Teacher experiences in using digital technology in the early grades to support teaching and learning

By

Candice Wilson

Submitted in partial fulfilment of the requirement for the degree

MAGISTER EDUCATIONIS

In the Faculty of Education

at the

University of Pretoria

November 2017

DECLARATION

I, Candice Wilson, hereby declare this MEd dissertation:

Teacher experiences in using digital technology in the early grades to support teaching and learning

to be my original work and that all the sources I have consulted have been acknowledged.

---------- 2017/11/30 ----------

Signature Date

- - o O o - -

ETHICS CLEARANCE CERTIFICATE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE	CLEARANCE NUMBER: **EC 16/06/01**
DEGREE AND PROJECT	M.Ed Teacher experiences in using digital technology in the early grades to support teaching and learning
INVESTIGATOR	Ms Candice Wilson
DEPARTMENT	Early Childhood Education
APPROVAL TO COMMENCE STUDY	05 May 2017
DATE OF CLEARANCE CERTIFICATE	13 December 2017

CHAIRPERSON OF ETHICS COMMITTEE: Prof Liesel Ebersöhn

CC

Ms Bronwynne Swarts
Dr Roy Venketsamy
Ms Linda Bosman

This Ethics Clearance Certificate should be read in conjunction with the Integrated Declaration Form (D08) which specifies details regarding:

- Compliance with approved research protocol,
- No significant changes,
- Informed consent/assent,
- Adverse experience or undue risk,
- Registered title, and
- Data storage requirements.

ETHICS STATEMENT

Candice Wilson has obtained, for the research described in this work, the applicable research ethics approval. I declare that I have observed the ethical standards required in terms of the University of Pretoria's "*Code of ethics for researchers and the Policy guidelines for responsible research,*"

Signature: 

Date: 2017/11/30

ACKNOWLEDGEMENTS

I would firstly like to thank and honour my Heavenly Father who provides me with the strength and perseverance to conquer all challenges. It is only by His unconditional love and unfailing grace that this dissertation was possible and has come to completion.

It is with a very thankful heart that I would like to acknowledge the following people for contributing to the successful completion of this dissertation

- My wonderful family, a very special thank you. Without your love, support and encouragement I would never have completed this study. To my wonderful father and mother, you have given me the opportunity to build my dream by creating a secure foundation in me. Your unconditional love and support in every aspect of my life is truly appreciated. Words could never convey my appreciation for all the sacrifices you have made to ensure I have an opportunity to reach my full potential. To my dear brother, your love support and encouragement pulled me through the tough times. I truly appreciate you.

- My supervisor, Dr Venketsamy for his guidance, advice, patience and unconditional support throughout my studies. Your encouragement and kind nature was a true comfort every step of the way. Thank you for everything I could learn from you. You are a role model to me.

- Dr Bosman for her advice and guidance throughout my studies. I truly appreciate your input and support.

- My colleagues at school for always encouraging me during the difficult times. It was a privilege to complete my studies knowing I have a great team behind me, ready to provide me with support and advice.

- Anneline du Preez for the copy editing of my dissertation. Thank you so much for your friendliness and excellent work.

- To all who supported me, whose names I might not have mentioned, I thank you.

- - o O o - -

SUMMARY

The use of technology is expanding at an increasing rate across the social and economic sectors around the world (Can-Yaşar, Inal, Özgün & Kandir, 2012). In the South African education system, technology has weaved its way into the classroom. The Department of Basic Education, together with various stakeholders, is increasingly supporting schools with digital technology to strengthen teaching and learning (Department of Basic Education, 2004). Educational technology and its implementation in educational programmes have grown and developed concurrently, and has opened up a new world for learners and teachers. Consequently, teachers need to adapt and develop their teaching methods in order to utilise this evolution in learning (Can-Yaşar et al., 2012:375). Parette, Hourcade, Blum, Watts, Stoner, Wojcik and Chrismore (2013:172) assert that learners grow up in an ever-changing world and need to keep up with technology. It is therefore the responsibility of teachers to understand the novel ways in which learners can harness developing technologies in their efforts to learn. For these reasons, it is imperative for teachers to accommodate modern thinking and to facilitate learner development.

The focus of my study is on teachers' experiences in the use of digital technology to support teaching and learning. The Technological Pedagogical and Content Knowledge (TPACK) model developed by (Koehler & Mishra, 2006) provided the theoretical framework used to support this study. Qualitative in nature and making use of case studies, semi-structured interviews were held with ten participants to gather the relevant data, attempting to answer the research question: How do early grade teachers (R-3) experience the use of digital technologies as a resource to support teaching and learning?

The findings suggest that early grade teachers are in favour of the use of digital technologies in their classrooms to support teaching and learning. However, due to various factors, it is not used and implemented successfully. It is recommended that to improve the use of digital technologies, teachers must be fully trained and provided with appropriate resources. Furthermore, continuous support from departmental officials will strengthen the use of digital technologies and improve learner performance and the quality of teaching and learning.

LANGUAGE EDITOR

AdP
language • editorial • communication

30 November 2017

To whom it may concern

CONFIRMATION OF COPY EDITING

This is to confirm that I have copy-edited the dissertation entitled “Teacher experiences in using digital technology in the early grades to support teaching and learning”, written by Candice Wilson.

Anneline du Preez
Language specialist and owner: AdP

KEYWORDS

- Digital technology
- Teaching
- Learning
- Early grades

- - o O o - -

TABLE OF CONTENTS

LIST OF FIGURES

- - o O o - -

LIST OF TABLES

- - o O o - -

CHAPTER 1
INTRODUCTION AND ORIENTATION

1.1 INTRODUCTION

Technology has been expanding rapidly over the last few years (Can-Yaşar, Inal, Özgün & Kandir 2012). Educational technology and its implementation in educational programmes have grown and developed concurrently, which has opened up a new world for both learners and teachers. However, teachers need to adapt and develop their teaching methods in order to utilise this evolution in learning (Can-Yaşar et al., 2012). Parette, Hourcade, Blum, Watts, Stoner, Wojcik and Chrismore (2013) assert that learners grow and learn in an ever-changing world. It is the responsibility of teachers to understand the novel ways in which learners can harness developing technologies to improve their learning. It is imperative for teachers to accommodate modern thinking and the use of technology to facilitate learner development.

Since education technology has developed so rapidly and speedily, it is clearly evident that there is a need for a shift in focus from a teacher-centred to a learner-centred approach. Teachers should develop new strategies of teaching that make use of digital technology in teaching and learning programmes to support and attend to all learners and their unique learning needs. These strategies may include developing appropriate resources that do not overstimulate or draw attention to unimportant information (Landsberg, Krüger & Nel, 2005), but rather enhance and develop better understanding in the learning process. This is only possible is a technological teaching culture is adopted by all teachers.

There is an increasing number of learners worldwide who are experiencing barriers to learning (Roualdes, 2013) and who therefore need support in teaching and learning. The use of digital technology in teaching and learning is a powerful tool that can support learners. It is therefore important that teachers

become accustomed to, and familiar with the use of technology to improve the quality of teaching and learning.

The aim of this study is to investigate teachers' experiences of using digital technology in the early grades to support teaching and learning. The focus is on improving teachers' understanding of using digital technology in the early grades to effectively support their teaching to accommodate the diverse needs of learners and the challenges they experience (Ayers, Mechling & Sansosti, 2013).

1.2 RATIONAL OF STUDY

The need for this research study arose from my own experiences as an early grade teacher. When discussing and developing new and innovative ways of teaching and supporting the diverse learning needs of our learners with co-workers, it was concluded that the development and use of digital technology programs to support teaching and learning was a challenge. Most of my peers chose not to make use of digital technology to support teaching and learning in their classrooms, even when having access to a wide range of digital technologies. This may be ascribed to their perception of not having appropriate knowledge or expertise to effectively develop and use such programs.

As a young and eager early grade teacher, I set out with the focus of better understanding the challenges my co-workers were experiencing in this area. As I developed and used digital technological support tools in my classroom, I found that the vast number of technological tools available (Kagohara, Van de Meer, Ramdoss, O'Reilly, Lancioni, Davis, Rispoli, Lang, Marschik, Sutherland, Green & Sigafoos, 2012) made the development of support programmes a trial-and-error and time-consuming process. I realised that I lacked skills in both pedagogical and technological knowledge areas, as well as in the integration of all knowledge areas (Koehler & Mishra, 2006).

The question that arose was whether the challenges observed were also experienced by other early grade teachers. This resulted in a viable

investigation into whether the problems and challenges experienced were characteristic of the specific environment, or whether teachers in other schools also experienced similar challenges.

Roualdes (2013) states that not all learners benefit from the educational resources available because of a number of challenges preventing the appropriate use and implementation of the resources by teachers. Digital technology is one such resource that is poorly implemented in schools, and too often it is ineffective. This seems to be due to the lack of teachers' knowledge and understanding of the use and implementation of digital technologies as teaching and learning support tools. Wilson, Brice, Cater, Fleming, Hay, Hicks, Picot, Taylor and Weaver (2011) support this statement by explaining that although some schools have the appropriate resources at their disposal, these are not used effectively and appropriately. According to Campigotto, McEwen and Epp (2012) the use of digital technology in supporting teaching and learning has not received enough attention and is regarded as under-researched. In contradiction to this statement, Ayers, Mechling and Sansosti (2013) posit that there is a growing body of research on this topic in other countries. As South Africa is a developing country, one of the government's major goals is to reduce the digital divide, which includes many different initiatives. One of these initiatives were outlined in White Paper 7 on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs) (Republic of South Africa, 2004) promoting the use of digital technologies to support teaching and learning. This goal, stipulating that by 2013 all teachers and learners should be able to use information and communication technology (ITC), has not yet been achieved. This is assumingly due to a number of determining factors such as teacher reluctantly, financial implications and many more. It is clear that in the South African context, this matter should receive attention – encouraging the development of a holistic view of digital technology use as a teaching and learning support tool – to achieve these goals and promote development.

For this reason, this study aims to develop a better understanding of South African early grade teachers' experiences when it comes to the implementation

of digital technology to support teaching and learning. Insight into both the successes and challenges teachers experience may present viable opportunities for them to more effectively teach and support learning when using digital technology, and consequently to give learners the opportunity to reach their full potential.

1.3. PURPOSE STATEMENT

The question no longer is whether the use of technology in the education system has a positive or a negative impact; the focus has shifted towards how technology can be used to enhance teaching and learning programmes (Palaiologou, 2014).

Roualdes (2013) indicates that many early grade teachers admit to not being prepared for the challenges of the diverse learning needs of learners in their classrooms. Teachers find it difficult to adapt the curriculum to accommodate the diversity of learning needs (Wilson et al., 2011). These and many other experiences often prevent the effective implementation of digital technological tools in the classroom (Varol, 2013). In order to gain insight into the lived experiences of early grade teachers regarding the use of digital technology, as well as the factors that influence the implementation of digital technologies, the intention is to explore and describe early grade teachers' experiences when using and implementing digital technological devices as tools to support teaching and learning.

1.3.1 Possible contributions of the study

This study attempts to understand the lived experiences of early grade teachers when using digital technologies as tools to support teaching and learning, thus creating a better understanding of how digital technologies are used in early grade classrooms.

By better understanding the lived experiences of early grade teachers, a sense of how to support teachers to effectively implement digital technologies as a

tool to support teaching and learning may be developed. This study can also serve as a basis for further research, given that learners must be supported in such a way that teaching and learning can take place effectively, with the focus on preparing and equipping learners with the tools needed to be successful in the 21st century (Fan, 2012). This study may assist the Department of Basic Education to take a more vigorous approach to ensuring that the goals set out in White Paper 7 (Republic of South Africa, 2004) on the use of digital technologies in schools are achieved.

1.4. RESEARCHER'S ASSUMPTIONS

The following are general assumptions I, as researcher, hold regarding the proposed study:

I assume that most early grade teachers who have access to digital technology as a teaching and learning resource make use of it regularly. My assumption is that younger teachers – between the age of 23 and 40 – will make use of digital technology more often and with greater ease than older teachers.

Seeing that Education White Paper 7 (Republic of South Africa, 2004) stipulates specific goals on the training of all educators in the implementation of digital technology in teaching and learning programmes, it is my assumption that most teachers have been effectively trained to implement and make use of digital technology in their teaching and learning programmes.

1.5. RESEARCH QUESTIONS

1.5.1 Main research question

How do early grade teachers experience and use digital technologies as a tool to support teaching and learning?

1.5.2 Secondary research questions

- How do early grade teachers use and implement digital technologies as a teaching and learning tool?
- Which factors influence the implementation of digital technologies in early grade classrooms as a tool to support teaching and learning?

1.6. CONCEPT CLARIFICATION

For this study, it is necessary to clarify the following concepts: “digital technology”, “early grades”, “teaching”, “learning” and “support”.

1.6.1 Digital technology

“Digital technology” can be explained as digitised information that is recorded in binary code, which represents words or images (Schafer, 2003). In this specific study, “digital technology” will refer to technological devices such as iPad and similar tablet devices. The term also includes other sources of electronic contents, such as internet multimedia and satellite televisions (Republic of South Africa, 2004). As Beschorner and Hutchison (2013) state, the use of an iPad in a classroom setting has brought about a noteworthy influence on the acquisition of concepts and skills, with little assistance from the teacher.

1.6.2 Early grades

As defined by the Oxford English Dictionary of Education (Oxford Online English Dictionary, 2016), “early years foundation stage” refers to the framework that sets out the national standards for teaching, learning and development of learners from birth to age birth to age nine.

In this study, the term “early grades” refers to the formative grades at school, namely Grade R to Grade 3. The main focus of early grade education is to develop primary skills and knowledge, so that further learning can take place.

1.6.3 Teaching

As defined by Pumilia-Gnarini, Favoron, Pacetti, Bishop and Guerra (2013), teaching is the provisional stimulation of the philological and intellectual growth of a person through the sharing of knowledge and experiences that are organised within a discipline. In this study, I will refer to “teaching” as the construction of specific interventions to promote the expansion of knowledge and skills.

1.6.4 Learning

“Learning” can be defined as the process of acquiring knowledge or skills, leading to a modification in behaviour and development (Oxford Online English Dictionary, 2016). As stated by Siemens (2005), learning can no longer take place if personal experience is not connected to the learning activity. In this study, “learning” refers to exactly that: the acquisition of new knowledge and skills that enhance development.

1.6.6 Support

“Support” can be defined as the use of tools that provide assistance (Oxford Online English Dictionary, 2016). In the context of this study, “support” can be described as any activity beyond the prescribed teaching content that contributes to the learning experience (Green & Milbourne, 1998) in the process of teaching and learning and the acquisition of knowledge and skills.

1.7 RESEARCH METHODOLOGY

The research methodology encompasses the epistemological paradigm and methodological approach. This section further outlines the research method and sampling procedure, data collection instruments and data analysis.

1.7.1 Research approach and design

This study was guided by a qualitative research approach with an interpretive paradigm (Cohen, Manion & Morrison, 2007) to investigate how early grade teachers experienced the use of digital technologies in their classrooms to support teaching and learning. An interpretative paradigm focuses on the subjective experiences gathered from the participants in the specific topic area (Cohen et al., 2007). Focusing on people, and their understanding and experiences of the world around them is the fundamental building block of the interpretive study (Yin, 2011). To form a holistic view of the events recounted by the participants in this study, it was decided it would be best to use an interpretive perspective (Yin, 2011). The research design was a case study from which information was collected to improve the understanding of the phenomenon being investigated. A case study can be defined as an investigation into a specific phenomenon, with the aim of obtaining better comprehension of the specific situation being explored (Cohen et al., 2007; Nieuwenhuis, 2013c). A case study can consist of a single case or multiple cases (Yin, 2014).

In this study I utilised a multiple-case study research design to provide a comprehensive description of the experiences and practices of early grade teachers in the use of digital technologies to support teaching and learning. By using multiple cases, I had the opportunity to analyse the data of each individual case study, but also across cases (Baxter & Jack, 2008). A better understanding could be obtained on the experiences and practices of early grade teachers when implementing digital technologies by creating a holistic view of the phenomenon and taking all possible factors that influence the use of it into account. Yin (2014:19) explains that if the main research question contains the word “what”, the researcher would use an exploratory case study research method. I studied the cases of early grade teachers who use mobile technologies as tools to support teaching and learning. As the researcher, I explored multiple situations, expecting multiple sets of experiences and perspectives (Baxter & Jack, 2008).

By approaching the study in this manner, I was able to create a comprehensive understanding of early grade teachers and their experiences of the use and implementation of digital technologies to support teaching and learning.

1.7.2 Research context

Primary school teachers were the main focus of this study, drawing attention to those teachers who are using digital technology as a teaching resource in their classes. One site was selected based on the predetermined sampling criteria. Preselected criteria relevant to the research question (Creswell, Ebersohn, Eloff, Ferreira, Ivancova, & Jansen, 2010) was set out before-hand, ensuring that relevant data could be collected. Through the use of purposive sampling data could be gathered from respondents who have experienced the central phenomenon being investigated (Creswell et al., 2010).

The school selected is a long-established urban primary school in the heart of Gauteng. This state primary school facilitates almost a 1 000 learners, most of whom are underprivileged. The school was selected by a project that sponsors mobile devices to schools, making it the perfect setting for me to conduct research.

1.7.3 Sampling procedure

Sampling can be described as the process of selecting participants who can supply the researcher with the best possible data to answer the research questions (Nieuwenhuis, 2013c). A purposive sampling strategy was used to identify the research sites and participants. Cohen et al., (2007) describe the use of purposive sampling as a way to access people who are knowledgeable on the phenomenon that is being researched. Consequently, in this study, teachers who are knowledgeable about the use of digital technologies as teaching and learning tools in foundation phase classrooms were purposefully selected.

Specific sampling criteria were set out for the school, as well as the early grade teachers, to guide the purposive sampling process (Nieuwenhuis, 2013c), ensuring a data-rich environment (see section 3.5 for a discussion on sampling criteria).

1.7.4 Data collection process

Ethical approval was obtained from the University of Pretoria. Data collection was conducted over a period of two months in five different phases, including a pre-data collection phase. During the pre-data collection phase I conducted semi-structured interviews with two of my colleagues. This pre-data collection phase was used to determine whether or not the questions set out for the semi-structured interviews were relevant and could lead to answering the research questions. During Phase 1, I approached schools and early grade teachers to obtain permission from all relevant parties to conduct the research. Phase 2 included informing all willing participants of the process of data collection, as well as setting an appointment with willing participants to conduct the semi-structured interviews. Phase 3 entailed conducting the semi-structured interviews with all participants, as well as the collection of documents, such as policies regarding the use and implementation of ICTs in schools. Phase 4 involved the analysis of all the data that was collected.

1.7.5 Data collection methods

Data collection instruments included the following: semi-structured interviews, journal keeping (field notes) and documents.

A semi-structured interview schedule was designed and used to collect data from early grade teachers regarding their experiences when implementing and using digital technologies to support teaching and learning. This ensured the creation of a comprehensive understanding of the lived experiences of the participants and how they perceived the use of digital technologies in their classrooms to support teaching and learning (Seidman, 2006). Throughout the data collection process, I made use of journalistic notes to document all

observations, relevant conversations, thoughts and questions that arose during this process (Gambold, 2010 as cited in Mills, Durepos & Wiebe). The documents analysed in this study were public documents (Olsen, 2010 as cited in Mills, Durepos & Wiebe) relating to the use and implementation of digital technology in early grade classrooms, as set out by the Department of Basic Education.

1.7.6 Data analysis

When analysing qualitative data, the challenge lies in the process of trying to make sense of the massive amount of data gathered (Patton, 2001). As described by Creswell (2007), data analysis is the process of preparing the data so that conclusions can be drawn. In this process an in-depth understanding of the data collected is developed, so that the data and its meaning can be holistically interpreted.

The data was summarised and organised by using a table for implementing case study research (see Table 3), helping me, as the researcher, to determine which of the data gathered was relevant and applicable (Hancock & Algozzine, 2006). After all the data was organised and summarised, themes and subthemes were identified (Patton, 2001) relating to how early grade teachers use and experience digital technologies to support teaching and learning.

1.8 ROLE OF THE RESEARCHER

When collecting qualitative data, the researcher is perceived as the research instrument, and the researcher's subjectivity plays a key role in the data gathering process (Nieuwenhuis, 2013c). The primary goal of this study was to acquire an in-depth understanding of the lived experiences of participants. Consequently, in this study, I was the primary research instrument and collected data first-hand from the participants.

Data collection and analysis can be susceptible to one-sidedness and favouritism.

For this reason, as the researcher, I objectively collected and analysed the data to ensure that a true and trustworthy reflection of the data was portrayed (McMillan & Schumacher, 2006; Creswell, 2007). The roles I adopted was that of an interviewer and interpreter (Creswell, 2007). In this regard, I prepared, structured and conducted semi-structured interviews, as well as collected relevant public documents focusing on the use and implementation of digital technology in the South African education system. Authentic recordings of the phenomenon were taken (McMillan & Schumacher, 2006), and I interpreted what was seen, heard and understood (Creswell, 2007). It was imperative that, as the researcher, I considered all ethical measures throughout the research study.

1.9 QUALITY CRITERIA

By addressing the trustworthiness (section 3.6) of this study and pointing out the limitations encountered during the research process (section 5.5), I attempted to ensure the quality of this study. The use of a pilot study was implemented to ensure that all questions asked during the semi-structured interviews were relevant in answering the research question, and to ensure that participants fully understood the questions being asked. The implementation of this phase ensured that the data collected was relevant and trustworthy.

Due to the rich data collected, some of the findings in this study may be transferable, but in general the transferability of this study is limited (Creswell et al., 2010).

1.10 ETHICAL CONSIDERATIONS

As described by Burton and Bartlett (2009) all ethical principles, such as honesty, avoiding harm, informed consent, privacy and confidentiality, were complied with regarding all participants in this study.

The ethical principles, as stipulated by the Ethics Committee of the University of Pretoria, were upheld through the course of this study. These principles

included the voluntary participation of all participants – letters and information meetings were used to inform all participants. Informed consent was obtained from all participants in this study. Interviews were recorded openly with the consent of the interviewees (Bogdan & Biklen, 2003). All participants were informed of their right to privacy, confidentiality and anonymity (Cohen et al., 2007). As the researcher, I treated all information gathered from all participants with confidentiality at all times (De Vos, Strydom, Fouché & Delport, 2002). Pseudonyms were used to protect the identity of all early grade teachers. None of the participants were exposed to any harm as the study was conducted, and safety in participation was ensured. None of the participants were misled, and thus I maintained trust between me and all participants during the course of the research study.

All participants were informed that withdrawal from the study was possible at any time. All participants were granted the opportunity to read the research report before publication, in this way forming part of the validation process of the research.

1.11 OUTLINE OF CHAPTERS

The outline of this study is provided below.

In Chapter 1, I provided an overview of the enquiry. This included the introduction, rationale, research problem and aims of the research project. Chapter 1 also included a clarification of the main concepts of this study, providing the reader with a clear understanding of the discussions in the chapters that follow. The role of the researcher, as well as the ethical considerations and quality criteria, was discussed in this chapter.

In Chapter 2 the literature review is presented. Literature was reviewed with a focus on the specific research questions of this study. This chapter offers a wide review of the literature regarding this phenomenon in the international context, as well as in the South African context. It also outlines the conceptual and theoretical framework that is underpinning this research project.

Chapter 3 explains the research methodology of this study and describes the selected research design study. This chapter also describes the data collection strategies employed and the analysis techniques used. Finally, trustworthiness and ethical considerations are discussed.

In Chapter 4 the data collected is presented. The analysis of the data and the findings of this research project are also discussed. Themes and sub-themes are used to present all the data gathered. Lastly, the different case studies are compared in this chapter.

Similarities and contradictions between the literature and the data collected are studied and comparisons are drawn in Chapter 5. The findings are argued in relation to the existing literature in an attempt to answer the research questions. The limitations and recommendations of this study are presented in this chapter.

- - o O o - -

CHAPTER 2
LITERATURE REVIEW:
TEACHERS' EXPERIENCE IN USING DIGITAL TECHNOLOGY IN THE EARLY GRADES

2.1 INTRODUCTION

In Chapter 1, I provided an overview of the research project. This chapter focuses on an in-depth literature review on the use of digital technology in the classroom as a resource to support teaching and learning. The review pays particular attention to the understanding, implementation and use of digital technology in the classroom and its influence on the learning and development of learners in the 21st century. Firstly, as the researcher, I will discuss the use of digital technology as a teaching and learning tool and how its successful implementation and use can enhance learners' learning experiences. The disadvantages of the use of digital technology in the classroom will also be discussed. This is followed by an investigation into how teachers experience the use and implementation of digital technologies as a teaching and learning resource, and a discussion on the factors that influence the successful implementation of digital technology in classrooms. The theoretical framework that will be used to support this study will also be discussed. Finally, a conclusion of chapter 2 will be given.

2.2 DIGITAL TECHNOLOGY AS A TEACHING AND LEARNING RESOURCE

As stated by Kayalar (2016), our lives revolve around technology and its continuous use. Technology is used on a daily basis in some way or form to simplify our daily activities, thus making it inevitable that digital technologies would become part of the teaching and learning process (Kayalar, 2016).

Digital technology integration into the classroom can be described as the process in which digital technologies are used as tools to support the process of teaching and learning (Keengwe, Pearson & Smart, 2009). This process involves the construction of learning programmes that are best suited to incorporate digital technologies as teaching tools into the curriculum to enhance and provide a meaningful learning situation for all learners (Keengwe et al., 2009). It is important to maintain focus in this process of development and integration. As Kayalar (2016) states, the integration of digital technologies into learning situations is not to teach learners how to use the technology, but to help educators use digital technologies as a tool to enhance learning experiences. O'Mara and Laidlaw (2011) suggest that the focus should be on the implementation of digital technology as a tool, and that the methods used should ensure that the use of digital technology is beneficial to all learners.

Yurdakul, Odabasi, Kilicer, Coklar, Birinci and Kurt (2012) stress the importance of teachers developing technological pedagogical knowledge in order to have a better understanding of the learners' needs and the tools that can be implemented to support optimal development. As such, early grade teachers need proficient pedagogical content knowledge in order to establish a holistic view of the way in which technology influences the development of learners (Levy, 2009).

Moreover, in order to support learners more efficiently, teachers must educate themselves to gain a deeper understanding of how learners acquire knowledge and skills. They should have a sound knowledge of the background of all learners and their capabilities when developing and integrating digital technology into the classroom (Can-Yaşar et al., 2012), so that they can provide learners with an alternative way in which they can develop their knowledge and skills (Levy, 2009).

Kayalar (2016) states that the most important component of effective digital technology integration into learning experiences is the skill and ability of the teacher. The teacher's ability to shape the integration of digital technology into learning activities to fully support all learners in the classroom is fundamental.

Digital technology is only one of many tools that can be used to successfully support teaching and learning activities (Keengwe et al., 2009). It is important to remember that the use of digital technologies is only a support tool and not a substitute for effective teaching (Keengwe et al., 2009). With regard to the decision-making process about classroom practice and the use of digital technologies, teacher knowledge is crucial (Varol, 2013). The educator is the key component in the successful implementation of digital technologies in the teaching and learning process. Kayalar's (2016) view is that if teachers are not prepared and knowledgeable when it comes to the use and integration of digital technologies in the learning process, the incorporation of technology in the learning programme cannot be successful.

Digital technology is a useful tool that can be used to aid teaching and learning experiences. In this regard, Huddleston (2016) is of the opinion that the focus of digital technology integration has become the technological device and not the successful implementation of the technological device into the learning programme (Huddleston, 2016).

2.2.1 Advantages of using digital technology as a teaching and learning resource

Learners belong to a technologically driven generation (Huddlestone, 2016). As such, they are interested in technology and focused on its use and development (Gallardo-Echenique, Marqués-Molias, Bullen & Strijbos, 2015). By using technological devices that are of interest to screen-orientated learners, the learners' attitude towards learning changes, opening up a gateway for successful learning (Yurdakul et al., 2012).

According to Blair (2012), the role of digital technology in the classroom needs to be seen in a new light. It is crucial for learners to develop certain skills to be able to achieve success in a technology-based life.

In this regard, critical thinking, creativity, communication and collaboration are skills that must be acquired and developed in a technology-supported

classroom and learning environment (Blair, 2012). According to Kayalar (2016), the use of technology grants teachers the opportunity to redesign and modernise teaching resources to suit various learning situations and environments, thus developing a holistic and interactive learning environment that captures the attention of all learners. To this end, the focus on the learners and on creating opportunities best suited to them may enable them to reach their full potential (Hennessy, Habler & Hofmann, 2015). In this regard, Wilson et al., (2011) maintain that digital technology gives learners the opportunity to experience and gain access to the world around them. They also get the opportunity to repeat any learning experience at their own pace, as many times as they need to. This is made possible by the fact that digital technology devices have become more accessible to both teachers and learners (Attard & Northcote, 2012).

Fan (2012) found that independent learning could take place when digital technology was effectively implemented to support learning programmes. Ayres et al., (2013) support the above by stating that learners are drawn to digital technology, and are motivated to learn through the use of digital technology. Apart from the seemingly positive effects of the use of digital technology on learner motivation, it was also found that skill acquisition improves when technology is effectively used in educational programmes (Ayres et al., 2013). Lieberman, Bates and So (2009) maintain that the use of digital technologies introduces young children to concepts such as abstract thinking and collaborative learning, as well as developing their skills in reasoning and problem solving. In support of this statement, Beschorner and Hutchison (2013) believe that using developmentally appropriate, interactive technology has a significant influence on the holistic development of the young learner. Beschorner and Hutchison (2013) and Lieberman et al., (2009) are convinced that cognitive development is influenced positively by the use of technology at a young age. In this regard, Johnson (2010) argues that when the internet is used during periods of rapid development, cognitive and psychological development are stimulated.

Johnson (2010) further believes that the use and access to the internet has a direct influence on learners' school readiness and its development. This factor may be ascribed to learners being exposed to reading and mathematical thinking at a very young age (Johnson, 2010).

Lieberman et al., (2009) and Levy (2009) argue that learners' vocabulary, spelling skills and reading showed improvement when digital technology was implemented into teaching and learning programmes. Adding to this view, Beschorner and Hutchinson (2013) state that the use of digital technology and language applications enhances reading, listening, speaking and writing skills, as well as the connections between these language components and skills. Levy (2009), on the other hand, found that reading digital texts enhanced learners' analysis abilities and comprehension. Furthermore, Lieberman et al. (2009) found that letter sound awareness and listening comprehension may also be enhanced while using digital technology (2009). As learners seemingly use technology to develop their own strategies of acquiring language, it seems evident that the teacher should capitalise on this and continue building on this knowledge, rather than starting anew (Levy, 2009).

If developmentally appropriate technology and software is used, the potential to improve learners' mathematical knowledge, and conceptual and related thinking and reasoning skills, may be increased (Lieberman et al., 2009). The use of digital games can also be an asset in supporting learning and development. Engaging in video games allows learners to create new ways of reasoning, thereby developing meaningful interaction that forces them to solve difficult problems (Wilson et al., 2011). Mathematics requires the ability to think in an abstract manner, as well as the ability to solve problems (Landsberg et al., 2011). Problem-solving skills are deemed the most important skills learners need to develop mathematical concepts. Lieberman et al., (2009) mention that arithmetic problem solving, geometric knowledge and spatial reasoning skills are advanced when software developed for mathematical learning is used. From the discussion in this section, it can be concluded that the use of interactive manipulative, sound and visual stimuli is important as learning tools that can support development.

Ke (2008) posits that the use of technology does not only enhance cognitive development, but also has a positive influence on learners' attitudes towards learning in general. Providing learners with learning experiences that are relevant and personally meaningful, blurring the boundaries between formal and informal learning, may make learners more attentive in all learning situations (Terras & Ramsay, 2012). In Johnson's (2010) view, exposure to the use of digital technology is emotionally and socially beneficial to learners. In addition, Marsh (2011) also mentions that learners' social skills development may be significantly influenced by the use of technology.

Wilson et al., (2011) state that exposing learners to familiar technology increases their chances of experiencing success both academically and psychologically. Johnson (2010) supports this statement by stating that the use of digital technology stimulates cognitive and psychological development, which serves as a clear indication that learning and development can be supported and enhanced by the use of digital technology. As such, it seems evident that the use of digital technology may serve as tool to support the development of higher-order thinking and reasoning skills in learners (Keengwe et al., 2009).

The advantages and benefits of using digital technology as a tool to support and develop learning skills seem infinite (Terras & Ramsay, 2012). Therefore the value of using digital technology as a tool to support and develop learning is in selecting the applications wisely with the goal of the activity in mind. Beschorner and Hutchinson (2013) assert that applications must give the learner the opportunity to discover, imagine, solve problems and make choices. Consequently, an important consideration is how the selected programme can support the learner in the best way possible, focusing on the emotions, reasoning and the physical well-being of the learner (Beschorner & Hutchinson 2013). In this regard, questions arose on the problems teachers may encounter in using the selected programmes to the benefit of the learners' development. This might indicate that the methods of implementation are problematic and not the tool or digital device itself (Hart & Laher, 2015).

2.2.2 Disadvantages of using digital technology as teaching and learning resources

While the use of digital technology may have a positive impact on learners, Johnson (2010) warns that overstimulation through the excessive use of digital technology may cause aggression and other emotional problems. In this regard, teachers need to find a balance between stimulation through technology and overstimulation. Wilson et al., (2011) caution against access to an ever-growing corpus of information, intensifying and adding to the challenges that learners face. As such, learners may become swamped by loads of data and become overwhelmed with the unlimited amount of information that is available to them, as well as the expectations of the systems around them to be able to process this information (Johnson, 2010). Therefore, teachers must be equipped and be able to identify the tools available and develop a teaching and learning support system that is appropriate for all learners.

Contrary to Blair's (2012) findings, Masters and Grogan (2015) indicate that young learners are becoming less creative and imaginative because of the use of digital technologies in learning programmes. This statement is supported by Kerckaert, Vanderlinde and Van Braak (2015), as they state that the use of digital technology has a negative impact on the playful learning and development of young learners. Poor concentration and a lack of language development may also be a result of the ineffective use and implementation of digital technologies in learning programmes (Kerckaert et al., 2015). Carr (2010) adds to this view by stating that the irresponsible use of digital technology in the classroom can lead to a cognitive overload, impairing the ability of learners to retain the information gathered. As a result, the learners' ability to learn and effectively create a deeper understanding may be negatively impacted, which may result in a limited amount of information being stored in the long-term memory (Carr, 2010).

Ineffective and excessive use and implementation of digital technology in the classroom may also negatively affect learners' motor development (Kerckaert

et al., 2015). In addition, Huddleston (2016) indicates that the excessive use of digital technology by young learners may cause many different learning problems, such as attention deficit hyperactivity disorder (ADHD), auditory processing disorder (APD) and memory disorders, just to name a few.

Johnson (2010) posits that despite the advantages and disadvantages of using technology in learning programmes, technologically orientated teaching and learning is a given. Even if learners do not have regular access to technological devices, Levy (2009) indicates that they exhibit a level of expertise when working with digital technological devices. It seems therefore crucial that teachers understand and are aware of the learning needs of all learners in this technologically driven world (Parette et al., 2013). This will require a synchronisation and integration of early grade teachers' technological, pedagogical and content knowledge (Koehler & Mishra 2006). In this regard, Chai, Koh, Tsai and Tan (2011) state that without the effective integration of the knowledge areas captured in the Technological Pedagogical and Content Knowledge (TPACK) model, the development of productive learning systems and the integration of technology into these systems, teaching and learning cannot be successful.

The use of digital technology can be beneficial to all learners, but it is important to remember that a balance must be maintained when using digital technology as a teaching and learning support tool, thus technological, pedagogical and content knowledge must be integrated and knowledge must be drawn from all thee knowledge areas, which will ensure that the use of digital technologies enhances learning and success can be experiences by all learners no matter the learning needs in the classroom (Graham 2011).

2.3 FACTORS THAT INFLUENCE THE EFFECTIVE IMPLEMENTATION OF DIGITAL TECHNOLOGY IN THE CLASSROOM

Yurdakul et al., (2012) state that the biggest barrier to technology integration and effective teaching in the 21st century is the lack of knowledge and competency of teachers to effectively implement and manage the use of technology in the classroom. In addition, Roualdes (2013) asserts that many early grade teachers admit to not being prepared to face the challenges of the diverse learning needs of learners in 21st-century classrooms. Consequently, teachers find it difficult to adapt the curriculum to suit the diversity of learning needs (Wilson et al., 2011).

Teacher knowledge, understanding and the ability to integrate and develop educational technological activities that are most appropriate for different learning situations is the most important factor in the successful implementation of digital technologies into the education programme (Kayalar 2016). This requires sufficient content, pedagogical and technological knowledge. Kayalar (2016) argues that although teachers mostly have sufficient content and pedagogical knowledge, they often lack technological knowledge. Along the same lines, Henessy, Habler and Hofman (2015) indicate that many teachers experience difficulty in making the expected connections between theory and the practical implementation of theory. This may be a result of the fact that many teachers in developing countries are not appropriately trained for this task (Henessy et al., 2015). Another factor identified by Henessy et al., (2015) is that training programmes mainly focus on developing the theoretical (content) knowledge of teachers, while the practical implementation may be lacking. Inan and Lowther (2009) furthermore found that, as the age of a teacher increases, their attitude and their use of digital technology in the classroom decreases.

As stated by Afshari, Bakar, Su Luan, Samah and Fooi (2009), older teachers have not been trained to make use of digital technology in their classrooms, because digital technology was not as developed and widely used when they

were trained. This may consequently affect older teachers' use of digital technology in classrooms.

While the rapid development and increasing availability of internet connectivity in first-world countries offer easier access to digital technology for teachers, this is seemingly not the case in developing countries such as South Africa. This is a significant reason why digital technology implementation in classrooms are less effective (Terras & Ramsay, 2012).

Another concern regarding the effective implementation of digital technology in the classroom is that it is time-consuming and it distracts from the main curriculum objective (Henessy et al., 2015). Teachers do not experience receiving assistance in developing and implementing digital technology in educational programmes, especially when they encounter technical difficulties (Keengwe et al., 2009).

Teachers, and their experiences and views regarding the integration process of digital technologies into education programmes are rarely brought into account when policies are designed and when research is done (Henessy et al., 2015). Teachers are the key component in the effective development and implementation of digital technologies in the 21st-century classroom (Kayalar 2016), making it imperative that their experiences and perspectives of the use of digital technologies in the classroom are being considered.

According to Henessy et al., (2015), teacher education and professional development has been neglected, especially in African countries. As a result, the focus has been diverted to the capability of a single technological device and not the holistic integration of the device as a support tool in the education programme (Philip & Garcia, 2013).

The use and implementation of digital technologies into learning programmes and classrooms can be effective in creating a successful learning environment for all learners. Unfortunately, implementation is easier said than done (Philip & Garcia, 2013).

2.4 THE THEORETICAL FRAMEWORK

A theoretical framework can be defined as a system of concepts, assumptions, theories, beliefs and expectations that shape the research (Abend, 2008). The theoretical framework that was used to support this study is the Technological Pedagogical and Content Knowledge (TPACK) model developed by (Koehler & Mishra, 2006). The focus of this study was on the experiences and practices of early grade teachers in implementing digital technologies as teaching and learning tools. The reason for the use of this model is based on Koehler and Mishra's belief that the intricate process of teaching can only take place when a vast variety of knowledge fields are consulted and used (Koehler & Mishra, 2006).

The TPACK model assists in determining teachers' effectiveness when using digital technologies (Archambault & Barnett, 2010). Chai et al., (2011) believe that teachers are not adequately trained to integrate all knowledge fields referred to in the TPACK model, and for that reason the successful implementation of digital technology is not possible.

In my opinion, many challenges other than insufficient training prevent the successful implementation and use of technology as a support tool. The purpose of this study is to explore the experiences and practices of early grade teachers in the implementation of digital technology as a teaching and learning tool. For this reason, data collection focused on gathering information that could shed some light on whether or not teachers are adequately prepared to effectively integrate digital technologies into educational programmes.

Koehler and Mishra (2006) reformulated the Pedagogical Content Knowledge (PCK) concept to adapt it to the context of the modern world of technology and learning. The result is the Technological Pedagogical and Content Knowledge model (TPACK Model) (Koehler & Mishra, 2006). Technology, content and pedagogy knowledge are at the centre of the TPACK model. They form the three primary constituents for teaching with technology.

Koehler, Mishra, Akcoaglu & Rosenburg (2013) state that the relationship between these three constituents forms the essence of the TPACK model, which encapsulates seven knowledge areas that are briefly discussed below:

Technological knowledge refers to the ability of the teacher to understand and use technology (Chai et al., 2011), as well as to adapt to, and learn new technologies (Koehler et al., 2013). In this study, it will be determined whether teachers use digital mobile technologies in learning support interventions and whether they feel comfortable doing it.

Secondly, content knowledge is the knowledge of subject matter (Chai et al., 2011), which consists of theoretical knowledge, procedural knowledge, factual knowledge and conceptual knowledge (Koehler et al., 2013). In the context of this study, content knowledge will be referred to as knowledge of the curriculum and what has to be taught.

Pedagogical knowledge is the knowledge and understanding of the practices and procedures of teaching and learning (Graham, 2011), which include the understanding of how knowledge is constructed and how skills are acquired (Koehler & Mishra, 2006). When referring to pedagogical knowledge in this specific study, it will be done in the context of the ability of the teacher to understand the unique learning needs of each learner, as well as the teacher's understanding of how each leaner must be supported to reach his or her full potential.

Pedagogical content knowledge is the type of knowledge that involves different kinds of content that require different methods of teaching (Koehler et al., 2013). In other words, it is all about knowing the different types of teaching applications and how they can be used to suit the content, as well as how the content should be organised to develop better teaching techniques (Koehler & Mishra, 2006). In this study, pedagogical content knowledge will refer to exactly that – the ability of the teacher to know what to teach at that moment, as well as how to teach it, so that all learners can gain insight and develop effectively.

Technological content knowledge refers to the mutual relationship between technology and content (Chai et al., 2011). It not only includes an understanding of the subject matter, but also knowing how the subject matter can be influenced by the application of technology (Koehler & Mishra, 2006). In this study, it will refer to whether or not teachers have the ability to understand when digital mobile technology can be used to enhance the understanding of the content being learnt.

Chai et al., (2011) describe technological pedagogical knowledge simply as the knowledge of how technology can be used to support and facilitate the application of pedagogy. In this research, it will refer to the ability of the teacher to know how to use digital mobile technology to either enhance the lesson, or to use it as extra support for learners with learning difficulties.

Technological pedagogical content knowledge is the understanding of the interactive relationship that exists between teachers, learners, content, technologies and applications (Archambault & Crippen, 2009). Chai et al., (2009) describe this as the appropriate use of pedagogy and technology to facilitate specific content learning, which is the basis of successful teaching with technology (Koehler & Mishra, 2006). In this study, technological pedagogical content knowledge refers to an understanding of this relationship and the effective implementation of technology to support learners with learning difficulties.

2.4.1 The theoretical framework linked to this study

The TPACK model is useful for understanding, developing and improving tools suitable for effective learning and teaching (Archambault & Barnett, 2010), especially in the context of determining the experiences and practices of early grade teachers when using digital technologies, as well as the challenges faced by teachers when doing so. As stated by Chai et al. (2011), the TPACK model is an effective framework that can cast light on educational problems experienced by teachers in the 21st century. As mentioned by Koehler and Mishra (2006), it is seemingly important that teachers have a firm

understanding of how technological knowledge relates to pedagogical and content knowledge to ensure effective teaching and learning. It was for these reasons that, as the researcher, I chose this theoretical framework to underpin this study.

During data collection, I focused on establishing whether or not teachers had sufficient knowledge, skills and training to successfully implement and use digital technology in their classrooms. The TPACK model was the framework used to construct the semi-structured interview questions, as well as the lens used for analysing the collected data. Themes and subthemes developed that could be identified and the interpreted. This created the opportunity for me as the researcher to comprehensively view the experiences and practices of early grade teachers with using digital technology.

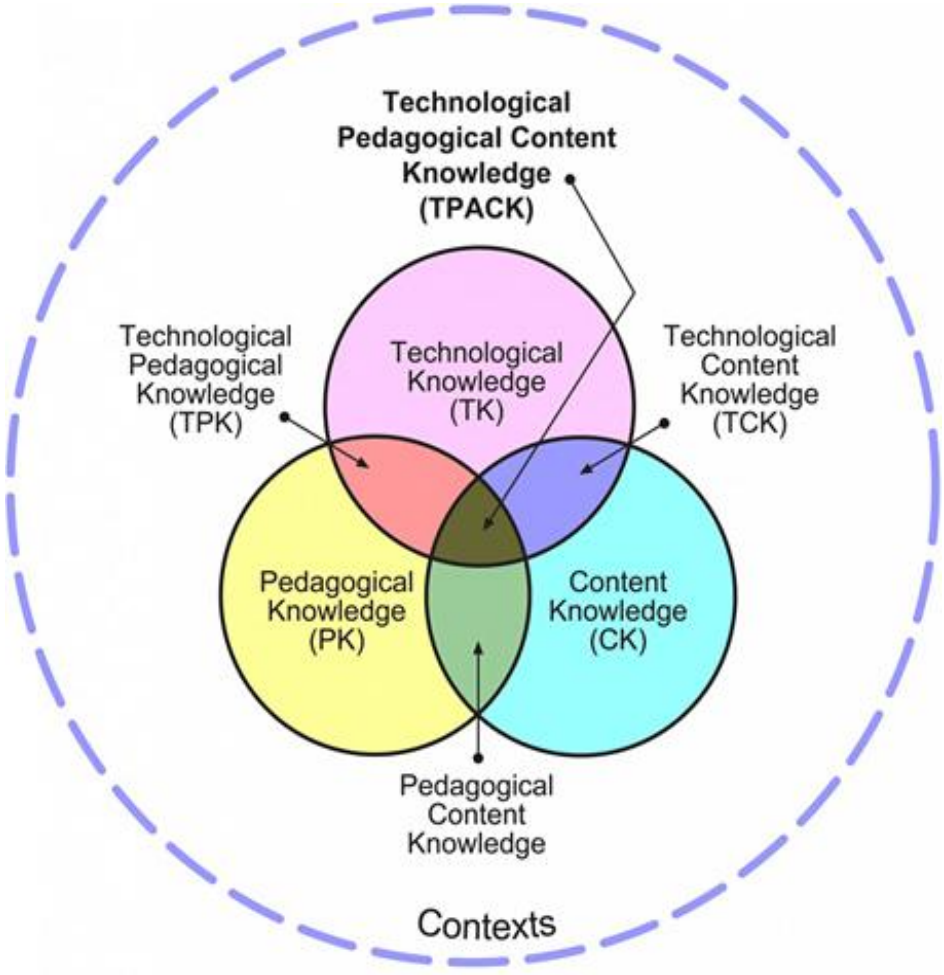

Figure 2.1: The TPACK model (Koehler & Mishra, 2006)

2.5 CONCLUSION

In this chapter, I reviewed literature relevant to the use of digital technology in the early grade classroom as a resource to support teaching and learning. It has been revealed by literature that one of the most serious issues in education is the use and implementation of digital technology in learning programmes (Afshari et al., 2009). The conclusion can be made from the literature studied that the use of digital technology in teaching and learning programmes can be a fundamental tool in new and innovative ways of teaching and learning, capturing the thoughts and imagination of our young learners, and consequently motivating them to learn and develop into young dynamic citizens of our wonderful country. The TPACK model, as theoretical framework for this study, has also been discussed, showing the importance and relevance of teacher development. Without the relevant knowledge and skills to cohesively integrate all knowledge areas, it is apparent that the successful integration of digital technology in our education system is seemingly not possible.

- - o O o - -

CHAPTER 3
RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

In Chapter 2, I reviewed literature on the use of digital technology as a resource to support teaching and learning in the early grade classroom context. In this chapter, I will explain the paradigmatic perspectives of the study and explain the research design I chose. The research design is very important to a research project, as it provides the strategy and framework of how the research would progress (Bogdan & Biklen, 2003; Mouton, 2001; Creswell et al., 2010). In this chapter, I will describe and discuss the data collection strategies I used to gather data, as well as the analysis techniques I employed. Trustworthiness and ethical considerations are also discussed in the chapter.

3.2 PARADIGMATIC CHOICES

The hermeneutics and phenomenology (Brown & Heggs, 2005) for this study are positioned in the qualitative, interpretive paradigm, and thus the approach to this research project is qualitative in nature (Burton & Bartlett, 2009).

3.2.1 Epistomological paradigm

Seeking to understand the deeper implications revealed in the data collected (Somekh & Lewin, 2005), the interpretivist paradigm was used to give me, as the researcher, the opportunity to collect in-depth data, as well as understand the context in which the data is collected. As interaction and conversation with the participants was possible (Creswell et al., 2010), I could gain insight into, and an understanding of how early grade teachers experienced the use of digital technology as a resource to support teaching and learning in their classrooms.

Interpretivist research attempts to understand the phenomena through the meanings people assign to them, assuming that there is not one reality, but many (Creswell et al., 2010). This was kept in mind during the interviews of the foundation phase teachers in the different case studies. Interpretivist studies are carried out in natural contexts, giving the researcher the best possible understanding of the phenomenon being investigated (Creswell, 2007). As the researcher, I did not attempt to manipulate the phenomenon of interest (Norris & Walker, 2005), and thus data collection was not done in an experimental situation but rather in a naturally occurring context (Creswell et al., 2010).

In this research project, the aim was to understand as much as possible of the participants and their experiences without consciously influencing them. The aim of this qualitative interpretivist study was not to generalise (Creswell, 2007), but to gather an in-depth understanding of the research topic. Nevertheless, I still had to try to be thorough, precise, meticulous and accurate (Burton & Bartlett, 2009).

3.2.2 Methodological approach

A qualitative study was chosen, since this approach is best suited to address the research question and nature of the study, as the main focus of the qualitative study is an in-depth investigation into the nature and meaning of an event or phenomenon (Nieuwenhuis, 2013b). The validity and reliability of the findings were ensured by the use of crystallisation.

Detailed evidence was gathered on how early grade teachers experience the use of digital technology as a resource to support and enhance teaching and learning, as the data collection strategy focused on gathering descriptive, in-depth data (Bogdan & Biklen, 2003). The data was obtained directly from early grade teachers (Norris & Walker, 2005). McMillan and Schumacher (2006) postulate that qualitative research is important for the development and improvement of teaching practices, making the qualitative method of study most appropriate when the focus is on teachers' experiences of using digital technology as a resource to support teaching and learning.

This research project was inductive in nature, as I searched for themes and constructed theories from empirical data to make meaning of the evidence gathered (Somekh & Lewin, 2005). Data gathering for this study was qualitative, and I therefore utilised qualitative methods in the data collection process. Informal interviews are one of the data collection methods favoured in interpretive studies, allowing the researcher to collect the data in a natural (school) situation (Burton & Bartlett, 2009). In this study, I aimed to follow a naturalistic enquiry where the emphasis was on individual contact with early grade teachers (Norris & Walker, 2005). As such, I chose to conduct face-to-face interviews to gather the data in order to provide me with a holistic view of early grade teachers' experiences of using digital technology to support teaching and learning. The analysis of documents also gave further insight into this phenomenon, providing me with a wide range of data sources to form a comprehensive understanding of the investigation (Afshari et al., 2009).

3.3 RESEARCH DESIGN (MULTIPLE CASE STUDY)

A research design serves as the blueprint of the way in which the research was conducted (Bogdan & Biklen, 2003; Creswell et al., 2010; Mouton, 2001). To ensure that all aspects that might be of value to the study were covered, I needed to set out a comprehensive plan beforehand. Burton and Bartlett (2009) advise that while it is important to have a clear plan of action, it must not become too rigid and should allow for changes according to different circumstances.

Accordingly, I left some room for adaption to the research strategy, such as a change in the sequence of planned events, as well as the order in which I conducted the interviews at the school. This included working around the different schedules of the participating teachers and also waiting for all consent letters to be returned. The research design was modified as the research process proceeded, as design decisions were made throughout the research process (Bogdan & Biklen, 2003). As the study progressed, the detailed design

of naturalistic enquiry unfolded, thus making it impossible to pre-specify the design in detail beforehand (Norris & Walker, 2005)

This study made use of the case study design, from which appropriate information could be collected to improve the understanding of the phenomena investigated. Case study design can be defined as an investigation into a specific phenomenon, with the aim of better comprehension of the specific situation being explored (Cohen et al., 2007; Nieuwenhuis, 2013c). A case study can consist of a single case or multiple cases (Yin, 2014). This design was selected and used because of the multiperspective analysis of the data it offers, and it helped me, as the researcher, to come to a clear and holistic understanding of the dynamics of the phenomenon being investigated (Creswell et al., 2010). The case study design also provided the opportunity to conduct a research project that did not have clear, straightforward answers, including methods to collect descriptive and explanatory data (Creswell, 2007). The aim of this case study research was to provide descriptions of teachers' experiences and not to generate or test theories (Eisenhardt, 1989). A case study design involves the comprehensive and systematic investigation into a number of cases, according to (Bless, Higson-Smith & Kagee, 2006). The multiple-case study design was selected for the qualitative component of the study, giving me the opportunity to analyse the data of each case, but also across cases granting me the opportunity to compare perspectives and experiences (Baxter & Jack, 2008). I could create a holistic view of the phenomenon and take all possibilities into account, so that a better understanding could be obtained regarding the use of digital technologies in early grades and the learning programmes as a resource to support teaching and learning.

The main characteristic of case studies is that they attempt to provide a holistic view and understanding of how participants make meaning of the phenomenon being investigated (Bogdan & Biklen, 2003). This allowed me to pose open-ended questions and to explore a deeper and broader understanding of how teachers experienced the use of digital technologies in the early grade classroom.

An in-depth understanding of the phenomenon being investigated was provided and the trustworthiness of the information was established by the use of a multiple-case study design, seeing that information was collected from various sources (Creswell et al., 2010). This study can be described as a multiple case study for the reason that data was collected from different participants in order to explore multiple situations, thus expecting multiple sets of experiences and perspectives from teachers (Baxter & Jack, 2008) regarding the use of digital technologies in the early grade classroom. For the purpose of this study, the sample included ten early grade teachers from one school. In-depth information and data was gathered by using an informal interview as data collection technique, where I diligently made use of a research journal to capture detailed information observed during each semi-structured interview. Using the different cases of the ten early grade teachers, the multiple-case study approach provided a holistic understanding (Cohen et al., 2000) of the phenomenon of the use of digital technology in early grade classrooms. An in-depth analysis of the documents on the use and implementation policies of digital technology in South African schools, published by the Department Education, added to developing this holistic picture. This provided me, as the researcher, with background on the planning and implementation set out by the Department of Basic Education, as well as an understanding of the practical use and implementation of these policies.

3.3.1 Selection of cases and participants

Early grade South African school teachers were the main focus in this study, and were thus the identified unit of analysis. This unit of analysis consisted of ten early grade teachers who were purposefully selected. It is described by Cohen et al., (2007) that purposive sampling is a way to access people who are knowledgeable on the phenomenon that is being researched. A stratified, purposeful sampling strategy was used to select participants. Preselected criteria relevant to the research question were thus used to select participants (Creswell et al., 2010). Therefore, the sample had to consist of Grade R to Grade 3 (qualified) teachers who had access to the use of digital technologies as a resource to support teaching and learning in the classroom.

3.3.1.1 Sampling criteria for the selected primary school:

The criteria for selecting schools to participate in the study were as follows:

- The primary school had to be situated in the Gauteng province.
- The school had to use digital mobile technology to support lessons in classrooms.
- The school had to indicate its willingness to voluntarily participate in the research project.

3.3.1.2 Sampling criteria for the selection of early grade teachers:

The criteria for selecting the relevant early grade teachers were as follows:

- The teachers had to be qualified (held a degree in early childhood education).
- The teachers had to be teaching learners in Grade R, 1, 2 or 3.
- The teachers had to have access to digital technologies that were provided by the school to support teaching and learning.
- The teachers had to indicate their willingness to voluntarily participate in the research project.

A short description of the primary school where the semi-structured interviews took place is given below.

3.3.2. The primary school

This school was selected purposefully and met all the sampling criteria stipulated. The school is situated in an urban area in Gauteng, with 986 learners attending the school. The Language of learning and Teaching (LOLT) of this school is English. Most of the learners are from low socio-economic status and low-income homes who experience many challenges daily. Because of the high unemployment numbers among parents, a feeding scheme was established by the school, ensuring that most learners have at least one meal a day.

This primary school received mobile devices from a teacher and learner empowerment project. The project attempts to empower both teachers and learners by supplying underprivileged schools with the resources to implement digital learning in classrooms. This was one of the main reasons why I selected this school. There are many schools in Gauteng that make use of digital technology systems in educational programmes, but seemingly only a few schools make this technology available for use to the early grade teachers. It was found that even though the school had mobile devices available, only a few teachers actually made use of these devices in their teaching and learning programmes.

3.4 PRE-DATA COLLECTION PHASE

A pilot study can be described as a condensed version of a research project, allowing the researcher to test the procedures that are to be used in the full-scale project (Van Teijlingen & Hundley, 2002). This pre-data collection phase is an investigation that makes use of the questions from the full-scale project, and aims to determine where improvements can be made to the subsequent study, as well as to identify flaws in the measuring instrument (De Vos et al., 2002). This pre-data collection phase gave me, as the researcher, an idea of what the method would look like in operation and the likely effects it would have. It created an invaluable opportunity for me as the researcher to identify and eliminate the practical problems by changing procedures, instructions and questions.

Seeing that the number of participants in a pilot study group is seemingly smaller than the number of participants who will take part in the full-scale study (De Vos, 2002), I conducted a pilot run on two of my colleagues who complied with the selection criteria set out in section 3.3.2. These willing participants were asked to participate in a semi-structured interview. The interviews contained the same questions I had set for the full-scale project. This process was invaluable in granting me information I would not have had if I had not conducted this pre-study.

This information and insight included the following:

- The approximate time it would take to conduct a single interview.
- Insight into specific questions that had to be reformulated to eliminate confusion.
- Feedback from participants, which served as invaluable information in structuring and conducting the semi-structured interviews in the main study.
- The results of the pre-test satisfied me, as the researcher, that the questions complied adequately to the requirements of the study.

3.5 DATA COLLECTION AND DOCUMENTATION

Qualitative data collection methods were followed, since the nature of this research project is qualitative. Norris and Walker (2005) explain that the emphasis of naturalistic enquiry lies in the personal interaction with the teachers, and therefore the preferred data collection techniques for this research project were more naturalistic in nature (Burton & Bartlett, 2009). One of the data collection methods recommended in interpretive studies is informal interviews (Burton & Bartlett 2009), aiming to build a comprehensive understanding of the lived experiences of the participants being interviewed and how they perceive the phenomena being investigated (Seidman, 2006). The use of a case study design enabled me the opportunity to collect descriptive and explanatory data (Creswell et al., 2007), therefore giving me the opportunity to extensively answer the research question. The validity and reliability of the findings were controlled by doing cross-referencing between the multiple cases.

The collection of descriptive data was the emphasis of this study (Bogdan & Biklen, 2003). In-depth descriptive data was collected by conducting semi-structured interviews, journal keeping (field notes) as well as document analysis (Nieuwenhuis, 2013c).

Open-ended questions gave the teachers the opportunity to elaborate on their experiences when using digital technology as a resource to support teaching and learning in the classroom, and effectively express their views to me. The analysis of policy documents on the use and implementation of digital technology in early grade teaching in our country gave me the opportunity to view this phenomenon from two different perspectives: where we should and want to be, and where we are in reality. These data collection methods enabled me to study the research question comprehensively and to probe for deeper meaning, seeing that people have different opinions on, and experiences of the same situation (Creswell et al., 2010).

Initial contact with the different schools and their principals was made telephonically. As the researcher, I introduced myself and also explained what the research project entailed, how it would take place and who would be involved. Only one of the five schools contacted indicated that the early grade teachers from that particular school would be permitted to participate in such a research project. No reasons were conveyed by any of the other schools as to why they did not want to allow their early grade teachers to participate in the study, but I respected their decisions. I arranged a suitable date for the first introductory visit with the school that showed a willingness to participate in this study. Upon the first visit, I introduced myself as the researcher to the school principal and the early grade teachers. I then gave them a more detailed explanation of the research project, as well as how the research would take place. To comply to the ethical requirements, I gave letters of informed voluntary consent and assent to the principal and early grade teachers.

3.5.1 Semi-structured interviews

Nieuwenhuis (2013c) mentions that a semi-structured interview requires the participant to answer predetermined questions on the phenomena being investigated. However, it was not only prepared questions that were asked, but also spontaneous questions that arose during the interview. Only one semi-structured interview was held with each of the participants.

Participants were asked whether they felt comfortable that an audio recording of the interview was made, and unfortunately none of the participants would allow me to record the interview. None of the participants could give a clear reason why they did not want the interview to be recorded. This decision was respected by me.

The questions that were asked in the semi-structured interview were specifically designed by making use of the TPACK model. These questions were tested beforehand in the pilot study, during which I determined whether or not all the questions were relevant, as well as understandable. The results of the pilot study were taken into careful consideration. Questions were also asked in line with the responses given during the semi-structured interviews. This was done to ensure that I fully understood the experiences and practices of the participants.

The semi-structured interviews took place at the participating schools after normal school hours, so as not to interfere with teaching times. The duration of an interview was approximately 30 to 45 minutes each. Teachers were asked to indicate when they were available to participate in the interviews. Once this information was received, dates and times with each of the participants were arranged. All the respondents were comfortable and open to share their experiences of the use of digital technology in their classrooms. Some respondents became very defensive when asked whether they had knowledge of how learners learned through the use of digital technology, resulting in very short answers to this question. However, when asked about the challenges they faced, most respondents were quick to answer the question in extensive detail.

The questions that were asked during the semi-structured interview are as follows (also see Appendix C):

- Please specify your age.
- What is your home language?
- What is the language you teach in?
- Do you know what digital technologies are?

- Can you give me three examples of digital technologies?
- How often do you use digital technologies in your classroom?
- For which subjects/learning programmes do you use digital technology?
- How do you use digital technologies in your classroom? Provide two examples.
- Explain how you experience the use of digital technologies in your classroom.
- What are the challenges you face when implementing digital technologies as a support tool?
- Do you feel you are supported and trained sufficiently to effectively implement digital technologies as learning support tool?
- Do you feel you are successful when implementing digital technologies as a learning support tool in your classroom? Explain.
- Do you feel that learners benefit from the use of digital technologies in learning programmes? Explain.
- Do you feel digital technologies can be implemented to support each lesson in your classroom?
- Would you say you can effectively implement mobile technologies in most of your lessons? Explain.
- Do you feel that you sufficiently understand how learners learn through the use of digital technologies?
- Would you like to use digital technologies as learning support tools more often? If yes, what prevents this from happening? If no, please provide a reason.
- Do you believe all learners can benefit from the use of mobile technologies as support tools?

3.5.2 Researcher's research journal

Throughout the research process, I kept field notes and a reflective research journal. My journal contained factual information, as well as decisions, interpretations and personal reflections, experiences, thoughts and feelings about my work with the participants. I documented my new insights, intuitions, and broad ideas that emerged during the semi-structured interviews (Creswell,

2012; Maree & Van der Westhuizen, 2013). I started my reflective journal as I made initial contact with the identified schools.

During each data collection process, I made sure to note every detail of the process. The guidelines set out by Gambold, (2010) as cited by Mills, Durepos and Wiebe, on how to take field notes were applied during this process. As explained by Gambold (2010), as cited by Mills, Durepos and Wiebe, field notes that have been taken should be expanded upon, and reviewed. As the researcher, I made sure to note information relevant to the research topic which could serve as additional useful data. My field notes included information on what I saw, experienced, my immediate thoughts, questions that arose and realisations I came to during the data collection process. The notes gave me the opportunity to make connections between the data captured, the research questions and the information obtained in the literature study (Gambold, 2010, as cited by Mills, Durepos & Wiebe).

3.5.3 The use of documents for data collection

Public records or documents, personal documents and physical materials are the three main types in which documents for data collection can be categorised (Olsen, 2010, as cited by Mills, Durepos & Wiebe). For the purpose of this study, public documents were used for data collection. These documents included the following:

- Department of Education Annual Report 2016/17
- White Paper 7 on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs), published by the Department of Education in 2004 (Republic of South Africa, 2004)
- Guidelines on the Management and Usage of ICTs in Public Schools in Gauteng (Gauteng Department of Education, 2011)

Seeing that these documents were created outside of the scope of this study, they provided me with different points of view, resulting in a rich and holistic

interpretation of the phenomenon being investigated (Olsen, 2010, as cited by Mills, Durepos & Wiebe).

They provided background information regarding the use and implementation of digital technology, as viewed by the Department of Basic Education and the Gauteng Department of Education, as well as the strategies set out by these departments to ensure the effective implementation of digital technology in our teaching and learning programmes. These documents also provided a unique insight into the level of successful implementation of these strategies in our teaching and learning systems (Olsen, 2010, as cited by Mills, Durepos & Wiebe).

3.6 DATA ANALYSIS AND INTERPRETATION

Data analysis was conducted concurrently with data collection, permitting adjustments to interview protocol, and allowing it to be more applicable to the research question. A process of inductive reasoning was used to carry out data analysis. As the researcher, I was the data gathering instrument. Considering the naturalistic aspect of the research, interviews were conducted at the school, as it suited the participating teachers.

The first step in the analysis of the qualitative data collected was for me to immerse myself in the data, giving me the opportunity to become familiar with it. A clear understanding of the information gathered was formed by the thorough examination of transcribed interviews, as well as of the field notes taken during interviews. The data was then encoded by means of content analysis, specifically looking for certain words according to which themes and subthemes could be identified (Creswell et al., 2010). When analysing open-ended questions, content analysis is used. Content analysis is a systematic approach to qualitative data analysis, whereby message content is identified and summarised.

This was done by studying data from different angles, aiming to identify cues in the text that could help me understand and interpret the raw data gathered.

Being inductive and interpretive, I looked for similarities and differences in the text to either corroborate of disprove the theory (Creswell, 2007). Conclusions were drawn on the basis of similarities and differences in responses and findings.

Once all the data had been collected, captured and processed, the qualitative data was interpreted together by means of triangulation (Creswell et al., 2010). The identification of multiple realities that are potentially present in the data Creswell (2007), are more likely to be identified by the use of inductive data analysis (Bogdan & Biklen, 2003). Data analysis was an ongoing part of the research process (Bogdan & Biklen, 2003). As stated by Bogdan and Biklen (2003), the researcher and the researcher's insight is the key instrument for analysis when reviewing mechanically recorded materials. The data analysed by me, as the researcher, was the data collected through the semi-structured interviews that were conducted.

3.7 TRUSTWORTHINESS

Throughout the research process I attempted to ensure rigour by attending to the criteria of credibility, transferability, dependability and confirmability (Akinyoade, 2012). To establish trustworthiness of the qualitative data analysis, these criteria were addressed as follows:

To ensure that the data collected was credible, I ensured that I fully understood what was being conveyed by the participants. Participants were also given the opportunity to review the transcribed interview, and inform me whether any information was misunderstood or misinterpreted.

Transferability can be defined as the degree to which the qualitative research findings can be transferred to other contexts (Akinyoade, 2012). The in-depth description of the research context, research process and its assumptions provides the relevant information to analyse whether or not the findings are transferable.

The dependability of a study refers to the ever-changing context in which the research study occurs, including the effects these changes may have on the study. My research journal is the underpinning factor of the dependability of this study. In this journal, I made sure to note everything taking place during the research process.

Confirmability refers to the degree to which others can confirm the data collected. To ensure confirmability in this research study, I gave all participants the opportunity to review the transcribed interviews, confirming that all information documented is accurate and correct.

Triangulation can be used to establish trustworthiness in qualitative research. Referring to corroboration between evidence from different data sources, I made use of triangulation to establish trustworthiness in this research project (Creswell, 2014). Different data sources and collection strategies were implemented, contributing to the trustworthiness of this study. The pilot study that was done before data collection took place also contributed to the trustworthiness of this study. It ensured that all questions asked were understandable, and made me aware of where possible misunderstandings could occur during the interview process. The many different teachers interviewed enhanced the trustworthiness of this study. An in-depth study was done of each case. The supporting literature in the literature review, as well as the different sources of data, also supported the trustworthiness of findings (Creswell et al., 2010). The validity and reliability of findings were checked by doing cross-referencing. The transferability of findings will be discussed in Chapter 5.

3.8 ROLE OF THE RESEARCHER

As the researcher, I wanted to gain knowledge and understanding of the teachers and their perspectives about the use of technology as a teaching and learning resource in the classroom. Thus, theorising needed to be done with participants rather than about them, because of the naturalistic focus of the research (Norris & Walker, 2005).

In-depth perspectives about the research topic was gathered by discussing the relevant points of this study with early grade teachers in semi-structured interviews. This gave me the opportunity to gain a holistic view of the experiences and opinions early grade teachers have regarding the use of digital technologies to support teaching and learning. Informal questions were asked to prompt teachers to give more in-depth descriptions of their lived experiences. I aimed to add knowledge to the field of research by gaining insight into early grade teachers' experiences, and not to pass judgment on how they implemented the use of digital technologies (Bogdan & Biklen, 2003).

As an early grade teacher who use digital technologies to support teaching and learning in my own classroom, I brought my own particular experiences to the research. It thus made this research project subjective due to the nature of the case study methodology and my views and opinions as a researcher (Bogdan & Biklen 2003). The descriptions, conclusions drawn and recommendations made in this research project were influenced by the assumptions I made as researcher.

3.9 ETHICAL CONSIDERATIONS

Prior to conducting research, ethical approval was obtained from the University of Pretoria. During the data collection process, I made sure that I adhered to all requirements of the Ethical Committee. All relevant laws, policies and guidelines of the University of Pretoria and the Faculty of Education were read and fully understood. As the researcher, I wanted to ensure that this research study would not negatively affect participants in any way.

The ethical principles, as stated by Burton and Bartlett (2009), were strictly followed. These principles include informed consent, confidentiality and privacy, honesty and openness, access to findings and avoiding harm (Burton & Bartlett, 2009). All participants were treated with the utmost respect and according to these ethical principles.

Informed consent was received from every participant in this research study. This consent was obtained in the form of a letter to the principal of the participating primary schools, as well as early grade teachers. As the researcher, I explained to all participants that their anonymity was ensured and I applied anonymity throughout the research process. All participants were informed that the study would be accessible to them (Burton & Bartlett, 2009). The semi-structured interviews were not audio-recorded, because the participants were uncomfortable with it and did not like to be recorded. The semi-structured interviews were held in a venue familiar to the participants. Interviews were kept informal, and a relaxing and conducive environment was created so that participants could feel at ease. All participants were fully aware that they could withdraw during the interview process at any time.

All participants were granted the opportunity to read the research report and give feedback. This formed part of the validation process of this research. Valuable feedback on the findings were gathered from participants. The school involved in this study were keen to receive the findings of this study, as it assisted in improving the support given to teachers on the use of digital technologies to support teaching and learning.

3.10 CONCLUSION

In this chapter, I discussed the research methodology of the study, elaborating on the research design and methods chosen for this study. I also described the data collection strategies employed and the analysis techniques used. Finally, trustworthiness, the role of the researcher and ethical considerations were also discussed.
In the next chapter, the data analysis process will be discussed and the results of this research project will be presented.

- - o O o - -

CHAPTER 4
DATA ANALYSIS AND RESULTES

4.1 INTRODUCTION

In this chapter, the results of the study are presented and discussed. The data analysis was steered by the main research question: how do early grade teachers experience and use digital technology as a tool to support teaching and learning? The main research question and the sub-questions were addressed by the identification of specific themes. The themes identified were determined through an in-depth analysis of the relationship between the theoretical framework of this study and the data collected. The data analysis strategies explained in Chapter 3 were followed. As the data was processed and analysed, correlations between the literature and data were clearly noticeable.

After each interview that was conducted with an early grade teacher, the data was documented and compared with previous interview data in order to detect any new insight that could add value to or enrich the following interview process. This also helped me to clarify points that were unclear or needed to be elaborated upon. In this way, the data analysis process had already started during the data collection process.

4.2 RESEARCH SETTING

As discussed in Chapter 3, section 3.3.2.1, the school selected was a public primary school in a long-established urban neighbourhood. Most of the learners attending the participating school come from economically disadvantaged homes. This school was the recipient of mobile technological devices from an empowerment project called iSchoolAfrica – iPad learning programme.

This project provides low-income schools with mobile technological devices with the aim of empowering both teachers and learners to use digital technology in their teaching and learning. Founded in 2009, the iSchoolAfrica project, developed by Core Group, focuses on providing disadvantaged and under-resourced schools with digital technology to enrich and enhance learning experiences. This particular school was provided with 30 iPad devices to be used by the foundation phase department.

It was indicated by the Early Grades Head of Department that training was provided to teachers, but that this training was irrelevant to the use and implementation of these devices in their daily teaching and learning programmes. The early grades Head of Department stated: *"…* we received training on how to manage press activities, and the benefits of the use of these iPads. The training gave us no information on how to use these devices in our daily teaching activities." When I first made contact with the school, she explained that none of the devices provided by this project were being used in educational programmes. The reason she provided was: "None of the teachers feel comfortable in making use of the devices as part of their teaching programmes." They also experienced a problem with theft of the devices: "… it is much safer to keep the devices locked away in the school safe." It resulted in a waste of resources, because of a wide range of challenges faced by schools and teachers.

4.3 DESCRIPTION OF SEMI-STRUCTURED INTERVIEWS

When referring to the participants in this study, I will refer to them as Participants 1 to 10. This is done to protect the anonymity of the participants, as well as the school. All respondents indicated a willingness to participate in this study and informed consent was obtained from all participants.

As the researcher, I individually contacted each early grade teacher who indicated a willingness to participate in this research study. An appropriate time was scheduled with each teacher after school hours.

Each semi-structured interview was held with the participants in their classrooms, seeing as this was the most convenient meeting place for them. As we started the semi-structured interviews, all participants were informed of the interview process again. All respondents were asked if they would feel comfortable if I made use of the audio-recording application on my smartphone to record the interviews. None of the respondents felt comfortable with this request, and rather gave consent that I could make notes of the interview and the answers they provided on my laptop.

As the researcher, I observed that each semi-structured interview that was conducted was a positive experience for the participants. Each participant was positive and excited to share her experiences with me. The common feeling I observed among the participants was a one of relief. Participant 3 expressed it as follows: "… thank you very much for taking the time to ask these questions; we are forced to make use and implement specific devices and methods of teaching, but no one takes the time to actually hear from us, how we experience it or if it actually works. It is such a relief to know there are still some people out there that want to know what we experience and face on a daily basis."

It was conveyed by participants that felt overwhelmed with using these devices, and that they were thankful to be given a voice to share their experiences and the challenges they face on a daily basis.

4.3.1 Profile of participants

4.3.1.1 Participant 1

Participant 1 was a Grade 1, middle-aged, Afrikaans-speaking teacher. She was a very enthusiastic teacher that cared deeply for her learners. She indicated that she did not use digital technology in her classroom often. She also indicated that she did not want to implement digital technology in her daily planning and lessons.

4.3.1.2 Participant 2

At the age of 56, this Afrikaans-speaking participant was very eager to learn how to use digital technology in her classroom, even though she did not at all make use of digital technology in the teaching and learning programmes in her Grade R classroom.

4.3.1.3 Participant 3

Participant 3 was a 60-year-old teacher. Her home language was Afrikaans, and she had been a Grade 1 teacher for over 20 years. This participant seldom made use of digital technology in her classroom, but indicated that she would like to use it more often.

4.3.1.4 Participant 4

Participant 4 was the only early grade teacher that indicated that she did make use of digital technology often in her teaching and learning programmes. She was a 59-year-old teacher who taught Grade 2 learners.

4.3.1.5 Participant 5

This participant was a Grade 1 teacher who made use of digital technology in her teaching and learning programmes once a week. She was a 59-year-old, Afrikaans-speaking teacher who wanted to make use of digital technology more often.

4.3.1.6 Participant 6

Participant 6 was a 38-year-old Grade 2 teacher. This participant did not make use of digital technology in her classroom very often, but she felt that all learners could benefit from the use of digital technology as a support tool in teaching and learning programmes.

4.3.1.7 Participant 7

Participant 7 was the LSEN (learners with special educational needs) (junior) teacher at the school. She made use of personal digital technology devices to motivate learners to complete their work, seeing as learners were rewarded with the opportunity to play a game on the technological devices. The technological devices were seldom used as a tool to support teaching and learning in her classroom.

4.3.1.8 Participant 8

This participant was a 35-year-old, Grade 2, Sesotho-speaking teacher. She did not make use of digital technology in her classroom at all, but she felt that using it could be very beneficial to minimising her workload.

4.3.1.9 Participant 9

Participant 9 was the 38-year-old, Shona-speaking, Physical Education teacher for all the early grade learners. She indicated that she did not make use of digital technology often. She was eager to make use of digital technology in her lessons, and also felt that it would be beneficial to all learners if digital technology would be implemented on a regular basis in her classroom.

4.3.1.10 Participant 10

This participant was the only respondent that indicated that she did not want to use digital technology in her classroom, even though she felt that some learners might benefit from its use. This 51-year-old, Grade 2, Afrikaans-speaking teacher felt that her teaching methods were effective, and for that reason she did not see the need to change her teaching methods.

4.4 DATA ANALYSIS PROCESS

Open-ended interview questions (See Appendix C) were used in order to gain the relevant data from each participating early grade teacher. Questions were asked regarding the use of digital technology in the early grade classrooms to gain insight into the experiences and practices of early grade teachers when making use of digital technology. Questions such as the amount of use of digital technology, how it is being used, the ability to make use of it and teachers' experiences when making use of digital technology, were asked. All these questions were designed with the TPACK model in mind. This gave me the opportunity to gain insight into the experiences, practices and ability of teachers to effectively implement digital technology in early grade classrooms.

Firstly, after each semi-structured interview was conducted, the interview was transcribed directly from the notes that were taken during the interview. The transcription process was done immediately after the interview was conducted, so as to ensure that all the data that was collected and captured correctly and as accurately as possible.

After each semi-structured interview that had been transcribed, I thoroughly read through each interview several times, immersing myself fully in the data that was collected from the respondents. As the researcher I then filtered through each interview. This was done to create a holistic picture of the experiences and practices of the respondents when making use of digital technology in their learning programmes. During this process, I made notes on the ideas and topics that were re-occurring and were of interest. Similar topics were clustered together and coded by making use of short phrases and colours. These codes were then organised into emerging themes. The process of thematic analysis (Creswell et al., 2010) brought structure to the data as relevant themes and subthemes were identified, while I studied the data through the lens provided by the theoretical framework. The themes and sub-themes will further be discussed in section 4.4.

4.5 RESEARCH RESULTS

As the data analysis process progressed, four main themes emerged, with several subthemes under each. Figure 4.1 is an overview of these themes and subthemes. These themes and subthemes will also be discussed in detail in this section.

Table 4.1 indicates the codes that will be used when referring to the participants in the presentation of the research findings:

Table 4.1: Coding of participants

Participant	Code
Participant 1	P1
Participant 2	P2
Participant 3	P3
Participant 4	P4
Participant 5	P5
Participant 6	P6
Participant 7	P7
Participant 8	P8
Participant 9	P9
Participant 10	P10

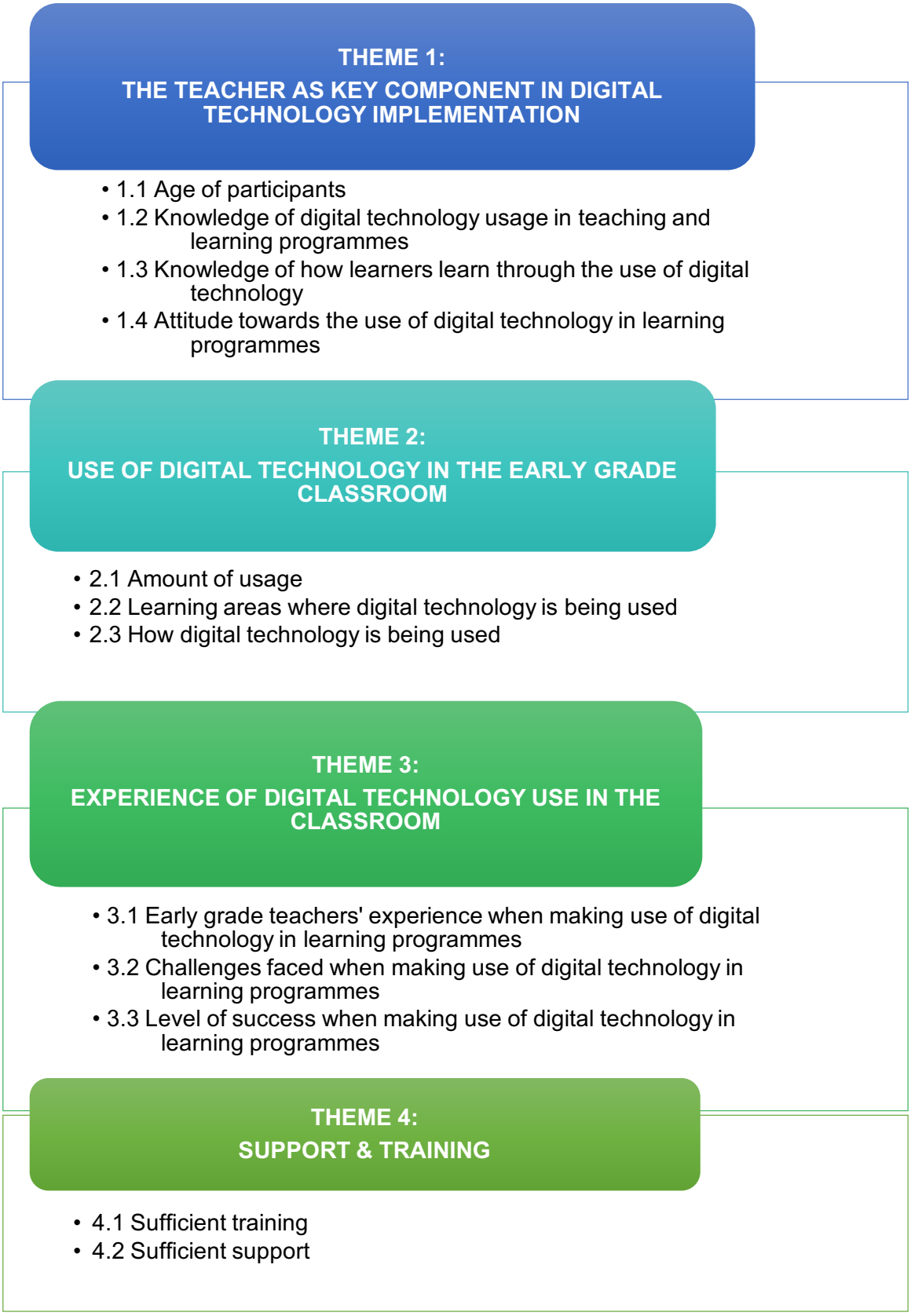

Figure 4.1: Themes and subthemes emerging from the data

4.5.1 Theme 1: The teacher as the key component in digital technology implementation

Theme 1 includes information on the participating teachers, seeing that the teacher and teacher knowledge is the key component in the implementation of digital technology in the classroom (Varol, 2013). It focuses on the teacher, her readiness, her ability and whether or not she possesses the relevant knowledge to effectively integrate digital technology into teaching and learning programmes. The TPACK model discussed in section 2.4 describes these knowledge areas in detail.

4.5.1.1 SUB-THEME 1.1: Age of participants

The average age of the participants in this study were 46 (seeing that the participants in this study were aged between the ages of 32 and 60). According to research done by Tweed (2013), it was found that age did not play a significant role in the successful integration of digital technology in American schools. However, in the sample school, it was found that only one participant (P4, aged 59 years) was keen to make use of digital technology in her classroom. Younger teachers were found to be reluctant to use digital technology to support teaching and learning. It was found that the participants between the ages of 32 and 38 rarely made use of digital technology in their classrooms. As stated by P8, age 35: “I don’t use technology in my class at all.” In contrast, the use of technology in teaching and learning programmes by the respondents aged between 51 and 60 is more diverse. P2 indicated: “I do not use technology in my lessons at all. I might use it for research for lesson planning, but that is not often either.” P4, age 59, indicated that she used digital technology often to support her teaching and learning programmes.

4.5.1.2 SUB-THEME 1.2: Knowledge of digital technology usage in teaching and learning programmes

All ten of the participants indicated that they had knowledge of digital technology, as stated by P2: “I have a cell phone, I also have a laptop, as well as an iPad that I use on a daily basis.” Even though the respondents indicated that they possessed knowledge of what digital technology is and how to use it, they indicated that they would use digital technology for personal use, but they did not have sufficient knowledge to effectively implement and manage digital technology in teaching and learning programmes. This was confirmed by P8: “… that is the reason why I don’t use technology in my lessons; I don’t know how to use it…”

4.5.1.3 SUB-THEME 1.3: Knowledge of how learners learn through the use of digital technology

It was indicated by eight of the participants that they understood how learners learn through the use of technology in teaching and learning programmes. Sharing her experience, P9 indicated that she thought she understood by stating the following*:* “I think it is more interesting to them…” This respondent seemed uncertain about her answer and reacted defensively when asked to explain her answer. Confirming my observations, she noted: “… I don’t really know*”.* Adding to this view, P3 indicated that she does not understand how leaners learn through the use of digital technology, but this does not stop this participant in her efforts to make use of digital technology in her classroom. In this regard, she said: “… I can see that is has changed over the years, but I don’t fully understand it.” Along the same lines, P10 indicated that she experienced her teaching methods as successful, by saying: “I have been teaching for many years and the way I taught then is the same way I teach now and it works.” It was observed that as long as this participant experienced progress among her learners, she saw no need to change her teaching methods.

Early grade teachers see and understand that learners acquire knowledge in many different ways, and learners need to be supported in this process of knowledge acquisition. Unfortunately it seems that teachers do not have the appropriate knowledge or skills to develop and adapt to the learning needs of the learners in their classrooms. This is confirmed by P2's reply: "The learners definitely learn differently than what they used to. I just don't know how to change my teaching techniques to fit their learning styles of learning." It was expressed by all respondents that they did not have sufficient knowledge about the use of digital technology in the classroom to effectively implement it in their teaching and learning programmes. This indicates that teachers lack sufficient technological content knowledge and technological pedagogical knowledge, and in some cases there is also a lack of technological knowledge.

4.5.1.4 SUB-THEME 1.4: Attitude towards the use of digital technology in learning programmes

The attitude of the participants towards the use of digital technology use in their teaching and learning programmes was mostly positive. Eight respondents indicated that they wanted to make use of digital technology more sufficiently in their classrooms, and that they would use it more often if they had the knowledge, skills, support, time and resources to do so effectively. P2 expressed it as follows: "I would like to use technology, … we as teachers don't have the appropriate skills to implement technology correctly, that it can be of help to our learners."

In contrast, P6 and P10 indicated that they did not want to make use of digital technology in their classrooms. P6 indicated that there were too many challenges, making it impossible to implement and maintain the use of digital technology on a more frequent basis and in more learning areas. For those reasons, P6 indicated that she did not want to make use of digital technology to support her teaching and learning programmes. Along the same lines P10 indicated: "I don't know how to use it (digital technology) as part of my lessons…"

This reveals that a lack of knowledge and skills to make use of digital technology in learning programmes is one of the main reasons why digital technology is not being effectively implemented in classrooms.

Although P9 indicated that she would like to make use of digital technology more often, it was conveyed that the following challenges prevent this: "… there are not enough devices in our school and we don't have the funds or support to acquire them. We also don't have the training to be able to use them (digital technologies) properly."

4.5.2 Theme 2: Use of digital technology in the early grade classroom

Theme 2 consists of information on the use of digital technology in the early grade classroom. This information gives insight into the amount of use of digital technology, as well as the way in which digital technology is being used in the early grade classroom.

4.5.2.1 SUB-THEME 2.1: Amount of use

Three participants indicated that they never made use of digital technology, as stated by P2: "I do not use technology in my lessons at all, I might use it for research for lesson planning, but that is not often either."

Along these lines, P1 and P5 also indicated that they used digital technology for lesson preparation more often than in classroom practice.

In contradiction to these participants, P4 indicated that she used digital technology often in her classroom, saying: "I make use of my cell phone daily in my classroom, but I also use an overhead projector."

It was suggested by most of the participants that they seldom made use of digital technology in their classrooms, suggesting that if the use of digital technology is the most convenient, it is used, as stated by P6: "… if it is the easiest way…"

4.5.2.2 SUB-THEME 2.2: Subjects digital technology is being used for

The participants indicated that they mostly used digital technology in mathematics, as indicated by P1: “I use it for informal assessments like let them do an online Math test.”

Participants also indicated that digital technology was implemented in subjects such as life skills, languages and art.

It is my observation that there is seemingly no clear indication of a structured programme that is frequently implemented by any of the participants. This observation is supported by P3: “There is no structured programme set in place…”

4.5.2.3 SUB-THEME 2.3: How digital technology is being used

Most of the respondents who made use of digital technology in their teaching and learning programmes indicated that the implementation of digital technology in learning programmes is mostly done to show learners pictures or videos to support a theme being taught, as explained by P6: “… it just takes up so much of my time to go and figure out how to use it and try and make it fit the lesson that I have found it easier just to use it (digital technological devices) for simple things.”

P7 indicated, “My class gets very motivated to do their work if they know that they can play on the tablet as a reward,” suggesting that digital technology is not being used as a support tool or being fully implemented in learning programmes.

P5 offered the following information: “In language activities I would also use technology for the teaching of phonics and sometimes stories and I also discovered a very good reading app…” P5 stated that her learners experienced a lot of success when making use of this app. It was noticeable that this

participant was the only respondent that mentioned making use of an app when implementing digital technology in her learning programmes.

P4 indicated, “I also don’t have knowledge of all the apps etc. It takes me a lot of time to find the appropriate information and websites to use in my classroom,” thus suggesting that teachers do not have sufficient technological knowledge to make use of the programs and apps available.

4.5.3 Theme 3: Experience of the use of digital technology in the classroom

4.5.3.1 SUB-THEME 3.1: How the use of digital technology is experienced by early grade teachers

When looking at experiences when making use of digital technology in teaching and learning programmes, it was indicated by P3, P6, P7 and P9 that they experienced the use of digital technology positively. P6: “They really enjoy it, ... they see things they have never seen before.” P6 further explained that learners did enjoy the use of digital technology as part of their learning programmes, seeing that they are granted the opportunity to experience so much more.

In contradiction to the positive experiences of four of the participants, P1, P4 and P5 experienced the use of digital technology very negatively when attempting to implement it as a tool to support their teaching programmes. P1 explained: “But they lose interest in the lesson very quickly.”

One of the biggest challenges experienced by the participating teachers is the fact that learners lose interest in the lesson, resulting in the unsuccessful completion of lessons (as noted in research journal). P5 supports this interpretation by stating: “I also found that the weaker learners lose concentration very quickly and then start playing around on the device; they never fully grasp the work that is taught to them.” Seeing that teachers have no way of preventing this, it results in minimal use of digital technology.

P2, P8 and P10 indicated that they never made use of digital technology, and could therefore not respond to this question. The use of digital technology is not implemented in some early grade classrooms for many different reasons, such as a lack of knowledge and resources, as stated by P8: “I don’t know how to use it, and the other thing is, we don’t have enough technology devices.”

Participants indicated that learners seemingly enjoyed lessons much more when the use of digital technology was implemented. Concepts taught are also grasped much quicker by learners when digital technology is implemented, and learners exhibit a better understanding of what is being taught. P3 indicated that the learners develop new and more in-depth skills when digital technology was implemented in learning programmes, but also stated: “I wish I could use it more, it also takes a lot of time to develop new ways of using technology in lessons.” This results in minimal use of digital devices as tools to support teaching and learning.

P5 indicated that when learners were given the opportunity to work on the devices themselves, the stronger learners had the opportunity to work faster and on their own. This gave the teacher the opportunity to give more attention to learners who battle or work slower. It was indicated by most participants that the lack of resources made the implementation of digital technology very difficult. P6 stated: “I only have the limited knowledge of using my own technology devices, I don’t really know what is the best way to use technology in my lessons.”

This statement was supported by all the participating teachers, admitting that they did not have the relevant skills and knowledge to effectively implement digital technology in the classroom, making it a challenging and negative experience for all participants. Time as a factor was also mentioned by the participants, indicating that it takes a great amount of time to prepare and develop a lesson that makes use of digital technology. The fact that it is a time-consuming process makes it difficult for teachers to implement digital technology in their teaching and learning programmes, as supported by P4: “Time is a problem because there is lots of other paperwork to get done, and

other responsibilities that have to be taken care of, I don't have the time to go and sit in front of a computer for hours, just for one lesson."

4.5.3.2 SUB-THEME 3.2: Challenges faced when making use of digital technology in learning programmes

The use of digital technology is limited, as indicated by P1: "Theft is a big problem, if they know you have a device in your classroom it gets stolen very quickly. You always have to know where your device is and watch it like a hawk."

It was indicated by two participants that the learners in their classrooms also become very unruly when any form of digital technology is used in the classroom. P5 mentioned: "The big classes also make it very difficult to implement the technology."

P4, P5, P7 and P9 indicated that the use of digital technology in teaching and learning programmes is made very challenging, with limited resources available to them. Seeing that resources are limited, participants seemingly face a hefty challenge in classroom management when implementing digital technology in their classrooms. It is the experience of P1 that "[l]earners also become lazy, it like they don't want to do regular classwork after working with the technology". P5 supports this by stating: "I experience a big problem in class discipline when I try and use technology in a lesson, it is as if the learners become totally different, they are so unruly."

This could be caused by, as stated by P1, learners not experiencing a lesson that makes use of digital technology as a learning programme, resulting in learners not paying attention to what is being taught during this process, "… because the devices are more interesting". P1, P2, P3, P4, P5 and P9 indicated that they experienced a lack of relevant knowledge or skills to effectively implement digital technology in teaching and learning programmes was the biggest barrier to successfully implementing technological devices in learning programmes.

Participants also indicated that sufficient time is a huge challenge when digital technology is implemented. Because of a lack of knowledge, skills, resources and support, effectively implementing digital technology is a very time-consuming activity for teachers. P5 describes the development of a lesson that makes use of digital technology a trial-and-error process. It can be very discouraging for early grade teachers when they spend so much time on developing a lesson that makes use of digital technology and know that it might not be successful. This sentiment was conveyed by P3: “My developmental skills, I sometimes feel overwhelmed with all the technology and information available, and I don’t have the skills and knowledge to be able to implement all the resources like I must.”

4.5.3.3 SUB-THEME 3.3: Level of success when making use of digital technology in learning programmes

With regard to making use of digital technology in teaching and learning programmes, P4, P6 and P7 indicated that they experienced the lesson or learning programme as successful: “I feel my learners understand better and enjoy a lesson much more,…”

The participants who indicated that they had not experienced success with the use of digital technology as part of their teaching and learning programmes, explained that this was because of the challenges they faced when implementing digital technologies. These challenges were extensively discussed in section 4.4.3.2.

When asked whether the use of digital technology was or could be beneficial to learners in the early grades, seven of the respondents indicated that if the challenges they faced when implementing digital technology in teaching and learning programmes were eliminated, it would be very beneficial for all leaners.

P10 stated, “I actually don’t know enough about this topic to be able to answer this question,” when asked whether digital technology could be beneficial to

learner development. P4 and P5 also acknowledged the fact that they did not fully understand the benefits of digital technology in teaching and learning programmes and for that reason they did not know whether it would be beneficial for learners or not. This indicates that a lack of knowledge in all knowledge areas, as defined by the TPACK model, seemingly is the main reason why digital technology is not successfully implemented in early grade teaching and learning programmes.

“I have seen that the stronger learners really benefit from the use of the technology in the class, but the weaker learners don’t really benefit, …” P5 said, and explained that although the use of digital technology was beneficial to some learners, other learners did not always experience its benefit in learning programmes. There might be many reasons for this, but as P4 stated, most of the learners at the school did not have access to digital technology at home. When making use of digital technology in the classroom, the learners lost focus and were mesmerised by the devices, thus making teaching and learning a very difficult process.

4.5.4 Theme 4: Training and support regarding the use of digital technology in the classroom

As the interviews were being conducted, it was noticeable that early grade teachers admitted to not having sufficient knowledge or skills to effectively make use of digital technology in their teaching and learning programmes. This theme consists of information gathered from respondents on support and training for teachers to effectively implement and manage the use of digital technology in the early grade classroom.

4.5.4.1 SUB-THEME 4.1: Sufficient training

When the participating teachers were asked whether they felt that they were sufficiently trained to implement digital technology in their teaching and learning programmes, all participants indicated, with no level of doubt, that they were

insufficiently trained to effectively implement digital technology in their classrooms, and to incorporate it into the curriculum they teach.

P7 stated: “We don’t get trained properly and we don’t receive any support to be able to implement technology in our classrooms.”

P4 indicated: “We don’t get trained, and for that reason we cannot use the technology given to us even if we want to.”

This indicated that the willingness to learn and develop new ways of teaching and developing learning programmes existed, but the training and development of these skills was absent. P7 supported this statement by saying: “We don’t get trained properly and we don’t receive any support to be able to implement technology in our classrooms.”

Clearly the teachers had the willingness to receive training, but as indicated by the respondents, the training programmes were seemingly not sufficient in providing the relevant knowledge and skills to enable them to successfully implement digital technology in their classrooms. It was indicated by P2, P8 and P10 that insufficient training was one of the main reasons why they did not make use of digital technology in their classrooms.

P2 stated: “… that is the main reason why I do not use technology in my classroom. I don’t know how to use the devices that were given to us at the school, never mind how to implement it in my teaching.”

4.5.4.2 SUB-THEME 4.2: Sufficient support

It was indicated by all of the respondents that sufficient support was not given, thus making the implementation of digital technology in classrooms a very challenging process. Participants explained that they needed support on both hardware and software implementation. This entails that teachers are being sufficiently supported to identify appropriate methods and programs that can be used in the classroom, making sure that the use and implementation of digital

technology in teaching and learning programmes are effective. The hardware/devices must also be maintained and repaired, but as stated by respondents, they did not have the time, skills or knowledge to keep these devices in working condition. The school also did not have the resources to be able to pay for professional help and support.

P5 stated: “When a device is damaged or when it needs updates and stuff like that, we don’t know how to fix this and we have no one that can help us, … It really helps with skill development, but it is just not practical to try and implement it on a permanent basis.”

Thus, the seemingly insufficient support results in digital devices not being used appropriately.

4.6 CONCLUSION

In this chapter, I aimed to present the research findings on the experiences and practices of early grade teachers when making use of, and implementing digital technology in their teaching and learning programmes. The resulting themes and sub-themes that emerged from the data gathered were elaborated upon and validated with direct quotes from the interviews conducted with the early grade teachers.

The data that has been documented in this chapter will be compared with the existing literature and theoretical framework in the following chapter. This is done in order to answer the research question. The limitations of the study, as well as the recommendations resulting from this study, will also be discussed in Chapter 5.

- - o O o - -

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In this chapter, I will argue the main research findings of this study in such a way that a conclusion can be made about the research topic (Joubert, 2016). In previous chapters, the literature on this topic was examined, an explanation of the research process was given and extracted themes and subthemes from the data collected were discussed. Next, I will compare the findings in the data with the literature examined and the research questions of this study will also be addressed.

5.2 LITERATURE CONTROL APPLIED TO THE RESULTS OF THE STUDY

The relationship between the findings of this investigation and established research is presented in three tables validating my findings with existing research. In Table 5.1 the similarities between the results of this study and the existing research are presented, indicating that the data collected in this study correlated with existing literature. The contradictions between the results of this study and the literature are presented in Table 5.2. The indicated points on which my data is silent but which are mentioned in literature are discussed in Table 5.3. Each table is then followed by a narrative discussion on the findings summarised in the tables.

5.2.1 Similarities between the existing litrature and the results of the study

In this section, I highlight correlations between the studies I cited in Chapter 2, and the participants' perceptions uncovered in this study.

As an introduction, I provide an overview of these correlations in Table 5.1, which also show the themes and subthemes identified in the study. In the paragraphs following the table, I elaborate on the points of congruency in terms of the main findings of the study.

Table 5.1: Comparison of results with existing knowledge: Supporting evidence

THEME 1 The teacher as key component in digital technology implementation			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
1.1 Knowledge of digital technology use in learning programmes	Yurdakul et al., (2012)	In order to have a better under-standing of the learners' needs and the tools that can be implement-ed to support optimal develop-ment, it is important for teachers to develop a technological pedagogical knowledge.	All the respondents in this study admitted to not having the knowledge and skills to effectively implement and make use of digital technology in their teaching and learning programmes. This lack of knowledge and ability may exist because early grade teachers do not experience
	Levy (2009)	To fully under-stand the way in which the use of technology influences the	

THEME 1 The teacher as key component in digital technology implementation			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		development of learners, teachers need proficient pedagogical con-tent knowledge.	sufficient training and support to acquire the appropriate knowledge and skills to effectively implement and manage the use of digital technology in their teaching and learning programmes. This results in the unsuccessful implementation and use of digital technology.
	Varol (2013)	During the development and decision-making process about classroom practice and the use of digital tech-nologies, teacher knowledge is crucial.	
1.2 Knowledge of how learners learn through the use of digital technology	Parette et al., (2013)	Teachers need to understand and be aware of the learning needs of all learners in this technologically driven world.	The respondents indicated that they saw the impact digital technology had on learners and the need for learners to be taught in a

THEME 1 The teacher as key component in digital technology implementation			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			technological learning environ-ment. Un-fortunately all the respondents admitted to not having the relevant knowledge and skills to effectively implement digital technology and create a learning environment that is suitable for their learners.
1.3 Attitude towards the use of digital technology in learning programmes	Hennessy et al., (2015)	When the focus is on the learners and on creating the most suitable learning opportunities by making use of digital technology, learners will be	Early grade teachers do feel that the effective use of digital technology in learning programmes can be beneficial in creating an exciting learning

THEME 1 The teacher as key component in digital technology implementation			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		enabled to reach their full potential.	environment for learners.
	Kerckaert et al., (2015)	Ineffective use and excessive implementation of digital technology in the classroom may negatively affect learners' motor development.	It was indicated by early grade teachers that they felt the use of digital technology might be beneficial to the learners in their classroom, but one respondent felt that learners might not be as active and become lazy and reluctant to take part in physical activities.

It is evident in the literature that teachers can be seen as the key component in the successful implementation and use of digital technology in teaching and learning programmes (Varol, 2013). Congruent with existing literature, the data collected in this study revealed that although teachers have the willingness to make use of digital technology in their teaching and learning programmes, it cannot be done effectively if there is a lack of knowledge in any of the knowledge fields (Chai et al., 2013). Knowledge of how to integrate these knowledge fields is described as a critical component in the successful

implementation of digital technology in learning programmes, as stated by (Koehler & Mishra, 2006). It was revealed through the data collected that early grade teachers lack the required technological knowledge, resulting in learning programmes that do not make use of digital technology as a support tool to enhance learning experiences. Data also revealed that even though early grade teachers might have the relevant knowledge in all three knowledge fields, knowledge of how to successfully integrate these knowledge fields to develop a sufficient learning programme supported by digital technology is lacking.

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
2.2 Learning areas where digital technology is being used	Lieberman et al., (2009)	If developmentally appropriate technology and software is used, it has the potential to improve learners' mathematical knowledge, and conceptual and related thinking and reasoning skills.	Early grade teachers make use of digital tech-nology to improve mathematical knowledge. The implementation of digital technology is rarely experienced as successful.
2.3 How digital technology is being used	Fan (2012)	Independent learning can take place when digital technology is effectively implemented to	One respondent in this study indicated that if she made use of digital technology in her lessons,

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		support learning programmes.	independent learning did take place. This gave her, as teacher, the opportunity to pay more attention to learners who needed extra help and support.
	Ke (2008)	The use of digital technology does not only enhance cognitive development, but also has a positive influence on learners' attitudes towards learning in general.	Most of the respondents indicated that the use of digital technology had a positive influence on the attitude of the learners towards learning. Teachers made use of digital technology not as part of their teaching programmes, but rather as a reward for learners after a

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			learning activity has been completed, thus making learners eager to complete learning activities with the promised reward in mind.
	Lieberman et al., (2009)	Learners' reading, vocabulary, listening, spelling, speaking and writing skills showed a significant improvement when digital technology was implemented into teaching and learning programmes.	One respondent indicated that she made use of a reading application as part of her reading programme. This respondent experienced it as very helpful and successful in her classroom, being very effective in developing reading skills. It was found that language development was
	Levy (2009)		
	Beschorner and Hutchinson (2013)		

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			one of the subject fields where digital technology was mostly used in the early grade classroom.

As contended by several authors such as Ke (2008), the use of digital technology not only has a positive effect on the cognitive development of learners, but also positively influences learners' attitudes towards learning programmes. In line with these findings in existing literature, some participants indicated that learners were eager to take part in learning activities when digital technology was integrated into the learning programme. This provides the insight that if digital technology is successfully implemented into learning programmes, young learners will be motivated to develop a learning culture.

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
3.1 Early grade teachers' experiences when making use of digital technology in learning programmes	Kaerckart et al., (2015)	Poor concentration may be a result of the excessive and ineffective use and implementation of digital technologies in learning programmes.	Respondents in this study indicated that the use of digital technology in learning programmes initially captured the attention of the learners, but that learners lost concentration very quickly during a lesson that made use of digital technology.
	Gallardo-Echenique et al., (2015)	Learners are interested in technology and focused on its use and development.	Most respondents indicated that their learners showed an interest in digital technology and did enjoy its use in teaching and learning programmes.
	Yurdakul et al., (2012)	By making use of technological devices that are of interest to	

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		screen-orientated learners, their attitude towards learning changes, opening up a gateway for successful learning.	
	Ayres et al., (2013)	Learners are drawn to digital technology, and are motivated to learn through using it.	
	Wilson et al., (2011)	Digital technology and its use gives learners the opportunity to experience and gain access to the world around them.	Seeing that most of the learners attending the participating school were from low-income homes, it was indicated that the use of digital technology granted the learners the opportunity to experience and

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			gain knowledge of the world around them, which they might not have experienced at home.
	Kayalar (2016)	The most important component of effective digital technology integration into learning experiences is the skill and ability of the teacher.	It is because of a lack of teacher skill and ability that the use of digital technology was unsuccessful.
3.2 Challenges faced when making use of digital technology in learning programmes	Johnson (2010)	Overstimulation through the excessive use of digital technology may cause aggression and other emotional problems in learners.	Some of the participating teachers indicated that they experienced disruption and unruliness among learners in their classrooms when digital technology

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			was used in teaching and learning programmes.
	Kaerckart et al., (2015)	Poor concentration may be a result of the extensive and ineffective use and implementation of digital technologies in learning programmes.	Respondents indicated that the loss of attention and concentration among learners when digital technology is used in teaching and learning programmes is very challenging, and it is one of the main reasons why digital technology is not being used more often in their classrooms.
	Chai et al., (2011)	Without the effective integration of the knowledge areas captured in the TPACK model,	A lack of knowledge and skills was indicated to be the biggest challenge faced

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		the development of productive learning systems that use technology, teaching and learning cannot be successful.	by participating teachers.
	Yurdakul et al., (2012)	The biggest barrier to technology integration and effective teaching is a lack of knowledge and competency among teachers to effectively implement and manage the use of digital technology in teaching and learning programmes.	
	Wilson et al., (2011)	Teachers find it difficult to adapt	A lack of knowledge of of

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		the curriculum to suit the learning programmes and diverse learning needs of the learners.	using digital technology, and difficulty in finding appropriate information and applications to suit each lesson and the curriculum, made it extremely difficult for teachers to use digital technology in their teaching and learning programmes.
	Henessy et al., (2015)	The effective implementation of digital technologies in the classroom falls short, because it is such a time-consuming process and it distracts from the main curriculum objective.	The responding teachers indicated that the development process for using digital technologies in their lessons was very time-consuming, making it a challenging

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			experience, which resulted in them not using digital technologies in their teaching and learning programmes.
3.3 Level of success experienced when making use of digital technology in learning programmes	Johnson (2010) Keengwe et al., (2009)	The use of digital technology stimulates cognitive and psychological development, serving as a clear indication that learning and development can be supported and enhanced by the use of digital technology.	If digital technology is implemented and managed effectively, it will be beneficial to all learners. Unfortunately, as stated by the respondents, effective implementation of digital technology is not possible without the appropriate knowledge and skills.
	Kayalar (2016)	Most teachers have sufficient	Insufficient knowledge and

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		content and pedagogy knowledge, but they lack sufficient technological knowledge.	skills to effectively make use of digital technology was the main reason why digital technology implementation in teaching and learning programmes were unsuccessful.

Researchers such as Johnson (2010) and Keengwe et al., (2009) point out the positive impact the use of digital technology can have on the development of all learners. These benefits can only be experienced if digital technology is implemented and managed effectively (Yurdakul et al., 2012). In this study, both learners and teachers showed interest in teaching and learning by making use of digital technology. As revealed by the data collected, in some instances digital technology use was beneficial, but unfortunately, due to the misuse of digital technology, the benefits could not be experienced in full. This misuse was due to a lack of knowledge and skills on behalf of the teachers, thus causing learners not to fully benefit from the use of digital technology implementation. It resulted in negative experiences for the teachers who used digital technology in teaching and learning programmes.

THEME 4 SUPPORT AND TRAINING			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
4.1 Sufficient training	Kayalar (2016)	If teachers are not skilful and knowledgeable when it comes to the use and integration of digital technologies in the teaching and learning process, the incorporation of technology in the learning programme cannot be successful.	It was indicated by all respondents that they were not skilful or knowledgeable when it comes to the implementation and use of digital technology in the early grade classroom, because of a lack of training and support. Consequently, the implementation and use of digital technology in learning programmes were unsuccessful.
	Chai et al., (2011)	Teachers are not adequately trained to integrate all knowledge fields referred to in the TPACK model, and for that reason the successful implementation of	

THEME 4 SUPPORT AND TRAINING			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		digital technology is not possible.	
	Henessy et al., (2015)	Teacher education and professional development has been neglected, especially in African countries.	All of the respondents indicated that they had not received sufficient training in order to gain the required knowledge to effectively make use of digital technology in the early grade classroom.
	Henessy et al., (2015)	Teachers experience difficulty in making the connections between theory and the practical implementation of digital technology. This may be a result of the fact that many	The responding teachers indicated that they did not possess the appropriate knowledge to effectively integrate the use of digital technology with the teaching and

THEME 4 SUPPORT AND TRAINING			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		teachers in developing countries are not appropriately trained for this task.	learning programme to support the curriculum that should be taught.
4.2 Sufficient support	Terras and Ramsey (2012)	The rapid development and increasing availability of internet connectivity in first-world countries offer easier access to digital technologies for teachers. Unfortunately, this is not the case in developing countries such as	The participating school in this study were the recipients of digital devices as part of an empowerment project. Although the early grade teachers had access to some digital devices, it was indicated that a lack of resources and support was one of the main

THEME 4 SUPPORT AND TRAINING			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
		South Africa, making it a significant reason why digital technology implementation in classrooms are less effective.	reasons why the implementation of digital technology use was ineffective and unsuccessful.
	Keengwe et al., (2009)	Teachers do not experience assistance when developing and implementing digital technology in educational programmes, especially when they encounter technical difficulties.	Respondents indicated that they had no knowledge of how to develop appropriate learning programmes consisting of digital technology. It was also indicated that they had no support in this process, resulting in the ineffective use of digital technology in teaching and

THEME 4 SUPPORT AND TRAINING			
Subtheme	Author and year	Existing knowledge	Interpretive discussion
			learning programmes.

In direct correlation with the findings of researchers such as Kayalar (2016), Chai et al., (2011) and Henessy et al., (2015), the data collected in this study suggested that teachers were not adequately trained to integrate digital technology in teaching and learning processes, making the successful implementation of digital technology impossible. In further support of the literature, it was indicated by participants that, although they were granted access to digital devices, the lack of resources and sufficient support was one of the main reasons why digital technology was not adequately implemented in early grade classrooms. A lack of sufficient training and support results in a lack of knowledge, which, in turn, results in digital technology not being used and implemented effectively.

5.2.2 Contradictions between the existing literature and results of the study

Contradictions between the literature and the study results were identified and will be summarised in Table 5.2. As part of a narrative discussion, I will present my interpretation of why I feel these contradictions are present.

Table 5.2: Comparison of results with existing knowledge: Contradictory evidence

THEME 1 The teacher as key component			
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?
1.1 Age of participants	Inan and Lowther (2009) Afshari, Bakar, Luan, Samah and Fooi (2009)	As teacher age increases, the attitude towards, and use of digital technology in the classroom decreases.	Nine of the ten respondents in this study indicated that they would like to make use of digital technology effectively more often, regardless of their age or years of experience.

In contradiction to the findings of numerous studies such as those by Inan and Lowther (2009), it was indicated by 90% of the participants that they would like to make use of digital technology more often in their teaching and learning programmes. The ages of the participants in this study ranged from 32 to 60. These findings lead me, as the researcher, to the conclusion that all respondents – no matter their age or years of experience – could see that the use of digital technology could be effective as a tool to support their learning programmes, thus indicating that teacher age does not play a significant role in the successful implementation of digital technology in teaching and learning programmes.

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
2.3 How digital technology is being used	Keengwe et al., (2009)	The use of digital technology and technological devices should only be used as a support tool, and not as a substitute for effective teaching and learning programmes.	It was stated by a respondent that if she had the ability to make use of digital technology in her teaching programmes, she would use it to substitute her lessons, giving the learners the opportunity to learn on their own and freeing up her time as a teacher. It is her opinion that the use of digital technology	This misconception may exist because of a lack of sufficient training and support, resulting teachers not knowing and understanding how digital technology should be used and implemented in teaching and learning programmes.

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
			and technological devices would make her job as a teacher a lot easier.	
	Blair (2012)	Critical thinking, creativity, communication and collaboration are skills that must be acquired and developed in a technology-supported classroom and learning environment.	It was indicated by a respondent that she only made use of a technological device as reward, granting learners the opportunity to play a game on the device if the learning activity was completed successfully. Other respondents	The many challenges relating to the implementation of digital technology in teaching and learning programmes contributed to the insufficient and unsuccessful use of digital technologies in teaching and learning programmes.

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
			indicated that they did not make use of digital technology at all in their teaching and learning programmes.	
	Fan (2012)	Independent learning can take place when digital technology is effectively implemented to support learning programmes.	Teachers did not make use of digital devices to promote independent learning in their classrooms.	This may be due to a lack of resources. Respondents stated that there were not enough devices for all the learners, so learners had to share. This resulted in learners fighting: one would take control of the

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
				activity and the others would lose interest.
	Attard and Northcote (2012)	Learners get the opportunity to repeat any learning experience at their own pace, as many times as they need to.	Digital technology was not being used effectively, resulting in learners not having the opportunity to repeat a learning experience.	Respondents indicated that they were not sufficiently trained and supported to effectively make use of digital technologies. A lack of resources also prevented the effective use of digital technologies in teaching and learning programmes.
	Kayalar (2016)	The use of digital technology in	Respondents indicated that they did not	This contradiction to the literature

THEME 2 USE OF DIGITAL TECHNOLOGY IN THE EARLY GRADE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
		the early grade classroom grants teachers the opportunity to redesign and modernise teaching resources to suit the various learning situations and environments, developing a holistic and interactive learning environment that captures the attention of all learners.	make use of digital technology because of the many challenges they faced when developing and implementing teaching and learning activities that make use of digital technology as a support tool.	may exist because of a lack of resources, time, knowledge and skills. These challenges resulted in the misuse of digital technology.

As contended by several authors such as Kayalar (2016), the benefits of effectively making use of digital technology as a support tool in teaching and learning programmes seem to be endless. Unfortunately, these benefits were not being fully experienced by the participants in this study.

It was indicated by all participants that they did not have sufficient knowledge and support to effectively make use of digital technology in teaching and learning programmes, resulting in the misuse of the resources available to them. It was also revealed by the data collected that some participants seemed to have a misconception of why digital technology should be used in teaching and learning programmes. It was stated by one of the participants that digital technology could be used as a substitute for the teacher in the classroom. It was understood that this teacher would make use of digital technology in her classroom as an alternative to teaching a lesson. In contradiction to this belief, Keengwe et al., (2009) states that the use of digital technology should only be used as a support tool in an effective teaching programme. It is my observation, as the researcher, that these misconceptions may be rooted in a lack of knowledge and skills on how to make use of digital technology. This observation was supported by the participant when it was stated that it was because of a lack of knowledge that she did not make use of digital technology in her classroom. Thus, it can be concluded that the lack of knowledge and skills created many misconceptions among teachers, resulting in the misuse of digital technology in teaching and learning programmes.

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
3.1 Early grade teachers' experience when making use	Ke (2008)	The use of digital technology enhances cognitive development	It was indicated by respondents that a lack of resources prevents the	It is my opinion as the researcher that learners did not

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
of digital technology in learning programmes		but also has a positive influence on the attitudes of learners towards learning in general.	effective use of digital technology in the early grade classroom, thus preventing cognitive development, as well as a positive attitude towards learning among learners.	benefit from the use of digital technology because of the many different challenges faced by early grade teachers. Seeing that digital devices were rarely used in teaching and learning programmes, learners focused on the digital device being used and lost focus on the learning
	Yurdakul et al., (2012)	When making use of technological devices that are of interest to screen-orientated learners, their attitude towards learning changes, opening up a gateway for successful learning.		

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
				programme. The learning and development of skills was thus not successful.
	Kayalar (2016)	The use of digital technology captures the attention of all learners.	It has been the expe-rience of the respondents that the attention of learners was captured briefly, but that the learners lost interest in the learning activity.	This might have occurred because of the insufficient use of digital technology in learning programmes, because of a lack of knowledge and skill.
	Lieberman et al., (2009)	The use of digital technologies has shown to	Respondents did not experience the develop-	Many challenges, including a lack of

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
		introduce young children to concepts such as abstract thinking and collaborative learning, developing their skills in reasoning and problem solving.	ment of such skills when digital technology was imple-mented in their teaching and learning programmes.	resources, prevent the use of digital technology in the early grade classroom, thus prevent-ing the development of learners' knowledge and skills.
	Beschorner and Hutchison (2013)	Using developmental-appropriate, interactive technology has a significant influence on the development of the young learner.		

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
	Terras and Ramsey (2012)	Providing learners with learning experiences that are relevant and personally meaningful, making the boundaries between formal and informal learning vague, may make learners more attentive in all learning situations.	It was indicated by the respondents that learners did not experience a lesson that made use of digital technology as a learning experience.	Lessons that made use of digital technology as a support tool were few and far between. This, combined with the fact that learners did not have access to digital technological devices at home, resulted in learners that were over-stimulated by the digital technological devices. This

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
				prevented learners from paying attention to the content being taught.
	Johnson (2010)	Exposure to the use of digital technology is emotionally and socially beneficial to learners.	Respondents indicated that learners became very excited when digital technology was used in the classroom. Learners did not want to share devices with others, and they did not pay attention to what was taught.	This may occur because of a lack of recourses, insufficient use of digital technology in lessons as well as the facts that digital technology is not used often in the classroom.
	Marsh (2011)	Learners' social skills development may be significantly influenced by the use of technology.		

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
			Learners also became unruly in the classroom when the teacher used digital technology.	
3.2 Chal-lenges faced when making use of digital technology in learning programmes	Hennessy et al., (2015)	By making use of digital technological devices, the focus is on the learners and on creating the best suited opportunities to enable them to reach their full potential.	It was indicated by some of the respondents that the use of digital technology was not beneficial for their learners.	This challenge might have been experienced because of a lack of resources and insufficient teacher knowledge and skill.
3.3 Level of success when making use	Ayres et al., (2013)	Learners are drawn to digital technology, and are	In this study, it was indicated by respondents	The huge number of challenges (lack of

THEME 3 EXPERIENCE OF DIGITAL TECHNOLOGY USE IN THE CLASSROOM				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
of digital technology in learning programmes		motivated to learn through the use of digital tech-nology.	that the use of digital technology was mostly unsuccessful. Learners enjoyed the use of digital technology in learning programmes, but quickly lost interest in the content of the lesson being taught, and focused on the device.	resources, knowledge, skills) faced by teachers prevent learners from experiencing the potential benefits of digital tech-nology use in learning programmes.
	Ayres et al., (2013)	Skill acquisition dramatically improves when technology is effectively used in educational programmes.		

The use of digital technology should be beneficial to all learners, but in contradiction to the findings of several researchers such as Kayalar (2016) and Marsh (2011), early grade teachers reported that the use of digital technology was mostly experienced negatively. As revealed by the data collected, the reason for this was the challenges experienced by the participating early grade teachers when developing and using digital technology in teaching and learning

programmes. These challenges include a lack of knowledge, skills, support and of sufficient training, as well as a lack of resources and time, resulting in an unpleasant teaching experience for teachers. Ultimately, digital technology was not used to its full potential in education programmes.

THEME 4 SUPPORT AND TRAINING				
Subtheme	Author and year	Existing knowledge	How does what I found contradict what is known?	Interpretive discussion
4.2 Sufficient support	Attard and Northcote (2012)	Digital technological devices have become more accessible to both teachers and learners.	One of the challenges indicated by the respondents was that the lack of resources prevented the effective implementation of digital technology in their early grade classrooms.	Digital devices were very expensive and so was their use and maintenance, making it very costly for schools to provide digital technology as a teaching and learning tool.

As indicated by the participating teachers in this study, even though they had access to digital devices to use in teaching and learning programmes, there were still not enough resources for all learners to participate in the learning activities. Participants indicated that they had large numbers of leaners in their

classrooms, thus making classroom management challenging when implementing digital technology, especially seeing that there were not enough devices. This contradicts the findings of Attard and Northcote (2012), who state that digital devices are more readily available to both teachers and learners. In a South African context, it must be noted that many learners are not privileged to have access to digital technology at home.

5.2.3 Comparison of results with existing knowledge: silences in data

When the results of this study were compared to the literature, certain silences were found in the data. In Table 5.3, the silences that are linked to trends which are related to the themes of this study are listed, followed by an interpretive discussion.

Table 5.3: Comparison of results with existing knowledge: Silences in data

Trend	Author and year	Interpretive discussion
Teachers and their experiences and views regarding the integration process of digital technologies into education programmes are rarely brought into account when policies are designed and when research is carried out.	Henessy et al., (2015)	All the respondents were very eager to share their views and experiences regarding digital technology use in their classrooms. One respondent indicated that she was grateful that I was doing a study that focused on teacher experience and the way in which they use the technologies. Teachers do not feel valued and their experiences are

Trend	Author and year	Interpretive discussion
		rarely brought into consideration. This is unfortunate, seeing that teachers are the key component in the effective implementation of digital technology in teaching and learning programmes.
The focus has been diverted to the capability of a single technological device and not the holistic integration of the device as a support tool in the education programme.	Philip and Garcia (2013)	Seeing that teachers do not have the appropriate knowledge, they do not fully understand the process of integrating a digital device as a support tool in teaching and learning programmes, and thus the focus is on the device and the capabilities of the device or the programs (applications) being used.
The implementation of digital technology in teaching and learning programmes is easier said than done.	Philip and Garcia (2013)	This participating school is a very good example of this statement. Digital devices had been donated to the school, but nevertheless the use and implementation

Trend	Author and year	Interpretive discussion
		of digital technology was unsuccessful.
If learners are exposed to familiar technology, it increases their chances of experiencing success academically and psychologically.	Wilson et al., (2011)	It was stated by the early grade teachers that the use of digital technology was rarely successful. The learners of this school were from low-income homes, and had little to no exposure to digital devices at home. It is my opinion that this might also be one of the reasons why digital technology use was unsuccessful. Because learners were not used to these devices, their use in learning programmes an overstimulated them.
The use of digital technology can be beneficial to all learners if a balance is maintained when using digital technology as a teaching and learning support tool. Technological, pedagogical and	Graham (2011)	Respondents in this study indicated that they did not have the knowledge and skills to implement digital technology effectively in their teaching and learning programmes. It is my assumption that the respondents might

Trend	Author and year	Interpretive discussion
content knowledge must be integrated and knowledge must be drawn from all three knowledge areas.		have knowledge in the three separate knowledge areas, but they did not have the ability to integrate these knowledge areas effectively.

5.3 ADDRESSING THE RESEARCH QUESTIONS FROM THE FINDINGS OF THE STUDY

The purpose of this research project was to make use of the existing literature and the data collected in this study to create a holistic understanding of how early grade teachers experience the use of digital technology in their teaching and learning programmes. The data collected enabled me, as the researcher, to develop a holistic understanding of the views and perspectives of the participants on the research topic. The theoretical framework was used to develop the semi-structured interview questions, creating a comprehensive basis on which to build a holistic view of the experiences and practices of the participants. The document analysis provided new insight into this phenomenon, thus creating a holistic picture of how digital technology should be implemented in schools versus the reality of the situation. All the data collected was extensively explored in order to answer the research question. In my attempt to answer the research question, I firstly addressed the secondary research questions, seeing that these questions are instrumental in answering the primary research question (Joubert, 2016).

5.3.1 Secondary research question 1

How do early grade teachers use and implement digital technologies as a teaching and learning tool?

In answer to this question emerging from subtheme 2.1 (see p.59), 2.2 (see p.60), 2.3 (see p.60) and 3.3 (see p.64), it was found that the early grade teachers in this study rarely made use of digital technology as a tool to support teaching and learning programmes. It was my assumption that if teachers had access to digital devices, these devices would be used and implemented in teaching and learning programmes. This assumption was thus proven to be incorrect by the data collected, seeing that digital technology would more often be used by the early grade teachers to prepare for lessons and learning programmes. The use of digital technology in teaching and learning programmes was also found to be mostly unsuccessful, with participants indicating a long list of challenges to making use of digital technology in their teaching and learning programmes.

It was found that early grade teachers mostly made use of digital technology in subject fields such as mathematics, language, life skills and art. As stated by Beschorner and Hutchison (2013) and Lieberman et al., (2009), cognitive development can be positively influenced by the effective use and implementation of digital technology in teaching and learning programmes. Unfortunately, because of insufficient use of digital technology in teaching and learning programmes, the benefits digital technology use holds for the growth and development of young learners is not being experienced.

It was indicated by respondents that the main use of digital technology in their teaching and learning programmes was to show pictures to learners. This suggested that the use of digital technology was not fully integrated into the teaching and learning programmes. Teachers were not making use of the wide spectrum of functions available on digital devices, thus preventing the productive use of digital technology in early grade classrooms.

One respondent indicated that when she made use of a reading application in her language programme, learners did benefit. This affirms the findings of Beschorner and Hutchison (2013) and Lieberman et al., (2009). Although the participating early grade teachers comprehended the beneficial nature of the

implementation and use of digital technology in their teaching and learning programmes, they still seemed to be unsuccessful in this process. This indicates that when the challenges faced by these teachers are addressed, the first step in the successful use and implementation of digital technology in early grade classrooms can take place.

5.3.2 Secondary research question 2

Which factors influence the implementation of digital technologies in early grade classrooms as a tool to support teaching and learning?

The answer to this question emerged from subtheme 1.1 (see p.56), 1.2 (see p.57), 1.3 (see p.57), 1.4 (see p.58), 3.1 (see p.61), 3.2 (see p.63), 4.1 (see p.66) and 4.2 (see p.67). While the interviews were conducted with the participants, it was noticeable that a number of different challenges faced by early grade teachers hindered the implementation and use of digital technology in teaching and learning programmes. Surprisingly, the age of the participants was not found not to be a challenge. As the researcher, I made the assumption that younger teachers would make use of digital technology more often than older teachers. This assumption was proven to be incorrect, seeing that it was found that teacher age has no significant impact on digital technology use in teaching and learning programmes.

Factors that do have a significant influence on the effective implementation of digital technology, as indicated by the respondents in this study, are discussed below.

Learners are not exposed to the use of digital devices at home or at school, resulting in a situation where learners are drawn to the digital devices, but they do not pay attention to what is being taught, but rather focus on the device itself. The insufficient use – caused by a lack of knowledge (technological pedagogical content knowledge) and skills on the side of the teachers – of digital technology in learning programmes contributes to learners losing interest in that which is being taught. The limited resources to which the early grade

teachers of this participating school have access also make the implementation process challenging. Although the school has some resources, the respondents indicated that a lack of resources was one of the main reasons why they did not make use of digital technology as often, as well as why the implementation of digital technology was unsuccessful.

It is my opinion that, as stated by Philip and Garcia (2013), because of a lack of sufficient knowledge, early grade teachers cannot effectively make use of digital devices. The focus is drawn to the device and its capabilities, and not the outcome of the lesson and the holistic integration of this device as a tool that can support the effective outcome of the lesson. This lack of knowledge seems to be a result of insufficient training and support. It was indicated by all the participating early grade teachers in this study that they were not effectively trained to sufficiently make use of digital technology and develop teaching and learning programmes suitable to the curriculum outcomes that had to be taught in their classrooms. This proves the assumption I made that all teachers are adequately trained to make use of digital technological devices in educational programmes, to be incorrect.

Thus, it can be concluded that the main factor that influences the effective implementation, use and management of digital technology in the early grade classroom is a lack of knowledge and skill, due to a lack of appropriate training and developmental support.

5.3.3 Primary research question

How do early grade teachers experience and use digital technologies as a tool to support teaching and learning?

The secondary research questions of this study form the basis for answering the primary research question. Thus, following on the answers in the secondary research questions, the primary research question can be answered as follows:

The responding early grade teachers mostly had a positive attitude towards the implementation and use of digital technology in their teaching and learning programmes. However, it is clear that a number of factors significantly influenced their use and implementation of the technology, and the teachers mostly experience it negatively. It must be stated that even though teachers did experience digital technology use negatively, the respondents also indicated that they did experience some positive aspects when implementing digital technology in their classrooms.

When looking at the positive experiences of early grade teachers, it must be noted that the early grade learners did enjoy the use of digital technology in their learning experiences. Learners got the opportunity to experience a new world which they possibly would never have experienced without the use and implementation of digital technology in their learning programmes. As indicated by a respondent, the use of digital technology granted her the opportunity to assist learners who encountered difficulties during the learning process, while giving the other learners the opportunities to continue with the learning experience.

It was mostly found that digital technology was seldom used in the teaching and learning programmes of these participants. A lack of skill and knowledge was indicated as the main reason why respondents seldom or never made use of digital technology. A lack of effective training and support was found to be the main reason for the insufficient knowledge and skills of the early grade teachers.

5.4 THEORETICAL FRAMEWORK RELATED TO RESEARCH FINDINGS

When looking at the theoretical framework and the components and information that added value to my study, the TPACK model must be noted. Acting as the lens through which this study was viewed, the TPACK model provided the foundation for me to build a better understanding of the phenomenon being investigated. This model consists of the different knowledge fields that play a

significant role in the effective implementation of digital technology as a tool to support teaching and learning.

It also acts as a guide in establishing whether or not a teacher possesses the appropriate knowledge and skills to combine these knowledge fields, ensuring the effective implementation of digital technology in teaching and learning programmes.

Secondly, the description of the different knowledge fields contributed to my understanding of the knowledge fields presented in the TPACK model and the emergent themes in the data that was collected. The themes not only revealed the importance of sufficient knowledge in the different knowledge fields, but also the skill of the teacher to effectively integrate all knowledge and knowledge fields. The model presented by Koehler & Mishra (2006) promotes teacher knowledge and skill as the most important component in ensuring the successful implementation of digital technology in teaching and learning programmes.

It was noticeable from the data collected that the main factor negatively influencing the use and implementation of digital technology is a lack of knowledge and skill. Sufficient knowledge and the effective integration of these knowledge fields is at the core of the TPACK model, which served as the foundation upon which I could build an in-depth understanding of how early grade teachers experience the use of digital technology usage. This research projected resulted in a better understanding of the challenges faced when digital technology is implemented in early grade learning programmes. In this study, the theory of Koehler and Mishra (2006) was confirmed: the process of teaching and learning can only take place when a vast variety of knowledge fields are consulted and used (Koehler & Mishra, 2006). It was clearly indicated by the data in this study that without the appropriate knowledge and skills, the effective integration of digital technology cannot take place, indicating a definite link between the theoretical framework and the data collected in this study.

5.5 LIMITATIONS OF THE STUDY

As indicated by Creswell et al., (2010), qualitative research has both strengths and weaknesses, and thus some challenges that limit this study were noted. These limitations were dealt with as best as possible.

Firstly, I acknowledge that aspects additional to the factors indicated by the respondents of this study can have a significant influence on the experiences and use of digital technology in early grade classrooms. Thus, one of the limitations of this study is the fact that only one primary school was used as data collection site. Although ten different cases were investigated, the respondents all had the same teaching circumstances. It is recommended that further investigations into this phenomenon should be undertaken to create a comprehensive understanding of early grade teacher experience when using digital technology in teaching and learning programmes.

Secondly, it must be noted that a supplementary data collection instrument should have been used, such as an extensive observation of the use of digital technology in the classroom, to create a comprehensive understanding of the use of digital technology in the early grade classroom.

Thirdly, in the development of an extensive understanding of the experiences of early grade teachers when making use of digital technology in their classrooms, a crucial question was left out in the semi-structured interviews. As the interviewer, I neglected to ask respondents which teaching method they preferred: one that makes use of digital technology or one that does not.

Another limitation is that the findings of this study cannot be generalised, yet transferability to cases similar to those in this research project may be possible, seeing that many schools are the recipients of digital devices as part of empowerment projects in South Africa.

Because the aim of case study research is to provide a comprehensive description of the specific cases being investigated (Cohen et al. 2007), this

study allowed me to gain an understanding of a specific phenomenon in a specific context for which the findings may potentially be transferred to similar contexts. Generalisable findings were never my aim.

Lastly, as indicated by the respondents in this research project, a lack of knowledge and skill development is one of the main reasons why the use of digital technology is not effectively integrated into their teaching and learning programmes. Teacher education and skill development is a vast area of research and was not covered fully in this limited study. Further research and investigation at other sites and in other contexts is needed to fully determine the extent of the findings in this study.

5.6 FINDINGS AND RECOMMENDATIONS

The aim of this research project was to create a better understanding of how early grade teachers experience the use of digital technology in their classrooms. The findings of this study are significant, as they reveal that early grade teachers are not adequately trained and supported to effectively make use of digital technology in their teaching and learning programmes. The findings, followed by recommendations, are discussed below:

Finding 1

The data collected from participants suggests that there is a lack of sufficient teacher training on the use and implementation of digital technology in teaching and learning programmes.

Recommendation

It is my recommendation that teacher education programmes are reviewed, and that the content of these training programmes are carefully investigated.

Establishing whether or not the curriculum being taught is relevant and sufficient to provide early grade teachers with the appropriate knowledge and

information to effectively make use of digital technology in their teaching and learning programmes. Training should take into consideration the fundamental knowledge fields described by the TPACK model, and build on each knowledge field. It should also focus on the skills to effectively integrate all knowledge fields that will result in the effective implementation of digital technology in early grade classrooms.

Finding 2

A lack of support was found to be a great challenge to teachers when attempting to implement digital technology in their teaching and learning programmes.

Recommendation

Teachers should be given the support needed to successfully make use of digital technology in their teaching and learning programmes. This support includes hardware support, where the devices are regularly serviced and kept in working condition. Software support is also essential, where teachers have the opportunity to consult with professionals on which technological programs will be best suited for specific teaching programmes. This will ensure that digital devices are used in effective ways to promote the optimal development of our early grade learners.

Finding 3

A lack of resources seems to be a big challenge faced by early grade teachers, when implementing and making use of digital devices.

Recommendation

Seeing that it is not financially viable to provide all teachers with enough digital technological devices, it is my recommendation that teachers are trained in developing new methods of teaching that make use of the limited digital

technological resources available in such a way that all learners benefit from the implementation of digital technology in their learning programmes.

Finding 4

It was found in the data collected that teachers were eager to learn and develop new ways of teaching to ensure their learners reach their full potential.

Recommendation

It is my recommendation that teacher trainers be made aware of the positive attitude most teachers have towards the use and implementation of digital technological devices in teaching and learning programmes, so that they can use this opportunity to develop the knowledge and skills of early grade teachers in comprehensive training programmes.

The following recommendations for further research, training and practice are made based on the literature review and the findings of this research study.

Recommendation 1

In order to gain a full understanding of how digital technology is being used, and to effectively contribute to a holistic understanding of the experiences of early grade teachers regarding the use of digital technology in teaching and learning programmes, the implementation of digital technology in these classrooms must be extensively observed.

Recommendation 2

A further study should specifically focus on teacher knowledge and skills for the implementation, use and management of digital technology in teaching and learning programmes. The aim is to establish which knowledge fields should be developed and focused on in training programmes.

Recommendation 3

Teacher preference regarding teaching methods should be taken into consideration when further investigating teacher experience on the use and implementation of digital technology.

Recommendation 4

It is recommended that further studies be done on training programmes, and the education and development of teacher knowledge in the implementation, use and management of digital technology in early grade classrooms.

5.7 CONCLUDING REMARKS

In this study, I used a qualitative approach to investigate the experiences of early grade teachers of the use of digital technology in their teaching and learning programmes. I was able to gather in-depth information regarding the phenomenon being investigated by making use of this approach. The purpose of this study was to acquire an in-depth knowledge and understanding of the lived experiences of early grade teachers in the development, implementation and use of digital technologies in their classrooms. I also aimed to gain insight into the factors that influence the implementation and use of digital technologies in the early grade classroom.

The semi-structured interviews held with the participants enabled me, as the researcher, to create a holistic understanding of the phenomenon. Themes and subthemes could be developed to enable me to compare the data collected with existing literature. This comparison allowed me to answer the research questions and add my contribution to this research topic.

Further research could extend on this study by investigating the lack of knowledge and skills of early grade teachers to be able to effectively use and implement digital technology in their teaching and learning programmes. Further investigation into the effectiveness of training programmes is also

needed. While more studies are necessary, it is possible to establish a better understanding of the experiences of early grade teachers when implementing and making use of digital technology in their teaching and learning programmes, as well as to fully understand the factors that influence the effective use of this support tool.

- - o O o - -

LIST OF REFERENCES

Abend, G. (2008). The Meaning of Theory. *Sociological Theory,* 26(2):173-199. Available at: https://www.jstor.org/stable/20453103

Afshari, M., Bakar, K.A., Su Luan, W., Samah, B.A. & Fooi, F.S. (2009). Factors Affecting Teachers' use of Information and Communication Technology. *Internationa Journal of Instruction,* 2(1):77-104. Available at: https://files.eric.ed.gov/fulltext/ED524156.pdf

Akinyoade, D. (2012). Analyses of Qualitative Data for Beginners. Nigeria: Afe Babalola University.

Archambault, L.M. & Barnett, J.H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education,* 4(55):1656–1662. Available at: https://doi.org/10.1016/j.compedu.2010.07.009

Archambault, L. & Crippen, K. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education*, 9(1):71–88. Available at: https://www.researchgate.net/publication/255629738_Examining_TPACK_among_K-12_online_distance_educators_in_the_United_States

Attard, C. & Northcote, M. (2012). Teaching with technology: Mathematics on the move: Using mobile technologies to support student learning. *Australian Primary Mathematics Classroom,* 17(1):29–32. Available at: https://research.avondale.edu.au/edu_papers/26/

Ayres, K.M., Mechling, L. & Sansosti, F.J. (2013). The use of mobile technologies to assist with life skills/independence of students with moderate/severe intellectual disability and/or autism spectrum disorders: Considerations for the future of school psychology. *Psychology in the Schools,* 3(50):259–271. Available at: http://www.onlinelibrary.wiley.com/doi/10.1002/pits.21673/pdf

Baxter, P. & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report,* 13(4):544–559. Available at: http://nsuworks.nova.edu/tqr/vol13/iss4/2/?utm_source=nsuworks.nova.edu%2Ftqr

Beschorner, B. & Hutchison, A. (2013). iPads as a literacy teaching tool in early childhood. *International Journal of Education in Mathematics, Science and Technology,* 1(1):16–24. Available at: http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED543276

Blair, N. (2012, February). Technology integration for the new 21st century learner. *National Association of Elementary School Principals*. Available at: https://www.naesp.org/sites/default/files/Blair_JF12.pdf

Bless, C., Higson-Smith, C. & Kagee, A. 2006. *Fundamentals of social research methods. An African perspective* (4th ed.). Cape Town: Juta.

Bogdan, R.C. & Biklen, S.K. (2003). *Qualitative research for education. An introduction to theories and methods*. Boston: Pearson Education Group Inc.

Brown, T. & Heggs, D. (2005). From hermeneutics to poststructuralism to psychoanalysis. In B. Somekh & C. Lewin (Eds.). *Research methods in the social sciences* (p. 293). London: SAGE Publications.

Burton, D. & Bartlett, S. (2009). *Key issues for education researchers*. Los Angeles: SAGE Publications.

Campigotto, R., McEwen, R. & Epp, C.D. (2012). Especially social: Exploring the use of an iOS application in special needs classrooms. *Computers & Education*, 60(1):74–86. Available at: http://www.sciencedirect.com/science/article/pii/S0360131512001790

Can-Yaşar, M., Inal, G., Özgün, U. & Kandir, A. (2012). Using technology in pre-school education. *US-China Education Review,* 3(4):375–383. Available at: http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED533574

Carr, N. (2010). *The Shallows: How the internet is changing the way we think, read and remember.* Available at: http://itun.es/us/mmTRw.l

Chai, C.S., Koh, J.H.L., Tsai, C. & Tan, L.L.W. (2011). Modelling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT). *Computers & Education,* 57:1184–1193.

Cohen, L., Manion, L. & Morrison, K. (2007). *Research methods in education* (6th ed.). New York: Routledge. Available at: https://dspace.utamu.ac.ug/bitstream/123456789/182/1/Research-Methods-in-Education-sixth-edition.pdf

Creswell, J.W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed). London: Sage Publications.

Creswell, J.W. (2014). Research Design: Qualitative, quantitative and mixed methods approaches (4th ed.). Boston: Pearson.

Creswell, J.W., Ebersohn, L., Eloff, I., Ferreira, R., Ivancova, N., Jansen, J. (2010). In Maree, K (Ed.). *First steps in research*. Pretoria: Van Schaik Publishers.

De Vos, A.S., Strydom, H., Fouché, C.B. & Delport, C.S.L. (2002). *Research at grass roots* (2nd ed.). Pretoria: Van Schaik Publishers.

Eisenhardt, K.M. (1989). Building theories from case study research. *The Academy of Management Review*, 14(4):532–550. Available at: http://amr.aom.org/content/14/4/532.short

Fan, T. (2012). Enhancing learning with the use of assistive technology for children on the autism spectrum. Master's dissertation. San Rafael: University of California.

Gallardo-Echenique, E.E., Marqués-Molias, L., Bullen, M. & Strijbos, J. (2015). Let's talk about digital learners in the digital era. *International Review of Research in Open & Distributed Learning,* 16(3):156–187. Available at: http://www.eric.ed.gov/?id=EJ1067883

Gauteng Department of Education. (2011). *Guidelines on the Management and Usage of ICTs in Public Schools in Gauteng*. E-learning Directorate, GDE.

Graham, C.R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education,* 53(3):1953–1960. Available at: http://www.sciencedirect.com/science/article/pii/S0360131511000911

Green, M. & Milbourne, L. (1998). Making learning support work. *Further Education Development Agency,* 2(6):5-64. Available at: files.eric.ed.gov/fulltext/ED417345.pdf

Hart, S.A. & Laher, S. (2015). Perceived usefulness and culture as predictors of teacher attitudes towards educational technology in South Africa. *South African Journal of Education*, 35(4):1-13. Available at: http://www.scielo.org.za/scielo.php?pid=S0256-01002015000400008&script=sci_arttext&tlng=pt

Hennesy, S., Habler, B. & Hofmann, R. (2015). Challenges and opportunities for teacher professional development in interactive use of technology in African schools. *Technology, Pedagogy and Education,* 24(5):537-564. Available at: http://dx.doi.org/10.1080/1475939X.2015.1092466

Huddlestone, B. (2016). Digital Cocaine: A Journey Toward iBalance. South Africa: Christian Art Publishers

Inan, A. & Lowther, D.L. (2009). Factors affecting technology integration in K-12 classrooms: a path model. *Association for Educational Communications and Technology,* 58(2):137-154. Available at: https://eric.ed.gov/?id=EJ877921

Johnson, G.M. (2010). Internet use and child development: Validation of the ecological techno-subsystem. *Educational Technology & Society*, 13(1):176–185. Available at: http://www.ifets.info/journals/13_1/17.pdf

Joubert, I. (2016). Gevallestudie: Riglyne vir die ontwerp en uitvoering van die navorsing. In Joubert, I., Hartell, C. & Lombard, K. (Eds.). *Navorsing – 'n Gids vir die beginner navorser* (pp. 136–138). Pretoria: Van Schaik.

Kagohara, D.M., Van de Meer, L., Ramdoss, S., O'Reilly, M.F., Lancioni, G.E., Davis, T.N., Rispoli, M., Lang, R., Marschik, P.B., Sutherland, D., Green, V.A. & Sigafoos, J. (2012). Using iPods and iPads in teaching programmes for individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities,* 34:147–156.

Kayalar, F. (2016). Cross-cultural Comparison of Teachers' Views upon Integration and Use of Technology in Classroom. *The Turkish Online Journal of Educational Technolgy,* 15(2):11-19. Available at: files.eric.ed.gov/fulltext/EJ1096412.pdf

Ke, F. (2008). A case study of computer gaming for math: Engaged learning. *Computers & Education,* 51(4):1609–1620. Available at: http://www.sciencedirect.com/science/article/pii/S0360131508000523

Keengwe, J., Pearson, D. & Smart, K. (2009). Technology Integration: Mobile Devices (iPods), Constructivist Pedagogy and Student Learning. *Association of the Advancement of Computing in Education,* 17(4):333-346. Available at: https://eric.ed.gov/?id=EJ871542

Kerckaert, S., Vanderlinde, R. & Van Braak, J. (2015). The role of ICT in early childhood education: Scale development and research on ICT use and influencing factors. *European Early Childhood Education Research Journal,* 23(2):183–199. Available at: http://www.tandfonline.com/doi/abs/10.1080/1350293X.2015.1016804

Koehler, M.J. & Mishra, P. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record,* 108(6):1017–1054. Available at: http://citeseerx.ist.psu.edu/viewdoc/download.

Koehler, M.J. & Mishra, P., Akcoaglu, M. & Rosenburg, J.M. (2013). Technological pedagogical content knowledge for teachers and teacher educators. *Commonwealth Education Media Centre for Asia*, Available at: http://joshuamrosenberg.com/wp-content/uploads/2014/01/ICT-teacher-education-Module-1-Final_May-20.pdf.

Landsberg, E., Krüger, D. & Nel, N. (Eds.). (2005). *Addressing barriers to learning: A South African perspective.* Pretoria: Van Schaik Publishers.

Levy, R. (2009). You have to understand words … but not read them: Young children becoming readers in a digital age. *Journal of Research in Reading,* 32(1):75–91. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9817.2008.01382.x/abstract

Lieberman, D.A., Bates, C.H. & So, J. (2009). Young children's learning with digital media. *Computers in Schools: Interdisciplinary Journal of Practice, Theory and Applied Research,* 26(4):271–283. Available at: http://www.tandfonline.com/doi/abs/10.1080/07380560903360194

Maree, K. & Van der Westhuizen, C. (2013). Planning a research proposal. In Maree, K. (Ed.). *First Steps in Research* (pp. 24–45). Pretoria: Van Schaik Publishers.

Marsh, J. (2011). Young children's literacy practices in a virtual world: Establishing an online interaction order. *International Reading Association,* 46(2):101–118. Available at: http://onlinelibrary.wiley.com/doi/10.1598/RRQ.46.2.1/full

Masters, J. & Grogan, L. (2015). Technology goes bush: Using mobile technologies to support learning in a bush kinder program. Paper presented at the 12th International Conference on Cognition and Exploratory Learning in Digital Age.

McMillan, J.H. & Schumacher, S. (2006). *Research in education, evidence-based inquiry* (6th ed.). USA: Pearson Education, Inc.

Mills, A.J., Durepos, G. & Wiebe, E. (2010). *Encyclopedia of case study research*. United States of America: SAGE Publications.

Mouton, J. (2001). *How to succeed in your master's and doctoral studies. A South African guide and resource book.* Pretoria: Van Schaik.

Nieuwenhuis, J. (2013a). Analysing qualitative data. In Maree, K. (Ed.). *First steps in research* (pp. 98–122). Pretoria: Van Schaik Publishers.

Nieuwenhuis, J. (2013b). Introducing qualitative research. In Maree, K. (Ed.). *First steps in research* (pp. 47–67). Pretoria: Van Schaik Publishers.

Nieuwenhuis, J. (2013c). Qualitative research designs and data gathering technigues. In Maree, K. (Ed.). *First steps in research* (pp. 69–97). Pretoria: Van Schaik Publishers.

Norris, N., & Walker, R. (2005). Naturalistic enquiry. In Somekh, B. & Lewin, C. (Eds.). *Research methods in the social sciences* (p. 133). London: SAGE Publications.

O'Mara, L. & Laidlaw, L. (2011). Living in the iWorld: Two literacy researchers reflect on the changing texts and literacy practices of childhood. *English Teaching: Practice and Critique,* 10(1):149–159. Available at: http://education.waikato.ac.nz/research/files/etpc/files/2011v10n4nar2

Oxford Online English Dictionary. (2016). *Oxford University Press: England*. Available at: http://www.oxfordreference.com/view/10.1093/acref/9780199212064.001.0001/acref-9780199212064

Palaiologou, I. (2014). Children under five and digital technologies: Implications for early year pedagogy. *European Early Childhood Education Research Journal,* 22(1):5–24. Available at: http://www.tandfonline.com/doi/abs/10.1080/1350293X.2014.929876

Patton, M.Q. (2001). *Qualitative research and evaluation methods* (3rd ed.). London: Sage Publications.

Parette, H.P., Hourcade, J.J., Blum, C., Watts, E.H., Stoner, J.B., Wojcik, B.W. & Chrismore, S.B. (2013). Technology user groups and early childhood education: A preliminary study. *Early Childhood Education Journal,* 41(3):171–179. Available at: https://link.springer.com/article/10.1007/s10643-012-0548-3

Philip, T. & Garcia, D. (2013). The importance of still teaching the iGeneration. *Harvard Educational Review*, 83(2):300–319. Available at: https://www.ssrc.org/publications/view/importance-still-teaching-igeneration-new-tech-central-pedagogy/

Pumilia-Gnarini, P.M., Favoron, E., Pacetti, E., Bishop, J. & Guerra, L. (2013). *Handbook of research on didactic strategies and technologies for education: Incorporating advancements.* United States of America: Information Science Reference.

Republic of South Africa. (2017). *Annual Report 2016/17*. Department of Basic Education. Available at: https://www.education.gov.za

Republic of South Africa. (2004). *White Paper 7 on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs).* Department of Education.

Republic of South Africa. (2010). *Guidelines for full-service/inclusive school*s. Department of Basic Education. Available at: www.education.gov.za/LinkClick.aspx?fileticket=ujnw5lr18MA=

Republic of South Africa. (2003). *Revised National Curriculum Statement Grades R-9*. Department of Education. Available at: www.education.gov.za/LinkClick.aspx?fileticket=WJoXaOgvys4%3D&amp

Roualdes, M.M. (2013). *Increasing public awareness of the needs of students with learning disabilities in the elementary setting.* Californian.

Schafer, E.D. (2003). *Digital technology.* Available at: www.encyclopedia.com/doc/1G2-3401801216.html.

Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). New York: Teaching College Press.

Siemens, G. (2005). Connectivism: A learning theory for the Digital Age. *International Journal of Instructional Technology and Distance Learning, 1(2):3-10.* Available at: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.87.3793

Somekh, B. & Lewin, C. (Eds.). (2005). *Research methods in the social sciences*. London: SAGE Publishers.

Terras, M.M. & Ramsay, J. (2012). The five psychological challenges facing effective mobile learning. *British Journal of Educational Technology,* 43(5):820-832. Available at: onlinelibrary.wiley.com/doi/10.1111/j.1467-8535.2012.01362.x/full

Tweed, S.R. (2013). Technology Implementation: Teacher Age, Experience, Self-Efficacy and Professional Development as Related to Classroom Technology Integration. Doctoral dissertation. East Tennessee State University.

Van Teijlingen, E. & Hundley, V. (2002). The importance of pilot studies. *Nursing Standards,* 16(40):33-36. Available at: https://www.ncbi.nlm.nih.gov/pubmed/12216297

Varol, F. (2013). Elementary school teachers and teaching with technology. *The Turkish Online Journal of Educational Technology,* 12(3):85–90. Available at: http://eric.ed.gov/?id=EJ1016857.

Wilson, C.H., Brice, C., Cater, E.I., Fleming, J.C., Hay, D.D., Hicks, J.D., Picot, E., Taylor, A.M. & Weaver, J. (2011). *Familiar technology promotes academic success for students with exceptional learning needs*. Available at: http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED530541

Yin, R.K. (2011). *Qualitative research from start to finish*. New York: The Guilford Press.

Yin, R.K. (2014). *Case study research: design and methods* (5th ed.). London: SAGE Publications.

Yurdakul, I.K., Odabasi, H.F., Kilicer, K., Coklar, A.N., Birinci, G. & Kurt, A.A. (2012). The development, validity and reliability of TPACK-deep: A technological pedagogical content knowledge scale. *Computers & Education,* 58(3):964–977. Available at: http://www.sciencedirect.com/science/article/pii/S0360131511002569

- - o O o - -

ANNEXURES

ANNEXURE A

Schools' letter of consent

ANNEXURE B

Teachers'/Participants' letter of consent

ANNEXURE C

Individual semi-structured interview schedule

- - o O o - -

Annexure A:

Schools' letter of consent

LETTER OF CONSENT FOR RESEARCH

Dear

I am currently busy with my master's degree entitled:

Teacher experiences in using digital technology in the early grades to support teaching and learning

The aim of my study is to determine how early grade teachers (Grade 1–Grade 3) experience and use digital technology to support teaching and learning.

The research question is as follows: How do early grade teachers experience and use digital technologies as a tool to support teaching and learning?

With your permission, I would like to involve the early grade teachers from this primary school in my study.

The ethics and research statement that is provided by the Faculty of Education of the University of Pretoria will be followed closely in order to ensure that a high ethical standard will be maintained. The anonymity of this primary school and all teachers participating in this study will be ensured at all times.

Three teachers from this this primary school will be selected based on the following pre-determined criteria:

- The teachers had to be qualified (held a degree in early childhood education).
- The teachers had to be teaching learners in Grade R, 1, 2 or 3.
- The teachers had to have access to digital technologies that were provided by the school to support teaching and learning.
- The teachers had to indicate their willingness to voluntarily participate in the research project.

The data will be collected by conducting an individual semi-structured interview with willing participants. This interview will be scheduled during after school hours, at a location that best suits the participating teacher.

If permission is granted, please sign your consent with full knowledge of the nature, purpose and procedures that will be followed during this research project.

Kind regards

_____

Miss C Wilson

E-mail address: canciwilson@gmail.com

Contact number: 082 773 7966

PERMISSION FOR RESEARCH
I, _____, hereby give permission to Candice Wilson to conduct her research with early grade teachers (Grade 1 to Grade 3) at_____ (name of school). Signature: _____ Date:_____

Annexure B:

Teachers'/Participants' letter of consent

Teacher experiences in using digital technology in the early grades to support teaching and learning

Name of participant: _____

Name of researcher: Miss Candice Wilson

Dear early grade teacher

The following information is provided to enable you to decide whether you wish to participate in this research study. Please take note that you are free to decide not to participate in this study. Furthermore, it is your right to withdraw at any point during the research study. You can be assured that your decision will be respected.

The purpose of this study is to determine how early grade teachers (Grade 1– Grade 3) experience and use digital technology to support teaching and learning.

The data will be collected by conducting an individual semi-structured interview with willing participants. This semi-structured individual interview will only take approximately 45 minutes and will be scheduled for a convenient time and place, as indicated by you.

You may ask questions before or during the time of participation. If you have any concerns regarding the data collection procedures, please notify me. Each early grade teacher will have the opportunity to verify the expressed views and

the transcriptions of interviews made by me. I can assure you that the data collected from you will be safeguarded. The information provided and data collected from you will be kept confidential. No mention of your name will be made. To ensure your privacy, I will use a pseudonym or a code name and maintain anonymity when referring to data collected from you.

Please sign to indicate full comprehension of the nature, purpose and procedures of the research and to give your consent to participate.

- ❖ I agree to participate in the above-mentioned research project and I grant permission that data may be collected during an individual semi-structured.
- ❖ I authorise the use of the individual semi-structured interviews for data analysis.

PERMISSION FOR RESEARCH
I, _____, hereby give permission to Candice Wilson to include me as a participant in her research with early grade teachers (Grade 1 to Grade 3) at_____ (name of school). Signature: _____ Date:_____

Annexure C:

Individual semi-structured interview schedule

Interview questions/prompts (the questions are only guidelines and the researcher will further be guided by the data gathered from the focus group interview and the completed semi-structured questionnaire).

- Please specify your age.
- What is your home language?
- What is the language you teach in?
- Do you know what digital technologies are?
- Can you give me three examples of digital technologies?
- How often do you use digital technologies in your classroom?
- For which subjects/learning programmes do you use digital technology?
- How do you use digital technologies in your classroom? Provide two examples.
- Explain how you experience the use of digital technologies in your classroom.
- What are the challenges you face when implementing digital technologies as a support tool?
- Do you feel you are supported and trained sufficiently to effectively implement digital technologies as learning support tool?
- Do you feel you are successful when implementing digital technologies as a learning support tool in your classroom? Explain.
- Do you feel that learners benefit from the use of digital technologies in learning programmes? Explain.
- Do you feel digital technologies can be implemented to support each lesson in your classroom?

- Would you say you can effectively implement mobile technologies in most of your lessons? Explain.
- Do you feel that you sufficiently understand how learners learn through the use of digital technologies?
- Would you like to use digital technologies as learning support tools more often? If yes, what prevents this from happening? If no, please provide a reason.
- Do you believe all learners can benefit from the use of mobile technologies as support tools?