet connectivity, a paucity of teacher and learner ICT skills and a dearth of teachers with these skills. According to Nkula and Krauss (2014), schools that have access to ICTs and internet connectivity just use these to acquire basic computer skills. They do not integrate ICTs into the curriculum. It is vital for all educators and learners to have access to the Internet and to have digital skills for them to take advantage of digital learning resources like e-learning, online courses and blended learning. ICT access and literacy also prepare learners for the workplace as most organisations use the Internet for communication and information sharing. Tertiary institutions also use technology-based tools to interact with students and this creates difficulties for students that don't have ICT skills when they enter tertiary institutions (Dede, 2009, cited by Nkula & Krauss, 2014; Lindberg et al., 2017).

Families with the financial means sometimes opt for home schooling for their children. This requires ICT skills and internet connection. The Internet also offers students online courses and e-learning, and students feel that they gain more from digital sources like YouTube than they do from traditional learning (Bytheway, 2017; Duffett, 2017). Ghavifekr et al. (2016) argue that new learning technologies have the potential to enhance education and make educator and learner communication very efficient. However, most educators seem reluctant to accept and implement these new ways of teaching, mostly because of challenges that they encounter when integrating ICT into the education curriculum. Cawthera (2001) and Fletcher (2003), cited by Dzansi and Amedzo (2014), disagree with the above statement in stating that there is no scientific evidence that ICT integration into schools will enhance education or will be better than traditional ways of teaching. Dzansi and Amedzo (2014)

argue that ICT does not replace traditional ways of teaching and learning as it complements teaching and learning.

2.5   Educators' and learners' perceptions of technology

Unfortunately, people see technology differently, for example, the young generation, also known as millennials or Generation Y, view smartphones as devices for various functions like social media, teaching or learning, while elderly people view smartphones as complex devices that can be used only for receiving or making calls and SMS messages. As stated by Van Oordt and Mulder (2016), personal preferences and attitudes also play a significant role in education systems and curricula, and the millennials' preferences differ from those of the older generation. Millennials prefer using digital devices for learning as they believe this improves their learning interest and interactions; however, unfortunately the curriculum was designed to cater for the older generation that still prefers traditional classroom learning. Blended learning is one of the education platforms that can assist in these challenges as it combines traditional classroom learning with online learning. It allows for both student-centred and teacher-centred learning, as this caters for the needs of millennial students and could help improve their attitude towards their studies and interaction with educators.

Mathipa and Mukhari (2014) assert that the educators of the twenty-first century are faced with a huge challenge as they teach the 'Net Generation'. These learners have adaptive skills. They are used to fast-paced technology and are willing to use any technology that is presented to them. They simply need access to ICT resources to enable them to put their skills to use. In contrast to this, most educators come from a traditional background that is resistant to change. They are set in their old pedagogical methods of teaching and learning. Lindberg et al. (2017) reveal that some educators believe that ICT could assist in their teaching and learning processes but they see time as a constraint to ICT use. They feel that searching for online teaching and learning

software is time consuming. Digital competence is another challenge for some educators. They find it difficult to integrate ICT into their curricula.

2.6　ICT access in urban and rural high schools in South Africa

According to Mathipa and Mukhari (2014:1213), "policy statement (White Paper, 2004, GED, 2007)" requires all South African learners to be ICT literate to prepare them for the future. Dzansi and Amedzo (2014) state that it is essential for South African learners to acquire ICT skills at pre-high school or high school level, as some of them do not further their studies because of financial issues. These skills will ensure that they are employable. There are various projects implemented by the private sector and non-government organisations aimed at assisting ICT integration into schools, for example, Mindset Learn, the national Department of Education's Microsoft Foundation agreement, and many others. Mindset Learn is a satellite internet tool that supplies schools with educational content. The Department of Education's agreement with Microsoft provides South African schools with software for a period of five years (Dzansi & Amedzo, 2014).

However, only urban schools seem to benefit from these projects. Rural schools are not included. This could be because rural schools do not have the infrastructure needed for the implementation of ICT. Dlongwa (2012), cited by Dzansi and Amedzo (2014), reveal that rural high schools do not have the infrastructure needed for ICT integration and safe computer laboratories. Neither do they have sufficient and adequate classrooms for their learners. Other challenges that militate against ICT adoption in rural schools are the educators' lack of ICT skills, lack of telephone lines, cost of ICT implementation, and a dearth of ICT support experts. Conger et al. (2016) note that South African rural schools are deprived of the benefits that ICT offers because of hardware and bandwidth limitations. Some of these rural

learners have an interest in IT professions or website development, but these lessons are not covered in their classes.

Ng'ambi et al. (2016) state that ICT has the potential to offer equitable access to education as it allows anyone to have access to digital education resources from anywhere. This accessibility includes remote rural schools with ICT connectivity. Ng'ambi et al. (2016) argue that rural learners face challenges when arriving at university as they frequently lack digital skills. Lessons are delivered in a way that requires them to use digital tools and they face the challenge of having to learn digital skills while simultaneously coping with their academic work. WhatsApp is also becoming a popular tool for teaching and learning.

While learners from rural schools are faced with the above-mentioned challenges, learners from urban schools enjoy the benefits of digital resources. They can interact with people globally through the use of interactive ICT platforms like LinkedIn, YouTube and e-learning. This gives them access to good-quality study material and results in good teaching and learning interactions and attitudes that ultimately are linked to good performance (Duffett, 2017; Lindberg et al., 2017).

 Mesfin et al. (2018) and Mathipa and Mukhari (2014) reveal that urban schools at all levels have safe computer laboratories with internet access and offer computer studies that teach their learners computer skills. Mathevula and Uwizeyimana (2014) argue that while schools in urban areas have access to ICTs like computers, the Internet and interactive white boards, training is still needed for them to integrate these ICTs into the curriculum.

Proper use and integration of ICT enhances teaching and learning. It produces a variety of advanced pedagogical methods that can benefit

schools, for example, teachers can use mathematical tools that can help improve learners' arithmetic and digital skills. Learners can also exchange information through discussion blogs. These pedagogical methods can help to develop learners' knowledge, communication, problem solving, digital and many other skills. Urban schools may have access to ICTs but they are not integrating these ICTs into the curriculum (Mathipa & Mukhari, 2014).

Urban schools employ teachers with advanced skills like software programming; however, there are few teachers with these skills in rural schools. This is advantageous to urban learners, as the information technology industry is one of the industries in demand in the twenty-first century. This means these learners can acquire these skills at a young age, and by the time they arrive at university they are not clueless in respect of programming and can take a software programming course. This could also mean their chances of being unemployed are slim.

The South African government has started addressing the issue of the digital divide by introducing the Teacher Laptop Initiative (TLI) which aims at providing teachers in public schools with laptops. According to Mathevula and Uwizeyimana (2014), this initiative was launched by the former Minister of Education, Naledi Pandor, but has not been implemented successfully in all South African government schools. However, the TLI will not solve the problems rural schools are still facing, as teachers' access to laptops does not guarantee that they will have internet connectivity, they will have ICT skills or they will allow students to learn from them. Although the South African government has started addressing the issue of the digital divide, there is no evidence that learners from under-resourced communities are enjoying the benefits of digital resources for learning.

This research focuses on the physical and digital challenges that educators and learners from an under-resourced high school face. It aims to explore the

impact that these challenges might have on teaching and learning in this high school.

2.7   Digital learning resources

Industries across the world, including developing countries like South Africa, have adopted digital transformation for all their processes. This digital revolution has forced the education sector to enhance its pedagogical practices to be technology based. There are various types of digital educational resources like e-learning, m-learning, blended learning, and distance learning that schools may use for teaching and learning. These learning resources were introduced in the section above and this chapter further discusses them.

2.7.1   E-learning

Turban et al. (2017) define e-learning as educational methods and materials delivered online to fulfil learning, training and teaching needs (as well as for knowledge acquisition) accessed at different locations. According to Mesfin et al. (2018), e-learning refers to the use of digital educational tools such as audio, video, text and images to assist in learning. This includes mobile technologies such as augmented or virtual reality. Mesfin et al. (2018) argue that e-learning is an enabler of education. It provides pedagogical advantages when planned and adopted properly. It facilitates better communication among students and teachers or students and fellow students. It promotes collaborative teaching and learning between teachers and learners which result in high performance and good-quality education. This prepares learners for the outside world which requires their participation in digital processes.

Lindberg et al. (2017) and Mesfin et al. (2018) reveal that teachers' and learners' computer literacy levels and access to digital resources are two of the constraints that hinder the adoption of e-learning in schools. Lindberg et

al. (2017) further contend that learners' digital skills affect their understanding of how they can use ICT for study purposes. ICT allows educators and students to share learning resources, for example, by using videos to share programmes or information in the entire school or throughout different schools at the same time. This results in shared knowledge, quality education and cost minimisation. This is advantageous to especially under-resourced schools, as they will benefit from well-resourced schools' knowledge should they have access to these resources.

E-learning also promotes collaborative learning as teachers and students can share information (video, text or audio) via web-based digital resources. This can also assist in promoting students' participation and independence as they don't rely on teachers when exchanging information online. They can do this at their own location in their own time. A teacher can only act as a guide in this type of learning (Mathevula & Uwizeyimana, 2014; Ng'ambi et al., 2016).

2.7.2 Blended learning

According to Van Oordt and Mulder (2016), blended learning is a combination of traditional face-to-face with online technology-based learning. Anderson and May (2010), cited by Kleinveldt et al. (2016), define blended learning as the integration of traditional face-to-face classes with digital learning methods. Digital learning environments give learners the convenience of accessing learning material remotely and as often as they want. Learners enjoy this as it gives them some sense of control. It allows them to learn at their own pace. This is very advantageous to slow learners as it gives them the ability to repeat a lesson until they feel comfortable in understaning it (Anderson & May, 2010, cited by Kleinveldt et al. (2016). Blended learning is learner centred. With this type of platform, learners do not require a teacher to deliver a lesson face to face. This can be done online through digital tools. Learners can also share information among one another through the use of these tools. This

produces ICT-skilled learners that are well prepared for tertiary studies and the workplace (Mathipa & Mukhari, 2014; Kleinveldt et al., 2016).

Blended learning can be achieved through the use of e-learning tools like a podcast or vodcast. A podcast is an audio e-learning tool that can aid in teaching and learning as it allows a student to listen to lectures and other curriculum or study-related audios, while a vodcast is an e-learning tool that combines audio and video. This allows a student to play back what was taught in class without having to sit in a classroom. These e-learning tools facilitate in student-centred learning as students can learn in the comfort of their homes, in coffee shops, or anywhere they prefer to learn. This also allows them to catch up on lectures that they have missed (Van Oordt & Mulder, 2016).

2.7.3 Distance learning

Turban et al. (2017) define distance learning as education conducted from anywhere, at any time, through the use of digital technology. Learners no longer have to be in a traditional classroom to attend a class. This can be achieved online through the use of virtual tools. Ng'ambi et al. (2016) argue that technology tools like Skype and WhatsApp have made distance education easily accessible to anyone. Traditionally distance education required the use of a special video-conferencing room. This has been replaced by the use of tools like Skype and WhatsApp that are readily accessible and free. One simply needs an internet connection. These tools enable everyone, including remote communities, to have access to quality and equitable education. This gives a learner an opportunity to enrol at any institution of their choice regardless of its location.

Edmodo is another ICT learning platform that enables distance education. This tool makes distance education accessible at both pre-tertiary and tertiary levels. These tools promote student and teacher collaboration. According to Kaler (2012), students' performance in distance education or virtual high schools is measured by their digital skills. It becomes difficult to make use of

this form of learning if a learner does not possess these important skills. Learners prefer online learning as they feel empowered by the ability to make comments when they do online courses. Porter et al. (2016) argue that internet access allows teachers and learners access to curriculum-related content; this access includes schools in rural communities that have access to the Internet.

2.7.4 M-learning

According to Turban et al. (2017), m-learning is e-learning through the use of handheld devices like smartphones and tablets. Hartnell-Young and Heym (2008), cited by Al-Said (2015), state that the rapid transformation of ICT has led to the introduction and use of mobile phones for teaching and learning: this is called m-learning. Mobile phones were traditionally used to receive and make calls but they have become hand-held computers. Universities and schools have started using them for teaching and learning through the use of applications like Edmodo, M-Thuto, etc. M-learning provides students with considerable benefits such as enabling them to learn anywhere and at a time convenient to them. Learners can even learn from cars because of mobile devices' portability.

Duffett (2017) notes that 40 percent of the South African population comprises individuals aged 19 years or younger, also known as Generation Z. This is the group born post-apartheid, which makes them more privileged than any other group. They have better opportunities and most of them attend multi-racial schools. They are called 'screen addicts' as they were born in the digital age. The South African education system needs to accommodate these learners in its curricula as they use smartphones for almost everything. They don't know of any other life than that of computers and smartphones. Traditional methods of teaching and learning are stultifying to these learners and this could have an impact on their performance (Duffett, 2017). Ng'ambi et al. (2016) argue that most students own smartphones and they use them for educational

purposes. The use of social networking tools like WhatsApp and Facebook for teaching and learning is increasing.

Al-Said (2015) reveals that mobile phone users outnumber the population in many countries. This means that these devices have the potential to allow everyone access to good-quality education as most learners own them. The use of mobile devices for teaching and learning may be increasing; however, there are still schools that are not part of this digital transformation because of barriers like lack of infrastructure, lack of awareness and lack of ICT skills in both teachers and learners. Porter et al. (2016) reveal that there are schools that have banned the use of mobile devices on their premises because of barriers such as phone disruptions in the classroom and learners accessing inappropriate material on the Internet.

2.8   Types of online learning software

The digital transformation in education has made it possible for schools to have access to a variety of online learning software that can be used to assist in teaching and learning. It depends on the educator and learners' needs as to which one to choose and use. To name a few, there is a mobile learning software program or application (app) named M-Thuto. M-Thuto is a web-based mathematics application that works on Wireless Application Protocol-enabled (WAP) digital devices. It is sometimes difficult for learners to understand a mathematics lesson delivered face to face because of language barriers. Most subjects are delivered in English, and this is a second or third language for some learners. This was designed specifically to address these challenges. It is packaged with class notes, exercises with solutions, and learning quizzes that can assist in improving students' mathematical skills. It stores each learner's interaction with the app, thus making it easy for educators to keep track of learner records like marks and performance. Mathematics is generally perceived as one of the most challenging subjects for learners, so it would be advantageous for any learner to have access to this type of software (Jantjies & Joy, 2015).

MoMaths is another South Africa mathematics mobile platform. This mobile tool was developed by Nokia in 2009 to assist South African high school learners (Grade 10 to 12) with their maths problems. This is accessible on any MTN or Cell C network mobile device with internet access. It is linked to the South African curriculum (Palumbo, 2014). ALEKS is web-based learning software that can be used to teach, assess and tutor students in financial accounting. The artificial intelligence used in this tool comes from a theory called knowledge space that assesses the student's competency. It assesses the student's problem-solving skills. The software can be accessed in any location that has an internet connection, thus allowing students to learn at their own pace in the comfort of their homes. Like many other online-based learning tools, this has proved to be effective in terms of student performance and progress when

compared with traditional learning. Most students were born in the digital age, hence computer-based learning tools stimulate their interest in learning (Baxter & Thibodeau, 2011). Jackson and Cossitt (2015) reveal that this tool is good at bringing learners without a financial background on an equal level as those with prior knowledge. It also assists those that have financial accounting knowledge but need a refresher course. The other advantage of this tool is that learners can prepare before starting their accounting classes without wasting the teacher's or lecturer's class time. It can also assist slow learners in revision.

Mindset Learn is a satellite digital tool that supplies South African schools with educational content. Schools can purchase a package that comprises a television set and decoder; it also provides teachers with some basic training in utilising the broadcasts (Dzansi & Amedzo, 2014). Edmodo is another online learning software program that assists in teaching and learning. It allows teachers to post assignments or quizzes for students. Teachers can also have direct conversations with learners. This can assist reticent learners shy to raise a question in class. It also allows students to help one another (Ng'ambi et al., 2016). According to Ali (2015), Edmodo is a social networking tool like Facebook that allows people to create profiles, add people and join groups. It has subject and publisher features that schools can use for their teaching and learning needs. The subject community allows teachers and learners to share learning material such as computer technology, mathematics or science. The publisher community allows learners to send direct messages to teachers. This is one of the most powerful educational platforms as it promotes knowledge sharing across schools. This tool also allows teacher and leaner collaboration. There is a multiplicity of online learning software not mentioned in this study that schools can adopt for their teaching and learning needs.

2.9 E-learning theories

2.9.1 Constructive theory: Bruner (1990)

Bruner's constructive theory (1990), cited by Ngavana et al. (2018), states that a learner actively develops knowledge based on their experience. This theory is based on emphasis that learners are actively involved in the learning process, in contrast to old traditional ways of passively acquiring knowledge from a teacher or other knowledgeable adult. This theory is identified as the suitable theory for ICT integration in teaching and learning as it is learner centred.

2.9.2 TPCK model: Mishra & Koehler (2006)

Traditionally education systems separated content knowledge and pedagogy. This resulted in the invention of educational programs where either content knowledge or pedagogy dominated. This isolation of teacher knowledge was advanced by Shulman (1987) by introducing an incorporation of content and pedagogy (PCK). This focuses on how content knowledge is articulated, incorporated and presented in teaching processes (Mishra & Koehler, 2006).

The 21st century technology advancement resulted in technology introduction in all disciplines including education. The South African Department of Education requires all educational institutions to integrate technology into their curricula, however there has been difficulties in achieving this requirement. A majority of teachers have never received training on technology integration to the curriculum in their college studies and this seems to be the main cause of the non-compliance to the department of education's requirement (Ramorola, 2013). Mishra & Koehler (2006) introduced the TPCK model in an attempt to address these issues. This model shows that proper integration of technology in educational institutions requires blending of technology, pedagogy and content knowledge. These three categories are interrelated and a change in one requires a change to all. Hechter et al. (2012) argue that

understanding of these three knowledge categories results in effective use and integration of technology, content and pedagogy to teaching and learning.
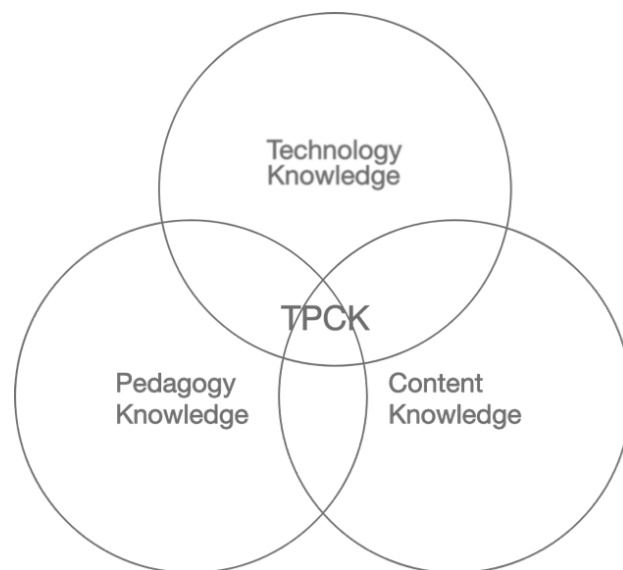
Figure 2.1: TPCK Model: Hechter et al. (2012:141)

2.9.3 UTAUT Theory: Venkatesh et al. (2003)

Venkatesh et al. (2003) argue that individual's technology use is influenced by four categories, namely performance expectancy, effort expectancy, social influence and facilitating conditions.

1.) **Performance expectancy:** is defined as an extent to which people believe that technology use promotes job performance. Venkatesh et al. (2003) argue that other 5 models that are related to performance expectancy are perceived usefulness (Davis et al. 1989), extrinsic motivation (Davis et al. 1992), job-fit (Thompson et al 1991), relative advantage (Moore and Benbasat 1991) and outcome expectations (Compeau and Higgins 1995b; Compeau et al. 1999). However, performance expectancy is the strongest determinant in respect of peoples' intention to use technology.

2.) **Effort expectancy:** is defined as the system's extent of user friendliness. Actual use of the system is determined by its ease of use. This category's significance diminishes with consistent use of technology. Effort expectancy is mostly noticeable in women than man.

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3.) **Social influence:** is defined as an extent to which a person views people's approval to his or her technology use. Social influence is mostly significant when its use is compulsory. This results in people changing the intention in an attempt to comply with social pressure.

4.) **Facilitating conditions:** this is an extent to which people believe in the existence of an organisational or technical system support. Existence of organisational and technical support motivates individual's technology adoption and reduce barriers to technology use.

The researcher adopted the e-learning assessment factors (indicators) of Đurek and Ređep (2016) as the theoretical basis for this study as mentioned in section 2.10. This theory encompasses a whole range of categories in its attempt to asses an institution's e-learning readiness. The other theories focus on one or few categories for example Bruner's constructive theory (1990) base its emphasis on the learner's ability to develop ICT skills and integrate them to their learning. Mishra & Koehler (2006) TPCK model focuses on blending of the teacher content knowledge, pedagogy and technology for proper integration of ICT. It does not look at other things like the school infrastructure, learners, etc. Lastly the UTAUT theory of Venkatesh et al. (2003) bases its focus on people's expectancies in technology adoption. The researcher found the e-learning readiness assessment factors of Đurek and Ređep (2016) well suited for this study.

2.10 Theoretical framework

Đurek and Ređep (2016) define e-learning readiness or e-readiness as the extent of a country's or society's access to electronic technology. The authors summarised e-learning readiness assessment tools from various technology assessment models. The e-learning assessment factors (indicators) of Đurek and Ređep (2016) provide the underpinning theoretical basis for this study. The e-learning assessment factors were used as guidelines for data collection and also as themes in data analysis.

Figure 2.2 depicts the underpinning theoretical basis for the study.

Figure 2.2: Đurek and Ređep's E-Learning Readiness Assessment Factors (2016)

2.11 Conceptual framework

From the underpinning theoretical framework, the researcher developed a conceptual framework for this study. In the conceptual framework, factors like resources, equipment and content have been collapsed into technology, human resources into learners, and standards into management. This is depicted in Figure 2.3.
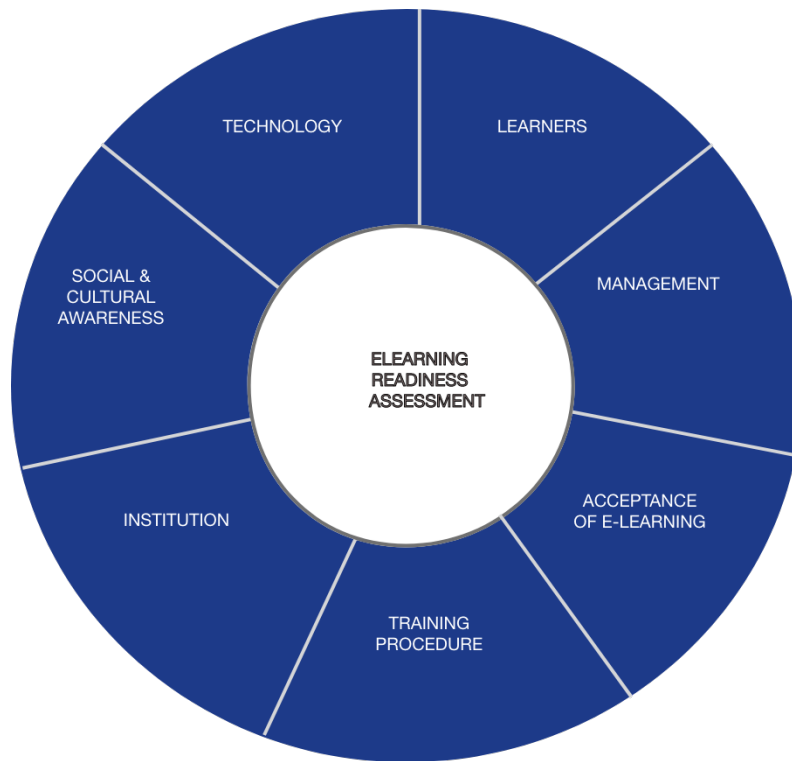
Figure 2.3: Conceptual framework: e-learning readiness assessment factors

2.11.1 Technology

According to Stols et al. (2015), the use of technology in classrooms provides many benefits such as enhanced educator efficiency, as educators can make use of Microsoft Office tools like Excel to capture student marks and PowerPoint to prepare and deliver lessons to students. It results in improved learner participation as learners can work on their own by accessing learning material online through the use of the Internet. It also provides learners with the ability to complete assessments and assignments online at any place that has internet access. There are many benefits of technology to teaching and learning.

Dzansi and Amedzo (2014) assert that the use of technological tools for teaching can assist educators that are not well qualified. These teachers can benefit from the material that is shared online by teachers that are experts in a subject. They can download the material, learn from it and use it for their own teaching sessions.

2.11.2 Learners

Most twenty-first century learners are advanced when it comes to digital competence compared with their educators. Almost all of them own a smartphone and they use the Internet every day for social networking on WhatsApp, Facebook and Twitter. Some own laptops and they use them to prepare PowerPoint presentations and send emails, while they use Microsoft Word for assignments. It is generally argued that most of these learners are ready to and capable of using the Internet when they are given access to it (Stols et al., 2015).

However, most learners in rural South African schools still lag behind in respect of ICT access and digital competence. They do not have access to ICT resources like computers, printers, faxes, etc. They have little knowledge of the outside world; they only focus on reading and writing (Bothun, 2016; Conger et al., 2016). These rural learners need to be offered equal opportunities as global learners. They need to be equipped with the most important skills of the twenty-first century, such as digital, problem-solving, communication, and critical-thinking skills.

2.11.3 Management

The Internet has become one of the crucial sources of education; however, this has come with its own challenges and complexities. Technology changes quickly, so it needs to be managed effectively. Đurek and Ređep (2016) reveal that ICT usage results in new business processes, and this requires teachers and learners to adapt to new pedagogical practices.

Bytheway (2017) argues that some teachers and students are intimidated by change so this technological evolution results in some teachers leaving the profession or learners dropping out. This proves that technology management

should not only focus on the complexity of technology use, but also on people's perception on technology.

According to Mathevula and Uwizeyimana (2014), learners' access to the Internet needs to be monitored as some access websites that are unrelated to learning. This poses a security risk as they can access information that can be harmful to them. Teachers need to have some kind of control regarding student access. They can achieve this by giving them assignments and guides with links to websites they can access. This will shift their focus to more appropriate websites.

2.11.4 Acceptance of e-learning

The willingness of high school educators and learners to use digital technology for educational purposes is of utmost importance for ICT adoption to succeed in any school or community. Capability is connected with acceptance; individuals without digital skills will not easly accept the use of ICT because of fear of failure. Therefore, acceptance of e-learning in any school will start with educators up-skilling themselves on computer technology and transferring those skills to learners (Balavivekanandhan & Arulchelvan, 2015).

2.11.5 Training procedure

Đurek and Ređep (2016) argue that an e-learning ready (e-ready) country or school has skilled personnel and provides training for those that need training. It is vital for all schools to ensure that their educators possess the digital skills needed to take advantage of ICT benefits. According to Conger et al. (2016), educators from rural South African schools need to improve their pedagogical practices, teaching self-efficacy, and ICT skills. They need to be trained and confident to be able to accept technology transformation and use it to benefit their schools and learners.

Mathevula and Uwizeyimana (2014) contend that urban school teachers may have digital skills; however, they do not always use them effectively in terms of ICT integration into the curriculum.

They equip their learners with computer skills like learning about computer hardware and software, doing presentations and sharing information on digital platforms like educational blogs. In contrast, they still use traditional classroom methods for teaching. In this day and age this is a concern, as the South African Department of Education requires all schools to integrate ICT into the curriculum. Urban schools have access to ICTs, but they are not utilising these ICTs effectively for the full benefit of their learners. They need training on ICT integration into the curriculum.

2.11.6 Institution

Internet access and poor infrastructure play a significant role in an institution's ICT adoption as high schools without internet access, electricity, computers, etc., will not be able to use digital learning resources and miss out on the benefits that ICT offers to teaching and learning. Schools need to overcome their internet and poor infrasctuture challenges to ensure improved student participation and motivation (Conger et al., 2016).

Rural schools in South Africa are still faced with ICT challenges. They are remote and unable to benefit from the ICT transition offered in urban schools. Most of these rural schools do not have computers and computer laboratories. Some do not have electricity and telephone lines, and this makes it impossible for them to access ICTs.

2.11.7 Social and cultural awareness

Schools in developed countries have adopted the use of ICT for their education processes and they are fully aware of the online learning resources available to them. However in developing countries like South Africa, only a

minority of schools use digital learning resources for teaching and learning. Some schools in rural communities are not aware of the digital learning resources available and how to access them (Conger et al., 2016).

2.12 Chapter summary

This chapter reviewed scholarly literature on the topic. It outlined the search strategy for the review of the literature and then examined digital transformation in the South African education sector, educators' and learners' perceptions of technology, ICT access in South African high schools, and digital learning resources and online learning plartforms to which schools have access. The underpinning theoretical framework of Đurek andReđep (2016) was addressed, and finally, the researcher created a conceptual framework for the study from the theoretical framework.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1   Introduction

In the previous chapter, the researcher reviewed scholarly literature on ICT and ICT challenges that rural schools face. Firstly, it looked at how the digital revolution has transformed South African education, and educators' and learners' perceptions of technology, ICT access and types of ICTs. It further explored the theories of Đurek and Ređep (2016) that guided the study and developed a conceptual framework from the theories.

This chapter focuses on the research design and methodology the study adopted. The researcher believes that a good research design and methodology plans, addresses and accomplishes the goals that the study intended to accomplish. The study adopted a descriptive research approach. According to Kothari (2004), a descriptive research approach is an approach where a researcher examines the status quo of a problem or situation. The researcher does not have control over a situation but examines what is happening or has happened. It is achieved through the use of surveys and other forms of investigative tools. On the other hand, an analytical research approach critically analyses existing information and facts to find a solution to a problem. The researcher chose a descriptive research approach instead of an analytical research approach as the study explores the ICT challenges an under-resourced high school has. The research aims to provide some insights into what the reasons for these challenges could be and how they might be mitigated. It aims to add the research findings to the current body of knowledge. The study examines a current situation beyond the researcher's control and therefore only can make recommendations as opposed to an analytical approach based on existing information and facts.

A research study is guided by a research process. A research process is a plan of sequential steps that a researcher undertakes to execute a research study. The diagram below illustrates the steps followed to carry out a research study.

Review the literature
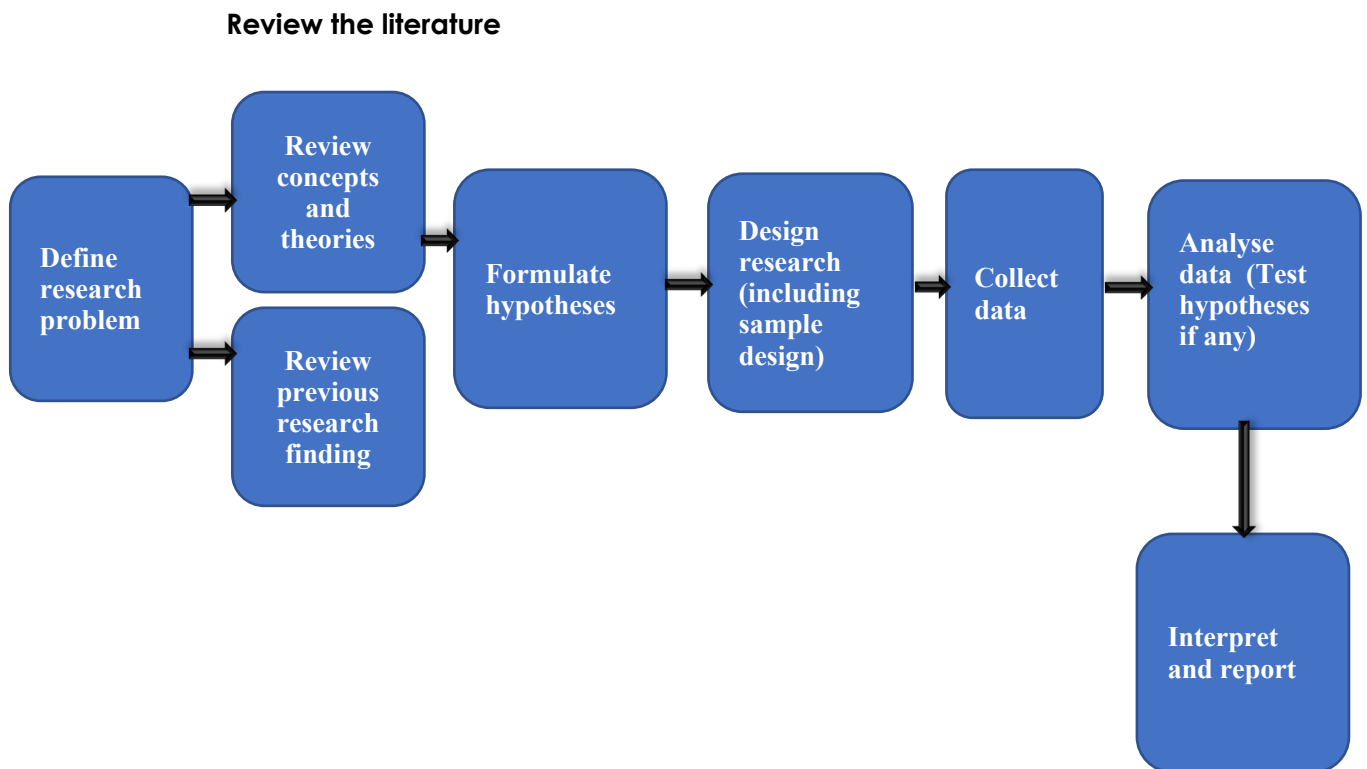
Figure 3.1: Research process (Kothari, 2004)

In this chapter the researcher first discusses the research paradigm that guided the research, then takes the reader through the research method adopted for the study, followed by the research design that best suited the selected method. The chapter further discusses the research methodologies selected for the study and how the data was analysed. Lastly, it focuses on the research reliability, validity and ethical considerations pertinent to the study.

3.2   Empirical case

The school that provided data is a rural high school in Kentani. Kentani is a settlement in the Eastern Cape province of South Africa. It is dominated by isiXhosa-speaking people and is one of the regions lacking infrastructure and technology. It is one of the areas that are stricken by poverty and a high rate of unemployment.

At the time of the study, the school had a total of 15 educators and 340 learners. It enrolled learners from Grade 8 To 12. The school had old classrooms, no telephone lines, no air conditioning, no computers or computer laboratories. The school was under construction and was expected to have more classrooms and computer laboratories at the end of the project. The rural high schools in the Eastern Cape province used to be junior secondary schools which started from grade 10 to 12. While some schools in the urban areas of the province and the entire country were senior secondary schools which started from grade 8 to 12. The department of education required uniformity across South African high schools and all former junior secondary schools were forced to change their grade structure to start from grade 8 to 12. This transition was gradually phased in from 2013 to 2015 across rural schools. After 2015, the school in the case study transformed its grades to conform with the department of education's requirement.

3.3   Research philosophy

According to Antwi and Hamza (2015:218), the term paradigm means pattern. It emanates from a Greek word paradeigma. It refers to different beliefs that underlie social research, often occasioning debates and conflict between researchers. Kivunja and Kuyini (2017:30) argue that there are three schools of social research: the positivist, interpretivist and critical realist paradigms. According to Antwi and Hamza (2015:218-219), positivism started in the nineteenth century and was perceived as the best approach in the social

sciences. Positivism paradigm is an objective approach that generates knowledge through the use of scientific methods. On the other hand, an interpretive paradigm emerged in the early twentieth century. It is a subjective approach whereby researchers attain knowledge by focusing on empathetic understanding of human beings. Qualitative researchers argue that this paradigm is the best as they believe that human beings view things differently and the methods of investigation should allow for this differentiation. Interpretivists believe that they need to be around the people they are studying in order to understand their experiences and behaviour. According to Thomson (1990), the critical realist philosophy was first published by Roy Bhaskar in 1975. Prior to this philosophy, the positivist philosophy was the dominant philosophy among social scientists. The realist theory of science focuses on the reality instead of objective or subjective observations.

3.3.1 Positivist philosophy

Angen (2000) defines a positivism paradigm as one used in the quantitative research approach. He sees it as a trustworthy methodological approach for measuring validity. According to Antwi and Hamza (2015: 218), positivists believe that knowledge can be acquired through observation and experiment, and it is gaugeable.

3.3.2 Interpretivist philosophy

Black (2006) states that the interpretivist paradigm is a subjective paradigm. In this paradigm the researcher has to make detailed interpretations of data as it can have different meanings depending on people's observations and beliefs. Angen (2000) defines an Interpretive paradigm as a paradigm associated with a qualitative approach. He argues that its legitimacy is questionable as it does not undergo the rigorous methodological criteria measures followed in the positivism paradigm. Thanh and Le Thanh (2015:24) describe an interpretive approach as a model whereby a researcher tries to

understand human experiences and perceptions, and attach meaning to them.

3.3.3 Critical realist philosophy

Thomson (1990) argues that the realist philosophy is concerned with ontology. It emphasises the connection of statements about the world or being, that is ontology, to statements about our knowledge of the world, that is epistemology. It therefore focuses on explanation of phenomena rather than description or prescribing. It argues that social structure reproduction is dependent on human actors or agency. It emphasises the unity of theory and practice.

Gorski (2013) states that Roy Bhaskar established the critical realism philosophy in collaboration with other social theorists. Gorski (2013) further argues that the critical realism theory is good for research studies because of its flexibility in allowing researchers to include general laws without abandoning the original explanation. Critical realism critically examines the internal and external activities of social structures to understand the natural and social reality.

It is the researcher's contention that there is no research philosophy that is better than another. A research philosophy has to be chosen based on the research aims and objectives. The researcher adopted a positivist approach for the study because she could not be subjective as she collected factual numeric data which was analysed through statistical methods. This study explored ICT challenges faced by a rural high school with the goal of suggesting ways in which the high school could adopt and implement digital tools for teaching and learning. The recommendations are intended to help other schools also in previously disadvantaged areas.

3.4 Research method

According to Kothari (2004), researchers can either choose a quantitative or qualitative research method to conduct their study. A quantitative research method is a method that measures the number of responses and is suitable for phenomena that can be presented in terms of figures. The author further reveals that this method can be sub-divided into three sub-methods: experimental, inferential and simulation approaches.

1. The **inferential approach** establishes a database that can be used to infer characteristics of a sample of a population through the use of surveys.

2. An **experimental approach** conducts some experiments on variables by controlling relationships between the variables to achieve the desired results.

3. A **simulation approach** focuses on process behaviour by generating data from a simulated environment that mimics the real environment.

A researcher can choose a sub-approach suitable to the study in question, depending on desired outcomes. Conversely, a qualitative research method focuses on the quality of the phenomena. It focuses on people's feelings and thoughts about a phenomenon.

Punch (2014:3) defines a quantitative approach as an empirical research approach that presents data in the form of numbers. It is an approach that can be conducted through instruments, checklists and records. Watson (2015) argues that there is no one research method superior to another. It depends entirely on the researcher which method is deemed best suited to the study. The author further states that research can even make use of a mixed method, which combines a quantitative and qualitative research if the study requires both methods to elicit sufficient information.

The researcher chose a quantitative approach in favour of a qualitative approach as the study sought to gain an understanding of the role played by

access to ICT or lack of ICT access on teaching and learning in rural South African high schools. The researcher believes this method was most suited to the study as it thoroughly measured the respondents' replies to statements through statistical methods, thus giving accurate figures that could be used to report on findings and make recommendations. Angen (2000) contends that quantitative research approaches are best in respect of validity measures. Quantitative approaches undergo thorough validity measures that ensure they conform to methodological standards and rules as opposed to qualitative approaches that raise concerns with regard to validity.

3.5   Research design

According to De Vaus (2001), a research design encompasses the structure of the research that needs to be created before data collection and analysis are done. It assists in ensuring that the evidence obtained will explicitly answer the research question. It is more than just a work plan as a work plan only focuses on how the work will be executed. A research design focuses on what evidence needs to be collected. Kothari (2004) defines a research design as a plan or structure that is constructed after the researcher has formulated the research problem. It prepares for research data gathering and analysis based on estimated effort, time and money. It is based on the research purpose. The purpose of this study is to explore challenges that under-resourced schools face in terms of access to digital learning resources. A selected under-resourced high school was studied.

As mentioned above, the research purpose guides the creation of an efficient research design. According to Kothari (2004:35-39), research designs can be categorised as follows: research design for exploratory studies; research design for descriptive and diagnostic studies; and research design for hypothesis-testing studies. The three research design categories are briefly described below.

Exploratory research design: this is a flexible research method focusing on discovering insights and beliefs. It examines various aspects of a problem and this assists in collecting relevant data. It makes use of different types of surveys as a method of data collection.

Descriptive and diagnostic research design: this research design focuses on the description of facts or characteristics of a person or group. Diagnostic research focuses on frequencies of associated variables.

Hypothesis-testing research design: this research design is generally known as an experiment-based design. It tests relationships between variables through the use of experiments. It focuses on reducing bias and increasing reliability.

De Vaus (2001) argues that a research design is not inherent to the research method, thus the researcher can choose any design appropriate to the study. Questionnaires were the only data collection instruments. The focus was particularly on technology, learners, management, acceptance of e-learning, training procedure, institution, and social and cultural awareness.

3.5.1 Case study

This study adopted a case study approach. McCartney et al. (2005:223-224) contend that a case study focuses on a certain context and the findings are normally applicable to the case being studied. Alpi and Evans (2019:4) define a case study as a comprehensive analysis that deals with a certain problem of an entity. According to Yazan (2015:138) a case study research is a comprehensive research strategy that investigates a problem through its focus on the "how" and "why" questions of that phenomenon. The case study was conducted in a rural high school in Kentani, Eastern Cape. Eastern Cape schools are rated as the lowest performers in the country when compared to other provinces. The Eastern Cape Department of Education serves 6,227 educational institutions and 873 is high schools. There are inequalities within these schools where urban schools in the province are well-resourced and

have an adequate number of qualified teachers. On the other hand, remote rural schools face a lot of challenges like scarcity of teachers, unqualified teachers, a high number of learners per school and poor infrastructure. These are the contributing factors to the Province's poor performance (Dzansi and Amedzo, 2014; Kota et al., 2017).

The researcher chose this school as it is in a remote rural area. It is an underprivileged school without ICTs such as computers, faxes, printers and telephone lines. It represents other similarly disadvantaged rural high schools in South Africa. While the school is small, it fits the criteria of the phenomena the researcher wishes to investigate. Despite its size, it has all the characteristics of a rural high school. It draws its learners from a rural village in the Eastern Cape. The majority of these learners come from low-income families and they have to walk long distances every day to attend school. This research seeks to investigate the teaching and learning challenges that rural schools face in this digital era. This school has been selected because it provides data that can be used to investigate the phenomenon of the study.

3.6   Research methodology

Peffers et al. (2008) define research methodology as principles and procedures that a researcher applies to a specific field of study when conducting research. According to Kothari (2004), research methodology refers to the logic and steps taken by the researcher to understand and solve a research problem. Research methodologies should be designed based on the problem, as they may differ depending on the problem to be solved. Research methodology focuses on research dimensions such as research methods, techniques, procedures, data collection and analysis.

3.6.1 Method of data collection

This study used questionnaires as a tool for data collection. Goegan et al. (2018:182) argue that social scientists prefer the use of questionnaires to attain

information. Questionnaires can be administered in various methods such as online, over the telephone or physically distributed. Questionnaires for this study were physically distributed to participants. They were written in English; however, the researcher assisted by translating those sections not understood by respondents into IsiXhosa as this is the language of the selected rural community. This facilitated clarity and participants' understanding of the questions. The design of the instrument was guided by the conceptual framework in Section 2.11. Section A of the questionnaire contained questions designed to understand the biographical backgrounds of the participants. Section B focused on questions that emerged from the conceptual framework. These questions were designed to assess the high school's e-readiness.

3.6.2 Sampling

Sampling refers to selected items used for the field of enquiry. A researcher decides on the sample design for the study before data collection. The Complete Enumeration Survey Method was used as a sampling method to select participants for this study. The researcher selected this sampling method in favour of other sampling methods because of the size of the universe and because of the need to study the area intensively.

The Complete Enumeration Survey Method is where each item in the universe is included in the data-collection process. This is mainly applied when the population itself is small. In this case, data was collected from all teachers in the empirical case (Kothari, 2004).

3.6.3 Unit of analysis

The unit of analysis for this study comprised educators at the selected high school, with emphasis on specific issues: the ICT challenges the high school faces, and the school's e-learning readiness in terms of technology, learners, management, acceptance of e-learning, training procedure, institution, and social and cultural awareness.

3.6.4 Data analysis

This section presents data collected from participants through questionnaires. In a quantitative research study, data is analysed and presented through the ways of presenting statistical findings such as tables, graphs, etc. Punch (2014:253) states that quantitative research measures a number of variables in a sample. Two main concepts in this regard are central tendency and variation. Three common measures of central tendency are the mode, median and mean: the mean is the most commonly used one.

The researcher used Microsoft Excel to analyse the collected data. Tables were used to present the collected data and frequencies were used for response comparisons.

3.7   Reliability and validity

According to Kothari (2004), a research study should undergo sound measurement tests and this can be achieved by measuring the validity, reliability and practicality of the study. As mentioned in Section 3.6.1, questionnaires were used as an instrument or measurement device for this study. The research questions led to the selection of this type of instrument. As they were of a quantitative nature, they needed a quantitative research method tool to gather responses and to measure the reliability and validity of the study. The research study measured the reliability and validity of the study. The measures undertaken to maximise the reliability and validity of the study are discussed in the sub-sections below.

3.7.1   Reliability

Kothari (2004) argues that a measuring instrument can only be considered reliable if it produces consistent results. Other researchers should proffer the same results when conducting the same research, using the same measuring tool under the same conditions. It is impossible to confirm one hundred percent reliability of a research study; however, reliability of a study can be measured

using estimations. Reliability of this research study was measured through a survey under a complete enumeration method. Reliability was therefore estimated by the consistency of the participants' responses. The responses were consistent in most of the questionnaire sections and the reseacher confirms the reliability of this study based on those findings. It is generally assumed that other researchers would obtain the same results if they use the same measuring tool under the same conditions.

3.7.2 Validity

Kothari (2004) states that validity refers to the measuring instrument's ability to measure what it was intended to measure. Angen (2000) argues that adherence to methodological standards and rules is of utmost importance in the quantitative approach and thus the validity of this approach can be trusted, whereas variable results are found in the qualitative approach. Experimental procedures used to measure validity find the qualitative approach to be too subjective. This is one of the reasons the researcher chose to follow a quantitative approach to ensure validity of the study.

In this study, a complete enumeration survey method was used to collect. Frequencies were used to measure the validity of participants' responses. Research findings were generated based on the number of frequencies for each question.

3.8   Delineation of the study

This research study was delineated to focus on ICT challenges faced by a selected rural high school in Kentani, Eastern Cape. This research area was selected to explore the ICT challenges learners at this high school might face because of a lack of access to digital learning resources. There are other high schools in the Eastern Cape without ICT access. They were not selected as part of this study because of the researcher's time and resource constraints.

3.9   Ethical considerations

The research was conducted based on the Cape Peninsula University's Faculty of Business and Management Sciences' research ethics guidelines.

- A consent and briefing letter was signed by the high school principal. This afforded the researcher the full consent of the respondents in respect of their participation in the study.
- Participants were informed of the objective of the research and assured that their answers would be treated as confidential and used for the purposes of the research only.
- Participants were informed that the questionnaires were intended for data collection only and no harm would come to participants.
- An ethics clearance certificate was granted to the researcher by the university prior to commencement of the research.

3.10   Chapter summary

This chapter discussed the research design and methodology the researcher used to conduct the study. Firstly, it discussed the research philosophies of social science and the decision to select a positivist philosophy. Thereafter, it provided an overview of the research method and design and why a quantitative research approach and exploratory research design for the study were used. It then outlined the methodology followed which includes the tool used to collect data, sample selection, unit of analysis and data analysis. Lastly, it discussed the issues of reliability and validity, the delineation of the study, and ethical considerations to ensure that the research complied with scientific research standards.

CHAPTER 4: RESEARCH FINDINGS AND ANALYSIS

4.1 Introduction

The previous chapter discussed the research design and methodology process. It focused on the research design used for the study which is an exploratory approach and then addressed the research methodology. The study followed a quantitative approach. Questionnaires were used as a method of data collection and their distribution is discussed in Section 3.6.1 of Chapter 3. Data was analysed using statistical methods to gain an understanding of the phenomenon.

This chapter focuses on analysing the data collected and presents the findings. The study used a statistical data analysis method as it used a quantitative approach. Watson (2015) argues that in statistical analysis, percentages, spread and central tendency may be used to describe the collected data. Implications may be drawn from analysed data. Microsoft Excel was used to assist with data analysis as it provides a simpler method of analysing data. Collected data is presented in the sub-sections below.

4.2 Participants' biographical information

The participants were educators at the selected school. The school has 15 educators and they all completed the questionnaires. Questionnaires were physically distributed to participants. Participants were informed that their participation was voluntarily and the researcher requested them to answer all questions as honestly as possible.

Section A of the questionnaires focused on the personal information of participants like gender, age, employment status, number of years they have been teaching, number of years in the current school, the subjects that they teach and the average number of students per class. This information was

collected from participants in order to better understand the selected sample. The sections below discuss the questions they were asked.

Statement 1: What is your gender?

Out of 15 participants, the majority (11) were men and the remainder were women. This information is important as it helps to understand which group is dominant in the school: men or women. Many industries used to be dominated by men; however, in 1998 Affirmative Action was introduced in South Africa through the Employment Equity Act of 1998. This led to a transition where everyone was treated equally and more women were employed in the workplaces. This does not seem to be the case in this high school as it is still dominated by male teachers, despite the legislation.

Statement 2: What is your age?

Table 4.1: Respondent's age

What is your age?	
Age	**No. of teachers**
< = 30	4
31–35	6
36–40	2
41–45	2
46–50	1

This question was asked to understand the age groups of participants. As indicated in Table 4.1 above, 4 participants are in the 30 or younger age group. This is followed by 6 participants in the 31–35 age group, 2 participants in the 36–40 age group, another 2 participants in the 41–45 age group and lastly, only 1 participant who is between the age of 46 and 50. The majority of school educators are younger than 35 years.

Statement 3: What is your employment status?

This was asked to ascertain the employment status of the participants. Out of 15 participants, 10 are permanently employed and 5 are temporary staff members. This is an advantage for the school as permanent employees tend to stay longer in their employment than their counterparts who are temporary staff members.

Statement 4: How long have you been teaching since graduating from college?

Table 4.2: Number of years teaching

How long have you been teaching since graduating from college?	
Number of years	**No. of teachers**
$0 \leq \alpha \leq 2$	1
$2 < \alpha \leq 4$	5
$4 < \alpha \leq 6$	4
$6 < \alpha \leq 8$	3
$\alpha > 8$	2

This question was asked to ascertain the number of years that the educators have been in the teaching profession. The options were $0 \leq \alpha \leq 2$, $2 < \alpha \leq 4$, $4 < \alpha \leq 6$, $6 < \alpha \leq 8$ and $\alpha > 8$ years. As indicated in Table 4.2 above, 5 participants have been teaching for 2 to 4 years, followed by 4 participants that have been in the teaching profession for 4 to 6 years, followed by 3 that have been in the profession for 6 to 8 years, and 2 participants that have been in the profession for 8+ years, and lastly, 1 participant who has been in the profession for 0 to 2 years. This helps to understand the teaching experience of the school educators. The majority of participants have not been in the profession for long, which means they don't have much teaching experience. However, this could be an advantage as they are fresh from college and still eager to learn new skills and transfer them to students.

Statement 5: How long have you been at this school?

Table 4.3: Number of years at current school

How long have you been at this school?	
Number of years	**No. of teachers**
$0 \leq \alpha \leq 2$	3
$2 < \alpha \leq 4$	6
$4 < \alpha \leq 6$	5
$6 < \alpha \leq 8$	0
$\alpha > 8$	1

This question was asked to determine how well the participants know the school. This is important as participants with long service at the school will know everything about the school and all changes that the school has undergone. The options for this question were $0 \leq \alpha \leq 2$, $2 < \alpha \leq 4$, $4 < \alpha \leq 6$, $6 < \alpha \leq 8$ and $\alpha > 8$ years. As shown is Table 4.3 above, the majority of respondents are new. Six of them fall in the 2 to 4 years category, followed by 5 that have been at the school for 4 to 6 years. Three have been at the school for the past 2 years and only 1 has been at the school for more than 8 years. Judging from the above figures, it can be argued that the majority of respondents have not had much experience of the school and this could mean they do not know much about the school. However, the new staff members could be beneficial to the school as they could have fresh ideas that could contribute positively to the school's learning processes.

Statement 6: Which subjects do you teach the target class?

Table 4.4: School subjects

Which subjects do you teach the target class?	
Subjects	**No. of teachers**
Arts	1
Languages	3
Mathematics	5
Music Education	0
Physical Education	0
Science	2
Social Studies/Humanities	3
Special Needs	0
Technology	1
Other	1

The researcher asked this question to establish what subjects are offered at the high school. The questionnaire contained subjects which are common to high schools in rural Eastern Cape. The options were arts, languages, mathematics, music education, physical education, science, social studies/humanities, special needs, technology, and other. As shown in Table 4.4, mathematics was being taught by the highest number of teachers (5). Three teachers teach languages, while a further 3 teach social studies/humanities. Two teach science. One teaches arts, another teaches technology, and lastly 1 teaches economics. The school seems to major in mathematics as most of its educators possess these skills. There is only one respondent that teaches technology. This is of concern as educators' technology skills are one of the main reasons that prompted this study. According to the questionnaire responses, the school does not offer any music, physical education and special needs studies.

Statement 7: What is the average number of students per class?

This question was important as it assessed whether the school has an acceptable number of students per class. The options were fewer than 10, 10 to 15, 16 to 20, 21 to 25 and more than 25. Findings were that class sizes ranged from 25 students to 50. Lower grades like 8 and 9 had the highest numbers, while higher grades had the lowest. This is problematic, as it cannot be easy for an educator to attend to each student's needs in an overcrowded class. However, the school seems to be addressing this problem by building extra classrooms.

4.3 E-Learning readiness assessment factors

This study set out with the aim of exploring the teaching and learning challenges that under-resourced schools face in the current digital era. This section dealt with that aim. A Likert scale was used to design the questions in the questionnaire. The questions were guided by the conceptual framework discussed in Section 2.11 of the literature review. The problem statement, main research question, sub-questions and aim are summarised below.

Table 4.5: Summarised statement of research problem, main research question, secondary research questions and research aim

Summary of statement of research problem, main research question, secondary research questions and research aim
Statement of Research Problem: Technology has transformed education at all levels, from primary to tertiary levels worldwide. Educators and learners no longer rely on traditional ways of teaching and learning; they make use of digital learning resources. However in developing countries like South Africa, there is no evidence that learners in under-resourced communities like rural areas benefit from digital resources on the Internet.
Main Research Question: How do high school educators and learners in under-resourced communities in South Africa cope with teaching and learning challenges in the digital era?
Secondary Question 1: What is the educators' and learners' awareness of digital learning resources in a selected under-resourced high school?
Secondary Question 2: What is the level of ICT access in a selected under-resourced high school?
Secondary Question 3: What learning challenges does the selected under-resourced high school face?
Secondary Question 4: What is the impact of the challenges on teaching and learning?
Research Aim: To explore the challenges that schools from under-resourced communities face owing to a lack of access to digital learning resources. The study will also examine the impact that these challenges might have on teaching and learning.

4.3.1 Technology

The following questions were guided by the technology section of the conceptual framework. The statements below are the questions respondents were asked in the questionnaire.

Statement 1: Were you taught ICTs at college?

Table 4.6: ICT Skills

Were you taught ICTs at college?	
Yes	No
9	6

This question was asked to establish whether respondents have ICT skills. It is imperative for all school educators to possess these skills in this digital age as all sectors, including the educational sector, are transforming their processes from manual to digital. The options were Yes and No. As indicated in Table 4.6 above, the majority of respondents (9) responded with a Yes and only 6 indicated no ICT background. This is a positive finding, as it appears the majority of school educators are computer literate. They appear to have the essential skills needed to adopt ICT should they have access to ICTs like computers and the Internet. The skilled educators can transfer their skills to the other six that don't have an ICT background.

Statement 2: Which ICTs are you familiar with?

Table 4.7: ICTs familiar with

Which ICTs are you familiar with?	
ICTs	No. of teachers
Desktop computer	9
Laptop	10
Smartphone	12
Tablet	10

This question sought to determine the ICTs respondents use or have used in the past. The options were desktop, laptop, smartphone and tablet. Twelve respondents indicated that they are familiar with smartphones, 9 indicated that they are familiar with desktops, 10 with laptops, and a further 10 with tablets. The majority of this school's educators seem to have access to smartphones – this means they can use these devices to access online teaching and learning resources. They also have access to other ICT resources like desktop computers, laptops and tablets. They seem to be equipped for ICT use; however, they need to skill up on the use of ICT to enhance teaching and learning processes.

Statement 3: Which ICTs do you use every day?

Table 4.8: ICTs used every day

Which ICT do you use every day?	
ICTs	**No. of teachers**
Desktop computer	2
Laptop	9
Smartphone	12
Tablet	4

The options were the same as the question above: desktop computer, laptop, smartphone and tablet. The majority of educators (12) indicated that they use smartphones every day, 9 indicated that they use laptops, 4 indicated that they use tablets and only 2 indicated that they use desktop computers. From the above information, it is evident that most educators use ICTs every day. This puts these educators in an advantageous position to adopt ICTs as they are not ignorant with regard to ICT resource use.

Statement 4: Do you ever use the Internet?

Table 4.9: Internet use

Do you ever use the Internet?	
Yes	**No**
10	5

This question sought to establish if the respondents know how to access and use the Internet and the options were Yes and No. As indicated above, 10 respondents indicated that they do make use of the Internet and only 5 respondents responded with a No. Most educators seem to have internet knowledge.

Statement 5: How many hours do you spend online per day?

Table 4.10: Hours spent online per day

How many hours do you spend online per day?	
No. of hours	**No. of teachers**
$0 \leq \alpha \leq 1$	6
$1 < \alpha \leq 2$	6
$2 < \alpha \leq 3$	0
$3 < \alpha \leq 4$	0
$4 < \alpha \leq 5$	3
$\alpha > 5$	0

The options were $0 \leq \alpha \leq 1$, $1 < \alpha \leq 2$, $2 < \alpha \leq 3$, $3 < \alpha \leq 4$, $4 < \alpha \leq 5$ and $\alpha > 5$ hours. Six respondents indicated that they spend between 0 and 1 hours on the Internet per day with another 6 that spend between 1 and 2 hours per day. Three spend between 4 and 5 hours per day. Judging from this information, it is clear that even though most of the teachers own smartphones, they do not spend much time on the Internet. The hours that are spent on the Internet may be for other activities like chatting on social media or researching information for their own studies.

Statement 6: How often do you use the Internet, social media or chat service for lesson preparation?

Table 4.11 Use of internet for lesson preparation

How often do you use the Internet, social media or chat service for lesson preparation?	
No. of hours	No. of teachers
$0 \leq \alpha \leq 1$	9
$1 < \alpha \leq 2$	4
$2 < \alpha \leq 3$	0
$3 < \alpha \leq 4$	0
$4 < \alpha \leq 5$	2
$\alpha > 5$	0

This question aimed at ascertaining if the respondents know that they can use the Internet, social media and chat service for teaching purposes. The options were $0 \leq \alpha \leq 1$, $1 < \alpha \leq 2$, $2 < \alpha \leq 3$, $3 < \alpha \leq 4$, $4 < \alpha \leq 5$ and $\alpha > 5$ hours. Nine respondents indicated that they use ICT platforms between 0 and 1 hours for lesson preparation which could mean that they do not use these platforms at all for lesson preparation. Four respondents indicated they only use these ICT platforms between 1 and 2 hours per day for lesson preparation. Two indicated that they use them for 4 to 5 hours per day. The findings were the majority of respondents do not use the ICT platforms in the question for lesson preparation. This could mean that they are not aware that they can use these platforms for lesson preparation. On the other hand, a few indicated that they are using them, but only for few hours.

Statement 7: How often do you use the Internet, social media or chat service for research for your own study?

Table 4.12: Use of the Internet for own study

How often do you use the Internet, social media or chat service for research for your own study?	
No. of hours	No. of teachers
$0 \leq \alpha \leq 1$	5
$1 < \alpha \leq 2$	7
$2 < \alpha \leq 3$	0
$3 < \alpha \leq 4$	0
$4 < \alpha \leq 5$	3
$\alpha > 5$	0

This question assessed the respondent's use of the Internet for their careers. The options were $0 \leq \alpha \leq 1$, $1 < \alpha \leq 2$, $2 < \alpha \leq 3$, $3 < \alpha \leq 4$, $4 < \alpha \leq 5$ and $\alpha > 5$ hours. Seven respondents indicated that they use the Internet for their own study for between 1 and 2 hours per day. Five do not use it at all for their own studies, while 3 indicated that they use it for 4 to 5 hours per day. This means the majority of respondents use these ICT platforms to up-skill themselves. The 5 respondents that indicated that they do not use it for own studies are probably not currently studying, as most studies require the use of ICT.

Statement 8: Do you use the Internet to share study material with students?

This question was asked to check the respondents' awareness about the use of the Internet for teaching and learning purposes. The options were Yes and No. Nine respondents indicated that they do not use the Internet for teaching and learning, while 6 respondents indicated that they do use it for teaching and learning. As mentioned in Statement 6 above, it appears the majority of teachers are not aware that they can use the Internet for teaching and learning, or they are not familiar with learning resources on the Internet.

Statement 9: Do you use social media services to share study material with students?

This question was asked to check the respondents' awareness of the use of social media services for teaching and learning purposes. The options were Yes and No. Nine respondents indicated that they do not use social media to share study material with students, while the remaining 6 indicated that they do make use of social media to share study material. It appears that only a minority of teachers make use of social media for teaching and learning purposes.

4.3.2 Training

The following questions were guided by the training procedure section of the conceptual framework. The statements below are the questions respondents were asked in the questionnaire. The options were Yes and No for all questions in this section.

Statement 1: Training in the use of computers/basic computer literacy?

This question was asked to establish if the respondents had some basic computer literacy skills. Nine respondents indicated that they have had training in basic computer skills and 6 indicated that they have not had such training. The majority of respondents have basic computer literacy skills. It appears that this school is ready for ICT adoption as it has skilled personnel.

Statement 2: Word processing (e.g. MSWord)?

This question sought to ascertain the respondents' word-processing skills. Nine respondents indicated that they do have these skills and 6 indicated that they do not have these skills. Again, the majority of respondents have word-processing skills. This is a vital skill for an educator in order to create assignments, prepare teaching documentation, and write letters, etc.

Statement 3: Spreadsheets (e.g. Excel)?

Respondents were asked whether they have had some training on spreadsheets like Microsoft Excel. Eight respondents indicated that they have had this training, while the remaining 7 indicated that they have not had such training. The majority of respondents seem to have knowledge of the use of spreadsheets as they indicated that they have had this training. This is an important tool that educators can use for storing student marks and any other student information.

Statement 4: Presentation software (e.g. PowerPoint)?

Respondents were asked whether they have had training on presentation software like PowerPoint. Eight respondents indicated that they have had this training, while 7 indicated that they have not had such training. The majority of respondents do have PowerPoint skills. This is an important tool that can be used for lesson preparation and delivery. It can also be used for presentations among educators.

Statement 5: Databases (e.g. Access)?

Respondents were asked whether they have had some basic training on databases like Microsoft Access. Six respondents indicated that they have had this training and 9 indicated that they had not. The majority of respondents appear to lack database skills. The school might need to send these educators for some database training to equip them with these skills as they need all these basic computer skills to be e-ready.

Statement 6: Training on how to integrate technology within the curriculum?

This question sought to establish whether the respondents had received some training on integrating technology within the curriculum. Two respondents agreed that they had received this training, while the remaining 12 indicated that they had not received any training on technology integration in the curriculum. One respondent skipped this question. It appears that the majority

of respondents have scant knowledge of the integration of technology into the curriculum.

Statement 7: Internet and email?

This statement attempted to ascertain whether the respondents had received any training on internet and email use. Six respondents indicated that they had such training, while the remaining 9 indicated they had not. This might be the reason why in Statement 8 of the technology section above, 9 respondents indicated that they do not use the Internet to share study material with students. They might not be familiar with the Internet resources they could use for teaching and learning.

Statement 8: Social media?

This question attempted to assess the respondents' knowledge of the use of social media like WhatsApp, LinkedIn, etc., to enhance teaching and learning. Six respondents indicated that they have had some training in the use of social media, while the remaining 9 voiced a lack of training. The majority of respondents seem to lack skills in the use of social media for educational purposes. They could be using social media for other activities, like chatting to friends and family.

4.3.3 Learners

The following set of questions came from the learners' section of the conceptual framework. The questions focused on the learners' digital competence.

Statement 1: Are most of the school learners computer literate?

This question was important in assessing the learners' levels of ICT skills. The options were Yes and No. Fourteen respondents indicated that their learners are not computer literate and only 1 indicated that learners are computer literate. This indicates that the majority of school learners do not have ICT skills. These learners could be lacking in these skills because of a lack of access to

ICT resources like computers and the Internet. They cannot be equipped with these skills until they have access to ICTs. While it is possible for a learner to attain these skills in their personal capacity, this will not be easy for learners from under-privileged communities like Kentani as they come from low-income families that struggle to make ends meet.

Statement 2: Do you have computer studies at this school?

Respondents were asked if they offer their students some computer studies to equip them with ICT skills. The options were Yes and No. All respondents indicated that they do not offer such lessons to their students. This might be because the school does not have any access to computers and the Internet as mentioned in Statement 1 above.

Statement 3: Do most of your learners own a laptop?

This question was asked to establish whether any learners own laptops. The options were Yes and No. According to the respondents, none own laptops. The researcher expected this because of her personal knowledge of the community. Laptops would be a luxury, with few homes able to afford laptops.

Statement 4: Do most of your learners own smartphones?

This was one of the questions in the questionnaire that was asked to determine whether school learners own smartphones. The options were Yes and No. Thirteen respondents indicated that school learners do own smartphones, while 2 disagreed. According to the responses, this school's learners have smartphones. These learners have powerful devices they can use for their own benefit but they seem to lack ICT skills as indicated by respondents in Statement 1 above. Without these skills they will not know how to access learning resources on the Internet.

Statement 5: What do they use their smartphones for?

This question was asked to establish whether learners use their smartphones for learning purposes or for other things. Only 13 respondents responded to this question and all indicated that learners use their smartphones for social media. Learners have an interest in social media but they probably use it to chat with friends and family. They need to be taught that they can use this ICT platform for their studies as well like creating learner groups where they can share study information or communicate learning problems with their educators.

4.3.4 Acceptance of e-learning

The following questions were guided by the acceptance of e-learning section of the conceptual framework. They sought to determine the school's willingness to adopt ICT for teaching and learning. The options were Yes and No in all questions. One respondent omitted this section of the questionnaire.

Statement 1: Does the school make use of computer-based tools for teaching?

The respondents were asked whether they make use of any ICTs for teaching. Two respondents indicated that they do make use of computer-based tools for teaching. In contrast, 12 respondents indicated that they do not make use of any computer-based tools for teaching. According to this information, the school has not adopted ICT for teaching. This could be due to many reasons, such as willingness to accept digital technology for teaching, as many respondents indicated that they had some training in ICT. It is expected of them to at least use their skills for teaching. Teachers might not be willing to accept the fact that the education sector is transforming its processes from manual to digital. This might be because they do not have ICT resources at the school, resulting in the non-use of computer-based tools for teaching.

Statement 2: Does the school make use of computer-based tools for learning?

The respondents were asked whether the school makes use of any ICTs for learning. Again, 2 respondents indicated that they do make use of computer-

based tools for learning, while 12 respondents indicated that they do not make use of any computer-based tools for their learning. This is similar to Statement 1 above and the reason might be similar. In Statement 1 of Section 4.3.3, the majority of respondents indicated that their learners are not computer literate, which could be the reason for their not using computer-based tools for learning. It might also be because of the school's lack of access to ICT resources.

Statement 3: Do you think ICT can help improve the quality of teaching and learning?

Respondents were asked about their thoughts on ICT enhancing the quality of teaching and learning. Thirteen respondents agreed that ICT can improve the quality of teaching and learning, while only 1 respondent saw this differently. The majority of respondents seem to be passionate about ICT integration into teaching and learning. They would appear to use it if they had access to it.

Statement 4: Does the school have ICT access or internet connectivity?

This question attempted to assess the ICT challenges of the school. All respondents indicated that the school does not have ICT resources or internet connectivity. This is a problem as this deprives the school of ICT benefits that other high schools enjoy, such as access to digital learning resources and not being dependent on traditional face-to-face classes.

Statement 5: Does the school want ICT access or internet connectivity?

This question sought to interrogate the school's interest in ICT access and internet connectivity. All respondents indicated that the school wants access to ICT and the Internet. However, it appears that the school does not have funding for this.

Statement 6: Do you think ICT access could improve the school's Grade 12 results?

The respondents were questioned on their thoughts of the possibility of ICT access improving Grade 12 results at their school. They all shared the same sentiment that ICT access could improve Grade 12 results.

Statement 7: Do you think ICT access could improve learners' understanding of the subjects?

Respondents were asked if they thought the use of ICT for teaching could improve learners' understanding of subjects. They all agreed that this could improve their understanding of subjects.

Statement 8: Do you think ICT access could improve learner participation?

Respondents were asked if they thought the use of ICT could improve learner participation. They all thought that this could result in better learner participation.

Statement 9: Would the use of computers and the Internet improve learner interest in the subject?

Lastly, respondents were interrogated on their thoughts on computers and the Internet improving learner interest in subjects. They all thought that this could improve learner interest in subjects. The school teachers seem to have willingness to adopt ICT for their educational processes. They appear to believe that should they have access to ICT, their teaching and learning processes could improve.

4.3.5 Management

The following questions came from the management section of the conceptual framework. They focused on the management of ICT with its main focus on computer hardware and software.

Statement 1: Does the school have someone that can provide technical support for its computers?

This question was asked to establish if there is someone with technical expertise at the school that could support the school's computer hardware and software, should it have access to them. All 15 respondents indicated that there is no person with such skills at the school. This means if the school had access to computers, they would need assistance from someone outside the school. On the other hand, the school could send some of its educators for training. This would be advantageous as the school would not have to pay someone should computer problems occur.

Statement 2: Would it need technical support from someone outside of the school?

This question attempted to assess if the school educators are willing to up-skill themselves on technical support or they are happy to depend on someone outside of the school. Fourteen respondents indicated that they would need technical support from someone outside of the school and only 1 respondent disagreed with them. This could mean that respondents thought they would need outside assistance as there is no one that currently has these skills at the school. On the other hand, it appears most respondents did not consider sending someone for training.

Statement 3: Does the school have safe computer laboratories?

This question was asked to establish if the school has a safe place for computers and other ICT hardware such as printers and scanners. All 15 respondents indicated that the school does not have safe computer

laboratories. This is a matter of concern as computers would not be safe should the school obtain them.

Statement 4: Are safe computer laboratories part of the school's future plans?

One respondent skipped this question. Out of 14 respondents, 11 indicated that safe computer laboratories are part of the school's future plans, while the remaining 3 disagreed. The researcher spoke to the school principal about this and he confirmed they are busy building a safe computer laboratory for the school as the school is improving its classrooms. This addresses the concern mentioned in Statement 3 above.

4.3.6 Social and cultural awareness

This was the last section of the questionnaire. It was guided by the social and cultural awareness section of the conceptual framework. It focused on the school's social and cultural awareness of ICT.

Statement 1: Would the school consider sponsorship from government or the private sector?

The respondents were asked whether their school would be interested in funding from government or the private sector for ICT access and internet connectivity. Fourteen respondents indicated they would be happy to get sponsorship, while only 1 respondent disagreed. The school appears to want ICT access but does not have funds for this access.

Statement 2: Which ICTs and tools would the school ask for?

Table 4.13: ICTs and tools the school needs

Which ICTs and tools would the school ask for?	
ICTs/Tools	**No. of teachers**
Desktop Computers	12
Laptops	14
Internet Access	11
Learning Software	10

This question was asked to establish which ICTs the school is interested in. Fourteen respondents indicated the school is in need of laptops, followed by 12 respondents that indicated the school needs desktop computers, followed by 11 respondents that indicated the school needs internet access, and lastly 10 respondents that indicated the school needs learning software. It appears that the school would be interested in all kinds of ICTs; however, the majority of respondents indicated that they need laptops more than any other ICTs.

Statement 3: Would the school ask the local community to protect the school's computers or laptops?
This question was asked to find out if the school has any plans in place for the safety of their computers. All respondents agreed that they would ask the local community to protect their computers and laptops.

Statement 4: How would the action requested in the above question be achieved?
Lastly, the respondents were asked how they would achieve the action in Statement 3 above. Twelve respondents indicated they would achieve this through the school governing body, and 3 respondents indicated that they would use the school learners to accomplish this. The school seems to have a plan in place for the safety of their hardware.

4.4 Chapter summary

This chapter presented the data analysis and findings of the study. Data was analysed using statistical analysis as the research was of a quantitative nature. The researcher reported findings based on the questionnaire feedback that was guided by the conceptual framework. The first section of this chapter focused on the school profile and biographical information of participants.

The second section dealt with themes that emerged from the conceptual framework: technology, training, learners, acceptance of e-learning, management, and social & cultural awareness.

The next chapter will focus on a discussion based on the findings.

CHAPTER 5: DISCUSSION OF FINDINGS

5.1 Introduction

This study sought to establish the teaching and learning challenges at a selected high school in the rural areas of the Eastern Cape. It also sought to understand how these challenges might impact teaching and learning at this high school and at other rural high schools. In order to understand the problem better, the researcher conducted a comprehensive literature review. A conceptual framework was created from Đurek and Ređep's (2016) theoretical framework. The conceptual framework guided the study and was used to formulate the questions listed in the questionnaire which helped to collect data and establish findings.

5.2 Findings

In reviewing the literature, and collecting and analysing data from the selected school, the researcher found significant challenges; the research thus revealed that the problem is greater than anticipated. Students are not using digital resources, and there are a number of reasons for this. As revealed in Section 4.3.3 in the research findings and analysis chapter, learners from the high school where the study was conducted do not have digital skills. Some have never seen or worked on a computer. This confirms the findings of Bothun (2016); Conger et al. (2016); and Bytheway (2017) in the problem statement and literature review sections, about learners in the rural communities of South Africa not possessing digital skills. This is a problem as almost everything is done online or via computers in the digital age. These learners are not enjoying the benefits that digital technology offers in teaching and learning.

It was discovered that the school in the study does not offer computer studies to their learners. This might be because the school does not have any access to computers and the Internet as mentioned in Statement 4 of Section 3.4.3. This is in resonates with the findings of Nnadozie (2015), Bothun (2016) and

Conger et al. (2016) in the literature review in respect of learners from rural South African schools not having access to ICT resources.

It was established that most of the school learners have smartphones however, none of these learners use their smartphones for learning. They only use these devices to chat with family and friends on social media. As argued by Duffett (2017) in Section 2.7.4, individuals that are 19 years and younger use their smartphones for almost anything, including learning. Van Oordt and Mulder (2016) further highlighted that young people use their smartphones for learning and prefer using digital devices to traditional methods of study. This does not seem to be the case for learners at this rural high school. This is a problem, as these learners are expected to perform as well as other learners that have access to good learning resources.

Respondents revealed that they own some laptops; however, these laptops are not used for teaching and learning as stated in Section 4.3.4 of Chapter 4. The laptops are probably used for school administrative work or other functions. Most of the teachers had not received training on how to integrate technology within the curriculum. This concurs with the findings of Ramorola (2013), in Section 2.9.2. This is one of the teaching and learning challenges that the school might be facing as the South African Department of Education requires all schools to integrate ICT into their curricula as indicated by Dzansi and Amedzo (2014); and Mathipa and Mukhari (2014) in Section 2.4 of the literature review. This is also in agreement with the argument of Conger et al. (2016) noted in the literature review that educators from rural South African schools need to improve their pedagogical practices to be able to accept technology transformation.

What is more concerning is that the teachers indicated that they believe access to ICTs will improve the school's quality of teaching and learning, learner participation and performance; however, they have no means of obtaining these resources. The respondents also indicated that they do not use

any digital tools for teaching and learning. It appears that the high school is unaware of the digital tools and methods they can use to enhance education. This proves what was highlighted by Conger et al. (2016) in Section 2.11.5, that rural high schools are still using old pedagogical practices. They need to adopt the new methods of teaching for the benefit of the school and their learners. Rural learners and teachers are also deprived of the ability to learn from others through participating in the online community. This allows high schools to exchange content and ideas; however, rural high schools are unable to participate because of a lack of ICT access.

While these rural high schools are faced with all the challenges mentioned above, urban high schools participate in and enjoy the benefits of digital transformation. They research online, use iPads, participate in online classes and online discussions, have safe computer laboratories, and follow computer studies curricula which include programming lessons. They learn presentation skills through the use of tools like Microsoft PowerPoint, and this builds their knowledge and confidence. They are thus well prepared for tertiary studies and the workplace. Most urban learners also have access to online learning software like Nokia MoMaths and M-Thuto to improve their mathematics performance, ALEKS to sharpen their financial accounting skills, and many other educational digital tools. However, Mathevula and Uwizeyimana (2014) and Nkula and Krauss (2014) revealed that although urban schools have access to ICT and internet connectivity, they still lack skills in integrating ICT into the curriculum.

Within the South African context, these findings help to understand that there is still a digital divide within South African schools. Teaching and learning in South Africa are thus still inequitable.

5.3 Insights

Insights are that students will struggle at university level as some lessons and assignments are delivered online. They are expected to have some digital skills when arriving at university. Their urban counterparts will outshine them, as they would have gained these skills at high school. This is one of the reasons some students from rural backgrounds perform poorly at university. Some never catch up, while others improve with time. These rural learners have no other learning experience other than sitting in a classroom, listening to a teacher, and taking notes. They are not exposed to anything else. They desire to sit in computer laboratories and research their assignments like other learners at well-resourced schools and catch up missed classes by audio- or video-recordings on digital channels. They want to be able to write a test online, regardless of where they are. All this is just a dream and will only be possible if they can get access to computers and the Internet or if they can be taught ways in which they can use their hand-held devices for learning.

As the world has gone high tech, these learners will struggle in the workplace. In the literature review above, Lindberg et al. (2017) note that workplaces use ICTs for communication and information sharing. Even if these learners succeed in the employment selection process, they will struggle to fit into the work environment. That will result in them being viewed as poor performers, as employers will not consider their background. Many workplaces make use of virtual channels for meetings and interviews. These learners will not be able to participate in these technological communications on the Internet. Some organisations also allow their employees to work remotely through the use of ICTs. It is thus vital for all schools to have ICT access and skilled teachers, and for learners to be able to participate in the digital transformation.

In this digital age where almost everything is done online, it is alarming to note that there are still schools not participating in the digital transformation. These learners are deprived of the opportunity of developing one of the most

important skills that a twenty-first century learner can possess. Computer literacy is a critical skill that can open doors for learners and teachers. Without these skills a person is limited and cannot participate in contemporary life, such as online learning, online purchasing, and e-health, to name a few. This is a problem that South Africa needs to address, as learners need to be given equal opportunities regardless of their background. There may be potential future leaders among these learners – they simply need a fair chance.

5.4 Chapter summary

This chapter interpreted the findings analysed in the previous chapter. It compared the findings with the literature surveyed in Chapter 2. It is clear from the findings that there is still a considerable digital divide in South Africa. Rural leaners and teachers have not been included in the digital transformation. They are still in the dark, with no digital skills, computers or internet access. The next chapter will draw conclusions from the findings of the study and make recommendations for rural high schools.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The previous chapter discussed the findings after analysing the data collected from participants through questionnaires. It also discussed the researcher's insights into the phenomenon. Đurek and Rečep's (2016) theoretical framework of e-learning readiness assessment factors helped to construct a conceptual framework which assisted the researcher in compiling a questionnaire that was used to collect data and interpret the findings. The aim of the study was to explore the teaching and learning challenges that under-resourced schools face owing to a lack of access to digital learning resources and to identify ways of introducing new learning methods in rural schools to enable rural learners and educators to cope with demands of the technological revolution. The findings of the study are expected to assist the selected high school and all other underprivileged high schools in South Africa.

This chapter provides a summary of the important points that assist in addressing the research problem. It also makes recommendations on how this rural school can participate in the digital transformation by introducing new learning methods. Research questions are also revisited in order to draw conclusions and make recommendations. This chapter is divided into six sub-sections in this order: the first sub-section is an introduction which provides a summary of what was discussed in the previous chapter and what will be discussed in this chapter; the second sub-section is an overview of the research; the third sub-section revisits the research questions to ensure that they have been answered; the fourth sub-section discusses the research contribution; the fifth sub-section notes the research limitations; the sixth sub-section makes recommendations to the rural school; and the last sub-section concludes the research.

6.2   Overview of the research

In Chapter 1, it was mentioned that the Internet is a source of learning at all educational levels as it provides access to digital learning resources. The chapter touched on different digital learning resources at a high level and how they have revolutionised the learning process, thus making it easier, faster and readily accessible. In this chapter, the researcher argued that while urban schools have access to the Internet and digital learning resources, this does not seem to be the case in rural schools. The emphasis was on South African high schools. This is what led to the research problem which is:

1. Technology has transformed education at all levels, from the primary to the tertiary level worldwide. Educators and learners no longer rely on traditional ways of teaching and learning; they make use of digital learning resources.
2. However in developing countries like South Africa, there is no evidence that learners in under-resourced communities like rural areas benefit from digital resources that are on the Internet.

In light of the above-mentioned research problem, the researcher sought to explore the underlying reasons for the situation, and that resulted in the following research objectives:

1. To determine educators and learners' awareness of digital learning resources in a selected under-resourced high school.
2. To determine the level of ICT access in a selected under-resourced high school.
3. To determine the learning challenges that a selected under-resourced high school faces.
4. To determine the impact of the challenges on teaching and learning.

In order to achieve the objectives mentioned in the summary of Chapter 1 above, in Chapter 2 the researcher reviewed scholarly literature to gather further insight into the problem. The researcher also visited the school to collect data through questionnaires. The literature review in Chapter 2 revealed that digital transformation has been adopted by many sectors in the global economy, and this includes the education sector. The literature review also revealed that the South African government requires all South African learners to be ICT literate – however, this does not seem to be the case in rural schools. Only urban schools seem to participate in this requirement. Some of the reasons for this non-participation were revealed to be a lack of infrastructure needed for ICT connectivity, educators' lack of ICT skills, cost of ICT implementation, and ICT support experts, to name a few. Chapter 2 also examined the various types of digital learning methods and online learning software that schools can implement for their teaching and learning. Lastly, in Chapter 2, the researcher considered the theoretical framework of Đurek and Rеđep (2016) and adopted it to create a conceptual framework for the study.

In Chapter 3, the research design and methodology used to conduct the study were outlined. The chapter commenced by providing background information on the case study; it then explained the rationale for choosing the case. The researcher discussed the research philosophy used to conduct the research and furnished reasons for choosing this philosophy. A positivist philosophy was used to conduct the study because of the nature of the study. In Chapter 3, the researcher further asserted that a quantitative research method was used to conduct the study as it would provide more accurate results through the use of statistical instruments. Chapter 3 also outlined the sampling method and instrument used for data collection and analysis.

In Chapter 4, the researcher analysed the data collected from participants and interpreted the findings. Data was collected though questionnaires, while Microsoft Excel assisted with data analysis. The questions in the questionnaire were guided by the conceptual framework described in Chapter 2. A Likert scale was used to rate questions. The conceptual framework covered e-learning readiness assessment factors as depicted in Figure 2.3 of Chapter 2: technology, learners, management, acceptance of e-learning, training procedure, institution, and social & cultural awareness.

In Chapter 5, the researcher discussed findings from participants' responses in Chapter 4 and from the literature review in Chapter 2. This chapter revealed that challenges exist in the twenty-first century. Rural learners do not use digital learning resources. Section 4.3.3 of Chapter 4 revealed that the high school in the study does not offer computer studies and some of the learners have never worked on or seen a computer. The chapter further revealed that while rural schools are faced with these learning and teaching challenges, urban schools enjoy the benefits of digital transformation.

6.3   Research questions revisited

In order to meet the research objectives mentioned in Section 6.2 above, the following research questions emerged and were answered in the research findings:

6.3.1 Main research question:

How do high school educators and learners in under-resourced communities in South Africa cope with teaching and learning challenges in the digital era?

From this main question, the following secondary research questions were derived:

1) **What is the educators' and learners' awareness of digital learning resources in a selected under-resourced high school?**

The majority of respondents indicated that they had learned some ICT skills at college and that they used the Internet every day. However, most respondents indicated that they had not received any training on ICT integration. They also indicated that they did not use any computer-based tools for teaching and learning. Both teachers' and learners' own smartphones; however, the findings were that they are unaware that they can use their smartphones for educational purposes.

2) **What is the level of ICT access in a selected under-resourced high school?**

According to respondents, the school does not have ICT resources and internet connectivity. The teachers own some laptops and smartphones, but they seem to be personal laptops that are used for personal reasons. None of their learners own a laptop, but most own smartphones.

From the research findings, it appears that both teachers and learners have access to smartphones, but do not use them for teaching and learning.

3) **What learning challenges does the selected under-resourced high school face?**

From the research feedback, the researcher elicited that even though the majority of teachers had received some basic computer training at college, none of them had received training on ICT integration into teaching and learning.

The school does not have internet connectivity and there is no infrastructure to connect this school to the Internet. The school does not have ICTs like computers, printers and scanners that they can use for educational purposes. School learners do not have the ICT skills to access and use computers. Some have never seen or worked on a computer in their entire lives. This is a

challenge for the school, as the South African Department of Education introduced ICT in all schools after 1994. This school is not enabled to participate in that requirement.

4) What is the impact of the challenges on teaching and learning?

This school cannot make use of the learning resources that are on the Internet. The school thus misses the opportunity to learn from other experts in the industry through digital tools like Edmodo and Mindset Learn as noted in Section 2.8 in the literature review.

The respondents also indicated that access to ICTs could improve learner interest in subjects and learner participation in lessons.

These school learners are not receiving the same education as that of other South African learners in urban schools. This might have an impact on their future when they have to choose careers or enter the workplace.

6.4   Research contributions

6.4.1 Theoretical contribution

This study adopted a positivist methodology to explore the teaching and learning challenges of the selected rural high school. It was guided by the conceptual framework generated from Đurek and Ređep's (2016) theoretical framework. It also explored scholarly literature in respect of the phenomenon. The conceptual framework together with the reviewed literature enabled the researcher to establish the problem. The researcher would not have been able to produce the findings if not guided by the conceptual framework and reviewed literature. The researcher believes that the findings of the study will contribute to the South African education sector.

6.4.2 Methodology contribution

The study adopted a quantitative approach. A rural high school in Kentani, Eastern Cape, was selected as the case to be studied and the school educators were the unit of analysis. The research tool used comprised questionnaires because of the nature of the research questions and as the tool assists in providing rich results. The quantitative approach helped the researcher to collect and analyse data accurately through the use of statistical methods. The approach also enabled the researcher to understand the problem better. Other researchers could have selected a different methodology for the same study.

6.4.3 Practical contributions

Practical contributions of this study are the high school in the case study and other rural high schools' awareness of the learning resources available on the Internet.

Rural teachers' and learners' awareness of the use of smartphones for educational purposes is a further contribution. Teachers in rural schools also realise the importance of equipping themselves with computer skills. The quality of education in rural schools may be improved through the use of digital learning methods.

6.5 Research limitations and further research

The research was conducted in one rural high school in Kentani, Eastern Cape, South Africa, with a small sample size. This was due to the limited time allocated to a course-based dissertation and the scope of the master's degree. Therefore, the research findings cannot be generalised to all South African rural high schools. Further research on this topic needs to be conducted on other rural high schools in the same province or in other South African provinces.

6.6 Recommendations

The following recommendations based on the findings of the study are presented to rural high schools in South Africa.

1) Rural high school teachers should introduce computer studies in their school curricula in order to equip learners with ICT skills. They could make use of their personal computers or laptops and connect to a personal device hotspot in order to assist learners while they are waiting for sponsorship from government or the private sector.

2) Rural teachers should research digital learning resources and software that they can adopt to enhance studies in their high schools.

3) Rural teachers and learners should start using their smartphones for teaching and learning purposes. They could make use of mobile applications like Edmodo, MoMaths and many other mobile applications not mentioned in this study. These tools do not require access to a computer or laptop.

4) Rural teachers should all skill up on the use of computers and the integration of ICT into the curriculum in order to fulfil the requirement of the South African Department of Education to integrate ICT into the curriculum.

6.7 Conclusion

Developed countries have adopted digital processes in their industries, while developing countries like South Africa are gradually adopting this transformation. The education sector is also following this process; however, in South African schools, there seems to be some sort of digital divide. Most urban schools have ICT access and enjoy the benefits of online digital resources.

On the other hand, most rural schools still have inadequate or no access to computers and the Internet. This deprives these learners of the benefits that ICT offers, such as completing online assessments, catching up on a missed class online, and sharing information online via emails or other digital tools.

For them, education is all about sitting in a traditional face-to-face classroom session listening to a teacher and taking notes. It is therefore vital for the South African education department to bridge this digital divide by providing ICT access to all learners. This will help these learners to excel academically and grow in their careers.

This research explored the challenges that under-resourced schools face in terms of access to digital learning resources and the impact that these challenges might have on teaching and learning. The purpose of the research was to identify ways of introducing new learning methods in rural schools. These new learning methods are presented in the recommendations section above. Quantitative data analysis was adopted as a research approach, questionnaires were used as a tool to collect data from the under-resourced school in the case study, and data was analysed using statistical methods.

Recommendations from the case study are deemed to apply to all under-resourced schools in rural South Africa.

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APPENDICES

Appendix A: Questionnaire

Cape Peninsula
University of Technology

Dear Participant,

You are invited to participate in this survey, the survey is for collecting data to explore the challenges of under-resourced schools in rural South Africa because of a lack of ICT access and the impact that these challenges might have in teaching and learning.

The survey forms part of a Master of Technology degree research project in the Graduate School of Business Management, Faculty of Business and Management Sciences at Cape Peninsula University of Technology.

The Internet is a source of learning resources at all levels from primary to tertiary education. Most countries in the world, including South Africa, have adopted the use of the Internet for their schools' learning processes, howerever there is no evidence that the under-resourced schools in South Africa are part of this digital transformation.

The main purpose of the survey is to gather information from you, which will assist in exploring the ICT challenges in rural South African schools and identifying ways of introducing new learning methods in this high school and other rural schools.

Please note that all information that you provide through your participation in this study will be kept confidential. Furthermore, you will not be identified anywhere in this study. There are no risks to your participation in this study.
The reseacher needs +- 30 minutes of your time to complete this questionnaire.

Thank you.

1. **Personal Information** (Please tick an appropriate answer)

   1.1   What is your gender?
          Male
          Female

   1.2   What is your age?
          30 or less
          31-35
          36-40
          41-45
          46-50
          51-55
          55 or above

   1.3   What is your employment status?
          Permanent
          Temporary

   1.4   How long have you been teaching since graduating from college
          $0 \leq \alpha \leq 2$
          $2 < \alpha \leq 4$
          $4 < \alpha \leq 6$
          $6 < \alpha \leq 8$
          $\alpha > 8$

   1.5   How long have you been at this school
          $0 \leq \alpha \leq 2$
          $2 < \alpha \leq 4$
          $4 < \alpha \leq 6$
          $6 < \alpha \leq 8$
          $\alpha > 8$

   1.6   Which subject(s) do you teach the target class? (Tick where applicable)
          Arts
          Mathematics
          Music Education
          Physical Education
          Science
          Languages
          Social Studies/Humanities
          Technology
          Special needs
          Other
          If other, please specify..

   1.7   What is the average number of students per class:
          Fewer than 10
          10-15
          16-20

21-25
more than 25

2. TECHNOLOGY (Please tick an appropriate answer)

2.1 Were you taught ICTs at college?
Yes
No

2.2 Which ICTs are you familiar with?
Destop (Personal Computer)
Laptop
Smartphone
Tablet
Other, specify………………………

2.3 Which ICT do you use everyday?
Destop (Personal Computer)
Laptop
Smartphone
Tablet
Other, specify………………………

2.4 Do you ever use the Internet?
Yes
No

2.5 If yes, how many hours do you spend online per day, or use the Internet
$0 \leq \alpha \leq 1$
$1 < \alpha \leq 2$
$2 < \alpha \leq 3$
$3 < \alpha \leq 4$
$4 < \alpha \leq 5$
$\alpha > 5$

2.6 How often do you use the Internet, Social Media or chat service for
2.6.1 Lesson preparation
$0 \leq \alpha \leq 1$
$1 < \alpha \leq 2$
$2 < \alpha \leq 3$
$3 < \alpha \leq 4$
$4 < \alpha \leq 5$
$\alpha > 5$

2.6.2 Research for your own study
$0 \leq \alpha \leq 1$
$1 < \alpha \leq 2$
$2 < \alpha \leq 3$
$3 < \alpha \leq 4$
$4 < \alpha \leq 5$

$\alpha > 5$

2.7　Do you use Internet to share study material with students
　　　Yes
　　　No

2.8　Do you use Social Media service to share study material with students
　　　Yes
　　　No

3. TRAINING

Please indicate with a tick whether you have had professional development in any of the ICT areas listed below?

Professional Development	Have you had it?	
	YES	**NO**
Training in the use of computers / basic computer literacy		
Word processing (e.g. MSWord)		
Spreadsheets (eg. Excel)		
Presentation software (eg. PowerPoint)		
Databases (eg. Access)		
Training on how to integrate technology within the curriculum		
Internet and email		
Social media		

4. LEARNERS (Please tick an appropriate answer)

4.1　Are most of the school learners computer literate?
　　　Yes
　　　No

4.2　Do you have computer studies in this school?
　　　Yes
　　　No

4.3　If yes, what computer tools and applications do you teach your learners?

Microsoft Office (e.g. MS Word, PowerPoint, excel etc.)
Microsoft Outlook (Emails)
Programming
Maths studies
Other
If other, please specify………….

4.4   Do most of your learners own a laptop?
Yes
No

4.5   If yes, what do they use their laptops for?
Assignments
PowerPoint Presentations
Emails
Personal Stuff
Other
If other, please specify…….

4.6   Do most of your learners own smartphones?
Yes
No

4.7   If yes, what do they use their smartphones for?
Learning
Social Media
Calls and SMS messages
Other
If other, please specify………

5. **ACCEPTANCE OF E-LEARNING** (Please tick an appropriate answer)

5.1   Does the school make use of computer-based tools for teaching?
Yes
No

5.2   Does the school make use of computer-based tools for learning?
Yes
No

5.3   Do you think ICT can help improve the quality of teaching and learning?
Yes
No

5.4   Does the school have ICT access or Internet?
Yes
No

5.5   If no, does the school want ICT access or Internet?
Yes

No

5.6 Do you think ICT access could improve the school's grade 12 results?
Yes
No

5.7 Do you think ICT access could improve the understanding of the subjects?
Yes
No

5.8 Do you think ICT access could improve learner participation?
Yes
No

5.9 Would the use of computers and internet improve learner interest in the
subject
Yes
No

6. MANAGEMENT (Please tick an appropriate answer)

6.1 Does the school have someone that can provide technical support for its computers?
Yes
No

6.2 If no, would it need technical support from someone outside of the school?
Yes
No

6.3 Does the school have safe computer labs?
Yes
No

6.4 If no, are safe computer labs part of the school's future plans?
Yes
No

7. SOCIAL AND CULTURAL AWARENESS (Please tick an appropriate answer)

7.1 Would the school consider sponsorship from government or private sector?
Yes
No

7.2 If yes, which of the following ICTs and tools would the school ask for?

Desktops (Personal Computers)

Laptops
Internet Access
Learning Software like Microsoft office
Other
If other, please specify……

7.3   Would the school ask the local community to protect the school's
        Computers or Laptops?
        Yes
        No

7.4   If yes, how would this be achieved?
        Through the School Governing Body
        Learners
        Other
        If other, please specify………

Appendix B: Ethical clearance

Cape Peninsula
University of Technology

P.O. Box 1906 • Bellville 7535 South Africa •Tel: +27 21 4603291 • Email: fbmsethics@cput.ac.za
Symphony Road Bellville 7535

Office of the Chairperson Research Ethics Committee	Faculty:	**BUSINESS AND MANAGEMENT SCIENCES**

At a meeting of the Faculty's Research Ethics Committee on **2 May 2018**, Ethics Approval was granted to **Unathi Gqontshi (201082039)** for research activities of **MTech: Business Administration** at the University of the Cape Peninsula University of Technology.

Title of dissertation/thesis/project:	LEARNING DYNAMICS IN THE 21ST CENTURY: CHALLENGES OF UNDER-RESOURCED SCHOOLS IN RURAL SOUTH AFRIC Lead Researcher/Supervisor: Prof. E Ruhode

Comments:

Decision: APPROVED

	14 May 2018
Signed: Chairperson: Research Ethics Committee	Date

Clearance Certificate No | 2018FBREC534

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