Exploring teachers' perceptions of the barriers and solutions to using one teacher laptop per class in a multi-grade context: The case of Intel® Teach – ICT implementation

Brenda Subramanien

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by

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Submitted in fulfilment of the requirements for the degree of Master in Education to be awarded at the Nelson Mandela Metropolitan University
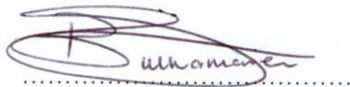
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ABSTRACT

This interpretive exploratory case study investigated the challenges and barriers to the multi-grade context in general, as well as to Information and Communication Technology (ICT) implementation in a multi-grade context. Possible solutions based on teacher perceptions were generated inductively within a three-level typology. The research took place in three phases. Pre-training data were gathered in the first phase, using an open-ended questionnaire (all participants: n=20); personal interviews (n=9); and two focus group interviews, which consisted of three participants per focus group. Training on the Intel® Teach ICT programme and the provision of laptops (one per teacher) constituted the second phase. The third phase included post-training data generation using an open-ended questionnaire (all participants) and two focus group interviews, which consisted of three participants per focus group, to elicit teacher perceptions of the training programme and their use of the laptops in the classroom after the training.

The findings suggest that first order (school or meso level) challenges pertaining to multi-grade teaching relate to the lack of resources; curriculum challenges; learner related challenges; isolation, impact on communication and teaching; time constraints; and a work overload as a result of the multiple roles. Second order challenges (self or micro level) related to the perceived uncaring attitude of the Department of Basic Education that left teachers feeling hurt and neglected; the unpreparedness for the multi-grade context which demotivated teachers; and the negative perceptions the teachers had about their learners. Third order challenges (system level, beyond the school level or micro level) were related to the lack of Departmental support from officials; the lack of curriculum training for the multi-grade context; and the lack of support on various fronts.

Regarding ICT related challenges, the findings suggest that first order barriers related to the lack of suitable infrastructure for ICT implementation; lack of peer support; lack of access to appropriate hardware and software; and lack of time. Second order barriers related to the negative beliefs in the self; negative perceptions about the learners' ability to use the laptop; and negative beliefs related to teaching and learning. The third order barriers were related to the lack of support and assistance from the Department of Basic Education for ICT implementation.

The findings suggest that the participants viewed the provisioning of enabling programmes for parents as an important solution to first order challenges, and a change in mindset as the most important solution for second order problems. Third order solutions included a *"multi-grade Renaissance"* towards a new model for multi-grade teaching; re-thinking the curriculum requirements regarding multi-grade teaching by the Department of Basic Education; increased support and training from the Department; incentives to teach with ICT in the multi-grade context; encouraging further research in

multi-grade teaching; providing sufficient resources; establishing partnerships with stakeholders; and the closure and merger of multi-grade schools.

There was evidence that the laptops provided were used in a variety of ways after the Intel® Teach training by the participants, including email as a tool to communicate with their fellow multi-grade peers, which serve to break their sense of isolation. Quantitative data from the open-ended questionnaire confirmed an increase in the usage of the laptop after the Intel® Teach training intervention. Although the participants generally experienced the Intel teach training intervention as positive, they also identified negative experiences.

These findings enabled the embedding of 'self and sustainable support from stakeholders' more explicitly in the professional teacher development ICT implementation framework of Du Plessis and Webb (2012b), which suggests that the Intel® Teach training intervention can be used as a vehicle to address ICT implementation within the multi-grade context. It is suggested that the Department of Basic Education should consider exposing all teachers to the Intel® Teach programme and assist multi-grade teachers by providing better on-going support and putting the necessary policies, implementation and infrastructure in place.

Key words: Barriers, challenges, first, second and third order typology, ICT implementation, ICT integration, Intel® Teach, Multi-grade teaching.

DEDICATION

This work is dedicated to

my parents

The late Pauly and Grace Barendse

who introduced me to the positives that multi-grade teaching holds for learners in a multi-grade classroom. You have ignited and kindled in me a passion to assist those often neglected in the rural, isolated areas, where multi-grade teaching is the only way to provide access to primary education. Your example of selfless love, commitment and dedication to educate and uplift those entrusted in your care has etched a remarkable impression on my life. I will always be grateful for your wisdom, support, encouragement, motivation, guidance, and belief in me and for being my role models and guarding angels throughout my career.

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To my late father, thank you for the advice, encouragement, support and sharing your experiences. Your words of wisdom and example of excellent service will remain my guiding star.

To my Mother, who has always been a great pillar of strength, support and encouragement. Thanks for always being available when I need you.

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ABBREVIATIONS

ABET	Adult Basic Education and Training
ACOT	Apple Classrooms of Tomorrow
ANA	Annual National Assessment
APEID	Asian Programme for Education Innovation and Development
BCEEA	Basic Conditions of Employment of Educators
BECTA	British Education Communications Technology Agency
CAI	Computer Assisted Instruction
CAMI	Computer Aided Maths Instruction
CAPS	Curriculum Assessment and Policy Statement
CBAM	Concerns Based Adoption Model
CBI	Computer Based Instruction
CD	Compact Disk
CMGE	Centre for Multi-Grade Education
CPD	Continuing Professional Development
CPUT	Cape Peninsula University of Technology
$CRAR^3FS^2$	Care, Relate, Assessment, Reflection, Read, Re-plan, Feedback, Share, Support-ongoing,
$C^2RHOAR^3FS^2R^2$	Care, Competence, Relate, Hands-on, On-going, Assessment, Reflection, Read, Re-plan, Feedback, Share, Support-ongoing, Recognition and Resources
DoBE	Department of Basic Education
EMIS	Education Management Information System
EPC	Education Policy Consortium
EU	European Union
FIFA	Fédération Internationale de Football Association
HEI	Higher Education Institution
HSRC	Human Sciences Research Council

ICT	Information Communication Technology
INSET	In-Service Training
INTEL	Integrated Electronics Corporation
KPL	Knowledge Practices Laboratory
LSEN	Learners with Special Educational Needs
LTSM	Learner and Teacher Support Materials
MDG	Millennium Development Goals
MGT	Multi-grade Teacher
MS	Microsoft
MSC	Mind Skill Character
MUSE	Multi-grade School Education
NCS	National Curriculum Statement
NEMED	Network of Multigrade Education
NGO	Non-Governmental Organisation
NSF	Norms and Standards for Funding
NWREL	Northwest Regional Educational Laboratory
PAM	Personnel Administration Measure
PFMA	Public Finance Management Act (No.1 of 1999 as amended by Act 29 of 1999)
PSOPP	Public Schools on Private Property
RIPPLES	Resources, Infrastructure, People Policies, Evaluation Learning new strategies, Support
SA	South Africa
SACE	South African Council for Educators
SAIDE	South African Institute for Distance Education
SASA	South African Schools Act (No.84 of 1996)
UNESCO	United Nations Educational Scientific and Cultural Organisation
WCDE	Western Cape Department of Education

CHAPTER 1

INTRODUCTION AND OVERVIEW

1.1   INTRODUCTION AND BACKGROUND

The vision and mission of the Department of Basic Education are to provide access to quality education for all, as stipulated in the South African Schools Act 84 of 1996 (Republic of South Africa, 1996b), as well as in the Constitution, Act 108 of 1996 (Republic of South Africa, 1996a). This is further underpinned by the principles of the Department of Education's Quality Learning and Teaching Campaign (Department of Education, 2009a), as well as the commitment to the Dakar Framework for Action 2000 (World Education Forum, 2000). The role that education plays in the battle against poverty has been re-emphasised and gained world-wide recognition in the 2010 FIFA World Cup launch of the *'1GOAL: Education for All'* campaign, which aims to harness the power of football to guarantee that education for all would become a permanent result of the 2010 FIFA World Cup (Global Campaign For Education & 1Goal, 2010).

According to Khan (2008), a UNESCO report highlighted the importance of Information and Communication Technology (ICT) as a tool in shaping the future of teaching and learning within the educational context. The South African Department of Education has realised this claim long before 2008, with the publication of a White Paper in 2004 (Department of Education, 2004). This White Paper on e-Education (2004) states that by 2013 all South African learners have to be ICT capable and that teachers should be using ICT resources in teaching and learning (Department of Education, 2004), thereby emphasising the importance of ICT within the educational context. However, in the year 2012, it seemed that this overzealous goal would not be possible, because the provision of computers via the Eastern Cape Department of Education's ICT Roll-out Plan was not meeting the demand.

Yet, in September 2005, a governmental report indicated that South Africa was well on track in terms of the Millennium goals[1] to be reached by 2015 (Modisane & Masango, 2005). However, it seems that this report might not be portraying a realistic picture (Chetty, 2010). According to Chetty (2010), South Africa is faced with a significant challenge in improving the quality of education,

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[1] The Millennium Goals to be reached by 2015 are to eradicate extreme poverty; to achieve universal primary education; to promote gender equality and empower women; to reduce child mortality; to improve maternal health; to combat HIV/AIDS, malaria and other diseases; to ensure environmental sustainability; and to develop a global partnership for development.

particularly in the rural areas. The White Paper on e-Education (Department of Education, 2004) suggests that ICT integration has the potential to improve education in terms of teaching and learning.

Prior to 2009, ICT resourcing to multi-grade schools was non-evident within the Uitenhage District in which the researcher resided. However, it seems that regarding the roll-out of ICT within the Uitenhage District, a small 'about turn' was noticed in May 2009, when the Eastern Cape Department of Education supplied one laptop each for teaching and learning to 100 educators working within the multi-grade teaching context within the Eastern Cape Province in the Uitenhage, Lusikisiki and Sterkspruit Districts. This one teacher laptop roll-out, should not be confused with the *'one laptop per child'* initiative (see http://one.laptop.org/). Although 100 laptops were provided, this was a very small number in comparison with the remaining number of teachers within the District and Province still without ICT resources. A study by Du Plessis (2010) also suggested that the roll-out of ICT resources to disadvantaged schools within the Port Elizabeth District, adjacent to the Uitenhage District, was non-existent. The Department of Education (2004) has also acknowledged that the educational school context is in desperate need, not only for ICT resources, but also for ICT resources to be used by teachers for teaching and learning. The ICT related resource problem was also highlighted by Howie, Muller and Paterson (2005). Data from the Department of Education (2009a) also suggest that ICT access at schools within South Africa and within the Eastern Cape Province is very low, and Education Management Information System (EMIS) 2010 data have also indicated that only 10% of the schools had a computer centre, concurring with Howie, Muller and Paterson (2005) and Du Plessis (2010).

The multi-grade teachers within the Uitenhage District who received the teacher laptops, referred to in the previous paragraph, had received very basic computer literacy training only, in terms of a program that lasted five hours per day over four days through the MSC College, prior to receiving them. The aim of the training was to ensure that the recipients would be able to use the laptops. Teachers were expected to use the computers to promote ICT implementation in their teaching and learning in multi-grade classrooms, but school visits and informal interviews with the multi-grade teachers confirmed that they were not using the laptops that they had been given.

While reading literature related to multi-grade education and ICT, several questions began to arise, such as, *'Is the Department of Education really aware of the challenges that multi-grade teachers experience?'* and *'What are the perceived problems that multi-grade teachers experience within the Uitenhage District?'* Further questions manifested, such as, *'Are these barriers similar in nature or different to those mentioned in the literature?'* Hence, a study concerned with multi-grade teachers' perceptions about the barriers or challenges could be useful to inform possible future policy, as well as planning for training and assistance.

From the onset, it was clear that the term multi-grade was permeated with problems. The learners from the multi-grade context generally come from poor parents, often farm workers, with low

levels of education. Multi-grade teaching schools are mostly situated on farms and are characterised by neglect (Kruss, 2009), poverty, lack of infrastructure, lack of parental involvement, high drop-out rates, low learner enrolment and absenteeism, and lack of basic services (Ministerial Committee, 2005). Multi-grade is also seen as a temporary intervention for providing access to education for rural learners (Cornish, 2010). It is often difficult to find qualified educators who are willing to teach in these areas. All this has served to create the perception that the quality of the education in schools practising multi-grade education is poor compared to that of schools practising mono-grade in the urban areas, especially when one looks at the funding that multi-grade schools receive.

In view of the above, the researcher grappled and formulated more subsequent questions, such as, 'What are the challenges that multi-grade teachers face?'; *'What could be the reasons why the educators did not use the laptops as was expected of them?'*; *'How can these multi-grade teachers be assisted to become users of a one-laptop for teaching and learning in their multi-grade classrooms?'*; and *'If training is provided to the multi-grade teachers, will it necessarily result in them using the laptop for teaching and learning?'*. Therefore, it seemed that a study of this nature could provide answers to these above stated questions.

1.2   PROBLEM STATEMENT

The researcher engaged in informal discussions with the multi-grade teachers who received their laptops during 2009. These informal discussions indicated that the teachers in multi-grade schools who each received a laptop, were not utilising their laptops for teaching and learning in the multi-grade classroom. It was also clear that although a short once-off basic training session had been provided, this had not resulted in ICT usage within the multi-grade classroom.

The researcher therefore grappled with how to sensitise the Department of Education and the Uitenhage District Office of these multi-grade teachers' needs in order to take education forward, as portrayed in section 1.1. Against this backdrop, the researcher decided to embark upon a formal study in order to report the multi-grade teachers' perceptions regarding the aspects indicated in question format with which the researcher grappled, as indicated in sections 1.1 and 1.2. These issues relate to challenges pertaining to the multi-grade classroom context and ICT usage, what the teachers perceived could be done, and whether something could be done that would yield practical evidence of usage. In view of the above and the aspects discussed in the previous sections, the research questions, as indicated in section 1.4, were formulated.

1.3   RESEARCH AIM AND OBJECTIVES

The overall research aim of this study was to enable teachers to use the laptop in the multi-grade classroom by determining their needs in order to use an existing teacher assistance programme, such as Intel® Teach, for one-laptop implementation within the multi-grade classroom school context. From the main research aim, the following objectives emerged:

- To ascertain the challenges and/or barriers that multi-grade teachers experience;

- To determine the challenges or barriers that mitigate against the use of a laptop in the multi-grade classroom;

- To ascertain what could be done to address the barriers in order to assist with classroom implementation of the laptop for teaching and learning, as perceived by the teachers;

- To expose the participating teachers to an existing ICT programme, Intel® Teach, with a view to assist the educators in using the laptop for teaching and learning in the multi-grade classroom;

- To determine whether the exposure to the Intel® Teach Programme had promoted a change in the participating teachers' practice, i.e. whether evidence existed to indicate whether teachers were using the laptop for teaching and learning;

- To sensitise and inform the Department of Basic Education regarding the issues that this study investigated and the findings pertaining to these issues; and

- To provide recommendations to the Department of Basic Education regarding what could be done to assist multi-grade teachers within similar contexts regarding how they could be assisted to use the laptop for teaching.

1.4   RESEARCH QUESTION AND SUB-QUESTIONS

The main research question that emerged from the problem statement and aims is:

Can the use of the Intel® Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context? Regarding the 'Can' question, Andrews (2003) states that there seems to be a concern regarding phrasing such a question. However, he argues that this type of question actually does not result in a mere 'yes' or 'no' response; rather, it provides an opportunity to find 'answers' that go beyond a simple 'yes' and 'no' (Andrews, 2003). In

the light of the above, the following subsidiary questions need to be answered in order to answer the main research question, namely:

- *What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

- *What are the teachers' perceptions of what can be done to meet these challenges?*

- *What did they perceive as the positive and negative aspects of the Intel® Teach training programme?*

- *Is there evidence that the Intel® Teach Training Programme enabled teachers to implement ICT into their teaching and learning in a multi-grade context?*

1.5 RELEVANCE OF STUDY

Multi-grade teaching is part of education systems in both developed and developing countries all over the world (Little, 2006; Tsolakidis, 2010) and is also practised in South Africa (Brown, 2010; Gardiner, 2008; Jordaan & Joubert, 2008; Joubert, 2010). Various terms are used for the practice of multi-grade teaching, like composite classes in New Zealand (Wilkinson & Hamilton, 2003); multi-age or multi-phase or mixed grades in the United Kingdom (Little, 2006); and multi-grade teaching in South Africa (Jordaan & Joubert, 2008). Gardiner (2008), Kruss (2009), Jordaan and Joubert (2008), Juvane (2007) and Little (2006) have lamented the neglect of multi-grade schools. This sentiment was shared by the multi-grade teachers in the Uitenhage District during informal interviews during school visits prior to the commencement of this study. The teachers indicated that they felt that the support they received from departmental officials was generally inferior and insufficient compared to the support given to mono-grade schools. The teachers indicated that they were seldom visited by departmental officials for on-site support and that the workshops and meetings did not address their challenges and needs.

Whilst it is important for educators to utilise the one-laptop awarded to their school, it is of equal importance to equip the educators with skills to utilise the technology in order to assist them with teaching and learning within their classrooms. The research findings could therefore make a valuable contribution towards a greater understanding of the plight of multi-grade teachers and to ascertain what they suggest could be done to assist them. In addition, the research could also enlighten the Department of Basic Education whether an ICT training programme, such as the Intel® Teach Programme, could assist with ICT implementation within the multi-grade context. Furthermore, the usage of one laptop as

an ICT resource could also expose learners from the poorest communities in which these multi-grade schools are situated to technological resources and provide an opportunity to assist with breaking down the digital divide for teachers and learners within the multi-grade context, an aspect that is also emphasised by the White Paper on e-Education (Department of Education, 2004).

Brown (2010) recognised multi-grade teaching as an *"under-researched area in South Africa"* (Brown, 2010, p. 193). Hence, it seems that research within the multi-grade context related to the challenges that multi-grade teachers face within their classrooms, the barriers they are faced with when using ICT for teaching and learning within their multi-grade context, the teachers' suggestions on what can be done to assist them, and whether the Intel® Teach Training Programme could assist them to start using the laptop for teaching and learning, and that the research findings could be useful to the Department and District Office with a view to future planning and initiatives.

The researcher therefore also envisaged that this research could play a role in assisting, motivating and encouraging multi-grade teachers to use the available technology in order to become part of the on-line and global community of ICT users. At the same time, the findings of this study could inform policy and further assistance related to the multi-grade context, especially within the Uitenhage District.

1.6   BRIEF CLARIFICATION OF CONCEPTS FROM LITERATURE

This research had as its foci the challenges related to the multi-grade classroom and ICT usage, and what the participating teachers envisaged could be done in order to address these challenges. The study also focused on how and what the perceptions of the teachers were related to further Intel® Teach training, as well as whether there was evidence of usage after the further training. At the same time, certain concepts or terminologies were used. It is therefore important to understand the different terminologies involved. Hence, a short overview is provided in the following sub-sections.

1.6.1   Perspectives on mono-grade and multi-grade education

In mono-grade education, one teacher is expected to teach to one grade or one subject in the same classroom. It is the primary and preferred method of instruction in most countries (Brunswic & Valérien, 2004; Little, 2006). Although learners in a mono-grade classroom also have different abilities, they are usually learners of the same age and progress from one grade level to the next. These learners do not usually stay with the same teacher, but move on to the next grade teacher (Berry, 2001b; Little, 2006).

In multi-grade teaching, on the other hand, the teacher is expected to teach all subjects to more than one grade of learners in the same classroom. These learners, who are differentiated in grade, ability, capability and age, sit in the same classroom. This practice occurs mostly in isolated or rural

areas with limited resources (Little, 2001; Berry, 2001b; Juvane, 2007; Joubert, 2010; Tsolakidis, 2010). Joubert (2010) defines multi-grade education in the South African milieu as:

> *"the situation, where one teacher teaches simultaneously all the learning areas or some of the learning areas to learners who are in two or more grades or in different grades in a combination of different phases. Multi-grade teaching occurs in rural areas, with limited facilities and mostly on farms"*

(Joubert, 2010, p. 2).

In South Africa, all public schools ascribe to the National Curriculum Statement (NCS) or the newly introduced Curriculum Assessment Policy Statement (CAPS) as the curriculum that is taught. There is no separate curriculum for multi-grade teaching. It is expected that teachers in multi-grade classrooms must address all expected outcomes for a particular grade. It seems that the preferred method of instruction in South Africa favours mono-grade teaching, in terms of which one teacher is responsible for teaching one grade or one subject to learners in the same classroom.

Multi-grade as an educational reality is not a new idea (Commonwealth Secretariat, 2007; Little, 2006; Mulkeen & Higgins, 2009) and is not confined to the South African context. Multi-grade teaching is a worldwide phenomenon. In Chapter Two, this issue will be further explored. Multi-grade education is seen as a temporary intervention for providing access to education for rural learners (Cornish, 2010). The Commonwealth Secretariat (2007), Little (2006) and Mulkeen and Higgins (2009) agreed on the criteria for prevalence and that the rationale for multi-grade teaching arose from necessity, namely to cater for the needs of all learners. Internationally, it seems that multi-grade schools account for about 30% of all primary schools in the world (Brunswic & Valérien, 2004; Little, 2006; Mulkeen & Higgins, 2009). However, statistics seem not to be accurate (Little, 2006).

Whether multi-grade is implemented as a choice or as necessity, the various literature sources (Commonwealth Secretariat, 2007; Gardiner, 2008; Jordaan & Joubert, 2008; Little, 2006) seem to concur on the conditions that prevail in areas where multi-grade teaching is practised, namely poverty, a lack of basic infrastructure, a lack of parental involvement, high drop-out rates, low learner enrolment, absenteeism and a lack of basic services. These schools are often located in remote, rural surroundings (Brown, 2010; Gardiner, 2008; Joubert, 2010, Juvane, 2007; Little, 2006; Mathot, 1998; Ministerial Committee, 2005; South African Institute for Distance Education, 2003).

International teacher perceptions of multi-grade teaching tend to be negative as it is perceived that teaching multi-grade classes carries a heavier workload and creates more stress for teachers in the work environment (Mulkeen & Higgins, 2009). Informal discussions with educators in the Uitenhage District revealed that these perceptions were also shared by some educators teaching multi-grade classes in the Uitenhage District. The importance of multi-grade education and recent research on multi-grade

education have renewed the focus on rural education and multi-grade education (Joubert, 2010). The 2010 Multi-Grade Conference in Paarl, South Africa, which was attended by the researcher in March 2010, also highlighted the fact that multi-grade education is an important reality that has to be addressed and supported.

1.6.2   Perspectives on ICT implementation

The term ICT (Information Communication Technology) in the South African school context may be described as "The term information and communication technology (generally abbreviated to ICT) [that] includes the technologies which together support people's ability to manage and communicate information electronically" (Biablobrzeska & Cohen, 2005, p.12). According to the Department of Education (2004):

> *"ICT's represent the convergence of information technology and communication technology. ICT's are the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge"*

(Department of Education, 2004, p.15).

ICT implementation and integration entails more than simply using the computer in traditional ways to support the traditional way of teaching, for example, using the computer as a tutor or teacher (Du Plessis, 2010). It requires new and innovative ways of teaching and introduces a new perspective on learning, where the focus is on learning (Du Plessis, 2010, with reference to Shelley, Cashman, Gunter & Gunter, 2002).

The South African White Paper on e-Education (2004) encourages ICT integration as an enhancement to teaching and learning (Department of Education, 2004). The importance of and support for ICT are further emphasised by the establishment of an educational portal, Thutong (www.thutong.doe.gov.za), as well as in various Curriculum Statements. The White Paper on e-Education recommends using ICT in South African schools through e-Learning as a transformational tool, focusing on interactive learning as an enhancement to teaching and learning (Department of Education, 2004). The Department of Education envisages that ICT will prompt the development of new teaching strategies that depend on collaboration, problem solving and simulation, as the introduction of computers in schools should be supporting the curriculum (Department of Education, 2004).

However, there seems to be many challenges or barriers to ICT implementation and integration (Ertmer, 1999; Du Plessis, 2010; Du Plessis & Webb, 2012a). Ertmer (1999) referred to first order and second order barriers or challenges, whereas Kozma (2003) and Kirkland and Sutch (2009)

identified barriers on three levels; micro (teacher or individual level), meso (school level) and macro (system level) typology as barriers, hence adding a third order barrier to Ertmer's (1999) two barrier typology. These aspects and the associated literature will be explored in more depth in Chapter 2 and will form the basis of the analysis and discussion of the data in Chapter 4. In addition, the heuristic of Du Plesssis and Webb (2012b) and the levels of use of Bialobrzeska and Cohen (2005) will be explored in chapter 2, as this formed the basis for the ICT reference when planning, implementing and sustaining teacher professional development.

1.7   METHODOLOGY: RESEARCH DESIGN

Methodology refers to the way in which a person approaches research. It implies that there is, firstly, a research design, underpinned by philosophical principles and, secondly, a research design process (Du Plessis, 2010, with reference to Gibson & Brown, 2009). For example, the research design refers to whether one conducts an experiment, case study or action research, whereas the research design process refers to ethical considerations, participant selection, data gathering tools, when the research occurred and when the data were selected, the phases of the research, the data analysis process and how trustworthiness was established (Gibson & Brown, 2009). From the literature, there are three main research approaches available to a researcher, namely qualitative, quantitative and mixed methods (Creswell, 2003). In the subsequent sections, an overview pertaining to the paradigmatic stance, the research approach and the type of study will be provided.

1.7.1   Interpretive paradigm

The paradigmatic stance of this study lies within the interpretive paradigm, since it aims to explore the participants' experiences and their inner perspectives (Cohen, Manion & Morrison, 2007) pertaining to ICT related aspects, as indicated in the research aims and research questions. Within the interpretive paradigm, the ontological position is that there are multiple realities (Creswell, 2003; Denzin & Lincoln, 2005); therefore reality is subjective (Johnson & Onwuegbuzie, 2004). Epistemologically, i.e. how we come to know, this study recognises that reality is socially constructed and holds a subjectivist view of reality (Denzin & Lincoln, 2005). This study therefore recognises that there is a degree of subjectivity, based on the interaction and relationship between the researcher and the participants as a result of the subjective interaction and nature of the research.

1.7.2   Qualitative research approach

This research used a qualitative research approach, since it allows more flexibility, is descriptive in nature, allows for exploration, is contextual and offers a holistic perspective (Marshall & Rossmann, 2006). According to Denzin and Lincoln (2005), the interpretivist utilises qualitative data gathering methods. Although qualitative data gathering methods are mostly used in interpretivist

research, Creswell (2003) states that it may also utilise quantitative data gathering tools; therefore, a mixed approach within the interpretive paradigm seems a possibility.

However, qualitative data gathering methods were considered best suited for this study. An open-ended questionnaire, semi-structured qualitative personal interviews and focus group interviews were employed, since they allow for the exploration and probing of participants' perceptions and experiences (Patton, 2002). According to Bogdan and Biklen (2003), qualitative research has been given various names, such as fieldwork, ethnography, inner perspective, case study, ecological, descriptive and symbolic interactionism.

Some quantitative data were also used to report on the last subsidiary question, but the qualitative data formed the main data source for this last question, too. The rationale for the use of quantitative data for the last subsidiary question was to ascertain whether the participants used the laptop and ICT related products and software subsequent to the training. The quantitative data and qualitative data were gathered in order to provide an overall picture, as not all the participants could be interviewed. However, all participants could complete the open-ended questionnaire, which contained some quantitative responses to indicate pre- and post-usage.

1.7.3   Exploratory case study

The research design for this research project was an intrinsic exploratory case study within the interpretive paradigm, which mainly used qualitative data, except for the last subsidiary question, where some quantitative data were collected. According to Flyvberg (2011), a case study is a rigorous examination of a single entity (as a person or community), highlighting developmental factors related to the setting. Creswell (2003) accentuated the explorative nature of the case study, whereas Picciano (2004) highlighted the descriptive and interpretive elements of the case study. In a case study, there is generally a great deal of interaction between researcher and participants (Creswell, 2003; Pring, 2004). Gerring (2007) viewed a case study as the study of an individual, a small group, a single situation or a specific case, conducted over a period of time. This case study was a study of a relatively small group; twenty multi-grade teachers as a community within the multi-grade context. However, one participant passed away during the research, which resulted in 19 responses in certain data gathering tools. This research enabled the researcher to provide the perceptions of a small group of participants regarding ICT related aspects and whether the participants used ICT in their school context after the Intel training.

A great deal of criticism has been levelled against the case study approach, an aspect that will be dealt with in chapter 3. One of the criticisms is that the researcher's involvement could compromise objectivity (Pring, 2004), with others being the duration of the study as well as the many data sources to be explored (Creswell, 2003). In addition, there is the issue of not being able to generalise (Berg, 1998).

However, Stake (1995) and Merriam (2009) argued that readers were the persons that could or would make the decision whether the findings seemed just and generalisable in their contexts.

Fiedler (2004) and Yin (2009) stated that case studies were ideal for answering questions related to the *"who, what, where, how and why?"* of a contemporary issue. Yin (2009) suggested that case studies could be explorative, descriptive and explanatory in nature, while Pring (2004) stated that qualitative and quantitative data could be used within the case study approach.

Taking the above into consideration, the intrinsic explorative case study approach was considered best suited to address the research question and sub-questions, as it assisted the researcher in exploring the *'what'* and *'how'* issue, namely *'What are the perceived challenges to the multi-grade?'*, *'What are the perceived challenges to ICT?'*, *'How can the perceived challenges and barriers be addressed according to the participants?'*, *'to ascertain their perceptions to what is positive and negative regarding the Intel intervention'* and *'to ascertain how they use the laptop and ICT after the training'*. Hence, this research provided the participants with a voice regarding their perceptions and experiences.

The case study approach therefore seems to provide researchers with an opportunity to explore experiences, perceptions and suggestions (Stake, 1995). Therefore, in this study, the case study approach was deemed best suited to explore the issues at hand of the participating multi-grade teachers.

1.8 RESEARCH METHOD

Gibson and Brown (2009) referred to the research method as the research design process, which involves a variety of aspects, such as ethical considerations, participant selection, data gathering tools, when the research occurred and when the data were selected, the phases of the research, the data analysis process, and how trustworthiness was established. The research method can therefore be seen as the procedures followed or the structured way in which the research was conducted. The research method of this study is briefly discussed in sections 1.8.1 to 1.8.9 below.

1.8.1 Research context

This study was conducted with twenty laptop recipient teachers practising multi-grade teaching in the Uitenhage District. Within this research, the unit or group of the study was the laptop recipients and their experiences and perceptions within the multi-grade context.

1.8.2 Participant selection: Population and sample

Sampling refers to a portion of an entire group (Denscombe, 2007) or *"reflecting the whole"* (Thomas, 2003, p. 102). Hence the sample involves the researcher's decisions regarding who should be

included, which setting or context should be used, which event should be studied, what should be observed, and what should be looked for.

For the purpose of this interpretive exploratory case study, purposive and convenience sampling was used. The participants were twenty multi-grade teachers from the Uitenhage District in the Eastern Cape Province in South Africa, who had received laptops from the Department of Basic Education. This provided the purposive dimension of the sample. At the same time, the sample was also convenient, as the researcher was a Department of Education official that worked with and visited the participants on a regular basis. In chapter 3, sampling will be explored in more depth.

1.8.3   Data collection tools

Within the interpretive paradigm, qualitative data collection tools are used to gather data. It was indicated in section 1.7.3 that qualitative data provide the researcher with an opportunity to explore the inner perceptions of research participants. In this study, the teachers' perceptions were explored via an open-ended questionnaire, individual interviews and focus group interviews.

According to Curry (2009), quantitative open-ended questionnaires are widely used as common data collection tools that allow for reliable data. Johnson and Christensen (2004) emphasise that the questionnaire is an appropriate data gathering tool, as it enables researchers to develop predetermined questions they would ask participants. This study employed two open-ended (pre- and post intervention) questionnaires, with some semi-closed questions, which were distributed to all twenty participants to explore their perceptions in their own words. The open-ended questionnaires also ensured anonymity, provided all the participants with an identical set of questions, did not take up as much time as the interviews, and did not need the researcher's presence when the participants had to answer the questions. In addition, the open-ended questionnaire allowed the participants to complete it without the assistance of the researcher and without any pressure from the researcher or any other participants. The questionnaire provided the participants the freedom to pen down their innermost thoughts, suggestions and reflections (Struwig & Stead, 2001).

The interview is another popular data gathering tool in qualitative research, as it provides opportunities to gain insight or, as Schostak (2006) stated, *"opening up the possibility of gaining insight into the experiences, concerns, interest, beliefs, values, knowledge and ways of seeing, thinking and acting of the others"* (Schostak, 2006, p. 10). Gilham (2000) stated that semi-structured interviews were important data collection techniques popularly used in case studies; hence the decision to use this tool within this study.

According to Mc Farlane (2000), the researcher must take into recognition the flexible nature of interviews. Mc Farlane (2000, citing Goodman, 1992, p. 123) posited that one should take

cognisance of the fact that everyone tries to make sense of life experiences. The interview data gathering technique provided the researcher with an opportunity to not only 'capture' the interviewees' perceptions, but also to probe responses.

This study therefore opted for semi-structured interviews to gain insight into the participants' perceptions (Schurink, Schurink & Poggenpoel, 1998). Individual semi-structured interviews were conducted to gain an in-depth understanding of the perceived challenges as experienced by individual teachers in the multi-grade context. The data provided the researcher with the opportunity to explore the differences and similarities individuals posit as challenges, and possible solutions to these.

The focus group interview was another data gathering tool utilised in this study. Johnson and Christensen (2004) stated that the focus group interview *"is a type of group interview in which a moderator / researcher leads a discussion with a small group of individuals"* (Johnson & Christensen, 2004, p. 185). Struwig and Stead (2001) stated that the focus group interview is a well designed conversation constructed to obtain insight into particular aspects within a relaxed atmosphere, while De Vos, Strydom, Fouché and Delport (2005) posited that focus group interviews provided an opportunity to gain an understanding of participants' perceptions and thoughts. This data gathering technique encourages group interaction on a predetermined topic or aspect (De Vos et al., 2005). Group interaction stimulated the other participants through the prompting of questions, allowed for in-depth discussion and data rich information, which was sometimes not possible to generate through an individual interview (Rossouw, 2003). Hence, the focus group interview aimed to generate data through group participation and was seen as a group conversation (Ritchie & Lewis, 2003).

In this study, the focus group interview was used to gain data-rich information on research questions 4 and 5 from two groups consisting of three to four participants each. It provided the opportunity for the researcher and the participants to listen to one another's views and served as affirmation, confirmation and validation of their individual experiences and perceptions (Cameron, 2005; Ritchie & Lewis, 2003; Rossouw, 2003). It also provided an opportunity for sharing opposing experiences and perceptions. The focus group interview stimulated group brainstorming and also allowed the researcher to gather data within a limited timeframe, hence it is more economical than individual interviews (Lankshear & Knobel, 2004).

Literature is also an important data resource. Leedy and Ormrod (2005) stated that the literature increased the researcher's confidence in regarding the research topic and that it also provided new approaches and ideas to the researcher. The literature review can therefore also be viewed as a method of gathering information and serves as validation for some of the findings. The researcher gained greater understanding of the topic through the relevant literature reviewed (Creswell, 2003). The literature presented a collection of existing recorded works completed by other scholars and researchers, including any gaps that may exist (Boote & Beile, 2005). Creswell (2003) stated that the literature

provided insight into what was researched in the field of the study and to what extent this was done. It also allowed the researcher to compare her study in relation to others in the field (Creswell, 2003; 2009). Furthermore it assisted in comparing the findings with what others have posited on the subject to make sense of the data (Leedy & Ormrod, 2005).

1.8.4   Research phases

This research unfolded in three phases. The first phase of the research, the pre-phase, concentrated on providing answers to the following subsidiary research questions:

- *What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

- *What were their perceptions of what can be done to meet these challenges?*

Initial individual interviews were conducted and recorded with nine teachers to examine questions 1, 2 and 3. All the participants also completed an open-ended questionnaire to provide data for questions 1, 2 and 3. The data collected from the interviews and the qualitative open-ended questionnaire provided answers to the first three questions. The qualitative open-ended data determined the perceptions of the educators and gave insight into their multi-grade realities (challenges and problems). It also gave an account of what the educators saw as the solutions to their specific problems.

The second phase entailed a series of Intel® Teach training courses. The training courses included Intel® Teach ICT Skills for Teachers, Intel® Teach Getting Started, and Intel® Teach Elements.

The third phase, also referred to as the post-training phase, employed focus group interviews to address the fourth and fifth subsidiary questions, individual semi-structured interviews, as well as an open-ended questionnaire, which also required some quantitative responses. These data gathering tools proposed to provide possible answers to the following subsidiary questions:

- *What did they perceive as the positive and negative aspects of the Intel® Teach training programme?*

- *Is there evidence that the Intel® Teach training programme enable teachers to implement ICT into their teaching and learning in a multi-grade context?*

Informal classroom observations were also made and teacher artefacts were inspected in order to ascertain whether the Intel® Teach training had enabled the teachers to implement ICT technology into their teaching and learning.

1.8.5   Researcher's role

The researcher collected the data, but did not participate in or conduct the Intel® Teach training. The researcher's role was to develop an understanding of the participants' perceptions, experiences and suggestions. In order to ensure that the research context was safe, the researcher subscribed to ethical procedures, which will be elaborated upon in a subsequent section.

1.8.6   Ethical considerations and consent

The researcher approached the Superintendent-General of the Eastern Cape Department of Education and District Director to obtain permission to conduct the research within the Uitenhage District. The District Director and each participating teacher received a letter in which the research was explained. The participants were informed that any input would be on a voluntary basis. Prior to gathering information, each participant was assured of the confidentiality of his/her input. They were assured that their names would not be named in the reporting of the data, nor would the data be made available to the Department of Basic Education, their employer. Participants are referred to in terms of a code, for example MGT1 (Multi-Grade Teacher Number 1) when reporting the findings. The participants and the Department of Basic Education were informed of the research aims and objectives, as indicated in a previous section, and the undertaking was given that at the end of the research they would be provided with the findings reported in this thesis. This was stated on each open-ended questionnaire and during the semi-structured interview.

As the data gathering tools were rendered in the English language and some of the participants' home language was Afrikaans or isiXhosa, some participants might not have been certain about certain wording. However, the participants were invited to contact the researcher, should there be any uncertainties pertaining to the questions on the open-ended questionnaires. During interviews, the questions were asked in English, but were then translated into their home language, when required by the participants. The participants were also allowed to answer in the language of their choice, as this would help them to express themselves in a clearer manner.

1.8.7   Data analysis and interpretation

Mouton (2001) describes data analysis as "*breaking up the data into manageable themes, patterns, trends and relationships*" (Mouton, 2001, p. 108), whilst Mills (2003) postulated that data analysis is a researcher's attempt to summarise the data in an accurate, correct, dependable and reliable way. Marshall and Rossmann (2006) concur with De Vos et al. (2005), who state that data analysis is a process through which the gathered data are ordered and structured to create meaning through interpretation. According to Creswell (2003), data analysis is a systematic process, managed in different ways, and eclectic in nature, which indicates that there is no absolute way to analyse the data. Creswell (2009) states that qualitative data can be looked at in multiple ways. Hence the process to analyse data

in qualitative research cannot be rigidly prescribed or dictated. In the process, it is therefore also important to prepare the data. Trochim (2006) postulates that the data preparation process, which involves data capturing and verification, as well as describing what the data show in short summaries, is part of data analysis. Therefore, data analysis unlocks the meaning of and provides greater understanding related to the research problem.

Data interpretation would, therefore, be undertaken after the data had been analysed and could involve explaining these patterns, trends and relationships. Shenton (2004) postulated that researchers should ensure that the *"findings emerge from the data and not their own predispositions"* (Shenton, 2004, p. 63). According to Mouton (2001), data interpretation refers to the process through which the researcher narrates the research findings. Denzin (2006) posited that data interpretation entailed comprehending and making sense of what is learnt, whilst Patton (2002) postulated that data interpretation focused on a holistic understanding of and arriving at conclusions about a certain issue. Therefore, raw data must be interpreted in order for it to be meaningful (Struwig & Stead, 2001).

For the purpose of this study, the suggestions for data analysis and interpretation of Creswell (2006; 2009) were used, and will be presented in greater detail in chapter 3. Creswell (2006; 2009) suggested that the data from the different data sources should be well organised and that the researcher should have a clear understanding of which data source refers to which aspect. Reading and re-reading of the various data sources is imperative. Hence, immersing one in the data are vital (Creswell, 2006; 2009). According to Basit (2003), coding plays an important role in the analysis of data and requires categorising. Codes were assigned to the various segments of the data (Creswell, 2003; 2006). The codes were then grouped together to form themes and sub-categories (Creswell, 2003; 2006). The categories and sub-categories were used to provide answers to the subsidiary questions by making use of verbatim quotations from the various data sources and summaries from the data established and the trends emerging from the data (Creswell, 2003; 2006). The data for this study was analysed according to the guidelines provided by Creswell (2006), in terms of which the emerging themes and categories were identified and broken down into tables to reflect the trends. The researcher used tables to tabulate the data as accurately as possible and reported comprehensively, to give a clear picture of the findings. Recordings and transcripts of recordings were done in order not to omit any part of the data.

1.8.8   Ensuring trustworthiness

This research addressed reliability and validity, terms used in quantitative research, as a measure of trustworthiness in qualitative data by considering the criteria of *"credibility, transferability, dependability and confirmability"* as purported by Ary, Jacobs, Razavieh and Sorensen (2006), Denscombe (2007), Guba and Lincoln (2005) and Shenton (2004). Each aspect is briefly highlighted below. In chapter 3, the above-stated authors will be used to discuss the aspects pertaining to credibility, transferability, dependability and confirmability.

According to Creswell (2006), triangulation is considered as the main method of validating findings in qualitative research. Triangulation is a process that aims to provide more credibility and reliability to the research (Bryman, 2004). Triangulation can be defined as using more than one method in the gathering of the data in order to lend credibility to the data (Bryman, 2004). Cohen and Manion (2000) suggested that triangulation referred to checking and re-checking the research results, using more than two methods. The researcher checked the data in this study from the various data gathering tools in order to establish whether they concurred. Triangulation in research enables the corroboration of data through confirmation from more than two sources (Cohen & Manion, 2000).

In this study the researcher ensured credibility by applying more than one method of data sampling (Ary et al., 2006; Leedy & Ormrod, 2005). Data were gathered through using open-ended questionnaires, individual interviews and focus group interviews. The literature reviewed also served as a method of providing credibility to the study.

The researcher ensured transferability through descriptions of the research methods and findings, in an attempt to assist other researchers in determining the transferability of the data. Detailed descriptions of the research methodology were presented; and interviews were recorded, transcribed and made available electronically on CD (Ary et al., 2006). The transcriptions served as source documents.

Bisschoff and Koebe (2005) stated that dependability referred to the consistency of the study, should it be repeated with similar participants in the same context. Therefore, the researcher aimed to provide a detailed account of the research in terms of the research design and research design process, literature, recordings and observations, as well as triangulating the data gathering methods (Ary et al., 2006).

Ary et al. (2006) highlighted the importance of confirmation by others. The researcher took cognisance of this through the extended range of literature reviewed. The researcher recorded and transcribed the data as reported by the participants. Records of all the data gathered through the open-ended questionnaires, personal interviews and focus group interviews were stored. The data from the personal interviews and the focus group interviews were recorded on dictaphone, and replayed to the participants. They were then asked to read the transcriptions to ensure that the correct data were reported. The researcher also had "*frequent de-briefing sessions*" (Shenton, 2004. p. 67) with the supervisor, who assisted with validating the coding and the findings of the research.

1.8.9 Delimitations and limitations

This study was delimited to include only the twenty laptop recipient multi-grade educators within the Uitenhage District. Secondly, it involved a small sample of the total multi-grade educators. The study excluded the twelve laptop recipient multi-grade educators in the Sundays River Valley Area

of the Uitenhage District, because of the logistics involved regarding the training venues and the distances involved in travelling. It also excluded the other laptop recipient multi-grade educators in Lusikisiki and Sterkspruit, as these educators are located far away from the Uitenhage District. The researcher therefore delimited the study in order to contain its scope.

The limitations of this study were that the researcher embarked on this study by employing a case study with only twenty participants. This can be seen as a limitation, because of the small number of multi-grade teachers that participated in the study. It does not offer the view of all the laptop recipients in the Eastern Cape, nor of all teachers in schools practising multi-grade teaching. Another limitation can be seen in the language used in the data gathering tools, because it was not the participants' home language.

1.9   CONCLUSION

This chapter set the scene for the research and introduced the research questions, aims and relevance of the study, and also provided an overview of the research design, research design process, data gathering tools used, data analysis process, and the methods employed to establish trustworthiness and ethical considerations. The next chapter, chapter 2, provides an overview of the literature.

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CHAPTER 2

LITERATURE REVIEW

2.1   INTRODUCTION

Chapter 2 deliberates extensively on the focus of this study and examines literature conducted in terms of the research question and sub-questions indicated in Chapter One, namely:

Can the use of the Intel® Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context?

The subsidiary questions are:

- *What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

- *What are the teachers' perceptions of what can be done to meet these challenges?*

- *What did they perceive as the positive and negative aspects of the Intel® Teach Training Programme?*

- *Is there evidence that the Intel® Teach Training Programme enabled teachers to implement ICT into their teaching and learning in a multi-grade context?*

In order to position multi-grade education, a short overview of education within the South African context and a short overview of multi-grade education within the African and South African contexts were provided. This provided a 'picture' from which to view these phenomenona. This study examined the one teacher laptop usage of a sample of multi-grade teachers in the Uitenhage District.

Below is an outline of the aspects explored within this chapter:

- Short overview of education in South Africa

- Multi-grade educational context: An overview

- Multi-grade teaching in Africa and South Africa: An overview

- Challenges related to multi-grade teaching context

- Barriers or challenges related to ICT implementation and integration

- Suggestions on what can be done to ameliorate the barriers and challenges

- Teacher professional development or training as a means to address barriers: What is required?

- Perspectives on ICT implementation and integration

- How ICT can be used within the educational context

- How one desktop or one laptop can be used within the educational context

- Uses of ICT in the multi-grade classroom: An overview

- Intel® Teach programme: An overview

- Linking the literature for this research: A schematic theoretical perspective

The aspects indicated above, are presented in various main and subsections in order to provide a picture of all the aspects related to multi-grade education and ICT related aspects associated with this research. The literature provides an explanation of conceptual aspects and at the same time assists in providing the theoretical perspectives related to this study.

2.2 SHORT OVERVIEW OF EDUCATION IN SOUTH AFRICA

In the following subsections, short overviews of the types of schools in the South African context, the history of the South African school system, a clarification of urban and rural education, as well as the focus of rural education, will be provided. This is done in order to provide a perspective on where education in the South African context came from and to show the differences within the system. The teachers who were involved in this research were not from rural areas only, but also from schools that serve the poorest within the rural areas. Therefore, it is necessary to provide the following overview in order to sketch the context.

2.2.1 Types of schools

The *South African Constitution* and the *South African Schools Act* (SASA) make provision for an educational system that allows South African children to be educated in public schools (public schools on state property and public schools on private property) and private schools, and to be homeschooled (Gardiner, 2008; Republic of South Africa, 1996b). Legislative prescripts and regulatory frameworks within which schools operate are the *Constitution Act 108 of 1996* (Republic of South Africa, 1996a), *SASA Act 84 of 1996* (Republic of South Africa, 2001, 2005), the *Education Laws Amendment Act* (Republic of South Africa, 2001, 2005), the *Employment of Educators Act* (Republic of

South Africa, 1998), the *Basic Conditions of Employment of Educators Act* (BCEEA) (Republic of South Africa, 1998a), the *Personnel Administration Measure* (PAM) (Department of Education, 1999), the *Public Service Act 103* (Republic of South Africa, 1994), the *Public Finance Management Act 1* (Republic of South Africa, 1999), and various provincial gazettes.

Public schools are resourced according to the Norms and Standards for Funding (NSF) by the South African Department of Basic Education. In terms of funding, the total learner enrolment prescribes the amount received by schools, which until recently excluded Grade R learners; this meant that only learners from Grades 1 to 12 were taken into consideration when schools were funded. This funding model operates favourably in large schools with high learner enrolment, for example, in 2011, School A with 1000 learners was funded at R784, compared to farm school B, with 26 learners at the same rate, which meant school B only had R20384 for the year to function and execute the national curriculum, whilst School A had R784 000.

Since the focus of this study was multi-grade education, practised in most farm and rural schools within the Uitenhage District, the study did not delve into the history of the types of schools, home schooling, independent schools, nor the classification of schools in terms of Section 21, or the quintiles in which schools are placed in terms of the NSF. However, in the following section, an overview is provided with respect to the history of the South African educational system and what the current situation entails. In addition, the concepts of urban and rural education are explored.

2.2.2   Short history of the South African educational system

Du Plessis (2004) stated that the South African educational system was controversial for decades, since the Apartheid pre-1994 educational system favoured 'White communities'. Gardiner (2008) concurred, adding that the Apartheid-based educational system was based on race and language. Funding and resources favoured White communities, who received the highest proportion of the educational budget (Du Plessis, 2004). In addition, Du Plessis (2004) referred to Van Harmelen (1995, p. 65, cited in Du Plessis, 2004), stating that the educational philosophy prior to the introduction of the Outcomes-Based Education (OBE) curriculum, Curriculum 2005, was based on behaviouristic principles, whereas Curriculum 2005 and the Natural Curriculum Statement (NCS) were based on constructivist principles. In 2012 and onwards, the Curriculum Assessment Policy Statement (CAPS) has streamlined the NCS. In addition to curriculum changes, the White Paper on e-Education encourages transformation, guides the use of ICT as an enhancement to the teaching and learning process, as well as augments the learner-centred learning approach (Department of Education, 2004).

Yet, despite all the political changes, it seems that post-apartheid South Africa is still challenged with extreme poverty and educational backlogs (Department of Education, 2007; Joubert, 2010; Nelson Mandela Foundation, 2005). Apart from the different types of schools mentioned above,

inequalities persist, many the legacies of Apartheid within the schooling system, such as mono-grade, multi-grade, well resourced and under-resourced schools (Gardiner, 2008; Department of Education, 2007; Ministerial Committee, 2005). An explanation of the terminologies mono-grade and multi-grade will be entertained in the section dealing with multi-grade education, as the research was conducted with a sample of teachers teaching in a multi-grade context.

2.2.3   Urban and Rural Education in South Africa: What is urban and what is rural education?

It is important to explore the concepts 'urban' and 'rural', as these concepts have different meanings within different contexts. Equally important, it seems that multi-grade schools are predominantly situated in rural areas within the South African context, hence the importance of unpacking the two aforementioned concepts.

Literature suggested that the terms 'urban' and 'rural' are not easily definable, as these terms have different meanings in different countries. Wako (2005) clearly indicated this point, highlighting the fact that the term 'urban', for example, carries different meanings in different African countries. Wako (2005) stated that:

> *"... what is termed as "urban" in one country context may be termed as "rural" in another country. In Ethiopia a town with 2000 inhabitants or more will be termed as "urban", while in Zambia the same-sized town will be classified as "rural" "*

(Wako, 2005, p. 4).

Gardiner (2008) concurred, stating that there is no clear consensus on the definitions of 'rural' and 'urban'. For the purpose of this study, the term 'urban' within the South African context refers to towns and cities with high population density, infrastructural development and growth, and access to all municipal services. The term 'rural' within this study is regarded as being typically farming or agricultural areas, with low population density, poverty, lack of infrastructural development, poor access roads, limited or no access to basic services, and a dearth of industrialisation (Kruss, 2009; Little, 2006; Ministerial Committee, 2005). However, it is important to guard against the understanding of rural as the opposite to urban, and *vice versa* (Gardiner, 2008). The many challenges that the rural population in South Africa have to deal with include high poverty levels, lack of basic services, isolation, illiteracy, high dependency on social grants, as well as high levels of unemployment (Brown, 2010; Gardiner, 2008; Joubert, 2010).

Although the current South African educational system recognises one educational system that does not discriminate between urban and rural education, it is committed to provide access to quality educational opportunities to isolated rural communities. Therefore, the South African

government has initiated several initiatives in order to assist with the needs of rural education. These initiatives are highlighted in the next section.

2.2.4   Focus areas of rural education

This section explores the focus areas of rural education, especially with reference to farms schools, which are predominantly multi-grade in nature (Department of Education, 2007). Prior to 1994, all farm schools in rural areas were controlled by the owners of the school (farmers and church organisations) and the state subsidised these schools in terms of resources (Department of Education, 2007; Gardiner, 2008). Section 14 of the South African Schools Act (SASA) (Republic of South Africa, 1996b) endorsed the state's responsibility for all public schools on private property (PSOPP) through the establishment of signed contracts with owners. The aim was to provide quality eduction and functionality as public state schools, resourced as all other public schools in terms of the NSF (Gardiner, 2008).

There are many conditions not conducive for effective teaching and learning within rural education (Gardiner, 2008; Joubert, 2010). The authors recognise that rural education is a challenge, and they identify the Eastern Cape, KwaZulu-Natal and the Limpopo Provinces as the ones with the largest number of schools in rural areas. The Nelson Mandela Foundation (2005) concurred, elucidating that rural education and poverty are challenges facing South Africa. As a legacy of Apartheid, created in the 1950's, the perception is that rural education is inferior to the education provided in urbanised areas, although there are pockets of excellence found throughout South Africa where rural schools are functioning optimally through innovative programmes (Ministerial Committee, 2005). As a result of the Apartheid discriminatory policies prior to 1994, which saw the neglect of rural education, the Ministerial Committee on Rural Education emphasised the need for addressing rural education challenges. This resulted in the establishment of the Rural Education Directorate in 2007. The strategic objectives of the Directorate are to ensure the access and retention of learners in rural and farm schools; improve the quality of rural, nodal and farm school education; and initiate sustainable partnerships with urban schools, community organisations, NGOs, the private sector and other organisations (Department of Education, 2007; Department of Education, 2009b).

The many challenges that rural schools face, will be discussed in Section 2.5 under *'Challenges related to multi-grade teaching context'*. The purpose of the Rural Education Directorate is not to create a new educational system, but to focus on areas that affect rural education. It seems that effective interventions in rural education cannot be achieved through a single approach (Altun, Kalayci & Avci, 2011). Altun et al. (2011) concurred with the Department of Education (2007) that a multi-faced integrated intervention was needed to address the challenges facing rural education. In February 2005, the Nelson Mandela Foundation's (2005) *'Emerging Voices'* rekindled interest in rural communities and highlighted the challenges experienced by rural schools (Nelson Mandela Foundation,

2005). According to the Country Report on Rural Education in South Africa (Ministerial Committee, 2005), some of the major challenges facing rural education are Section 14 agreements for public schools operating on private land, governance and management, mergers of rural and farm schools, multi-grade teaching, district development and support, support of local government to improve schooling in rural areas, teaching in rural areas, social problems that affect access to and success in education, and infrastructure (Department of Education, 2007; Ministerial Committee, 2005).

A real commitment to the administration of rural education has been evident since the establishment of the Directorate of Rural Education at national level within the Department of Basic Education. However, the researcher is not aware that this Directorate is mirrored in the provinces or districts in which multi-grade teaching occurs.

2.3 MULTI-GRADE EDUCATION CONTEXT: OVERVIEW AND CONCEPTUAL CLARIFICATION

In the previous sections, an overview was provided of the South African education system and context in order to indicate where the system was coming from and to highlight the intentions for the future. The previous section indicated what Gardiner (2008) alluded to, namely that South African schools differ in terms of social, economic and linguistic conditions. Although the South African Department of Education recognises a single system, it is plagued with remnants of the Apartheid system (Gardiner, 2008). The previous section elevated the divisions between public and private schools, as well as rural and urban schools. Within the educational arena, there is another division: between mono-grade and multi-grade teaching. This section then aims to provide a conceptual clarification related to multi-grade education by providing an overview of multi-grade education in terms of a description, its prevalence, focus, and how teaching looks within this context.

2.3.1 Defining multi-grade education

From the literature reviewed and with reference to Chapter One, multi-grade teaching within this study is understood to be a teaching practice found in both developing and developed countries. The main rationale for the implementation of multi-grade education can be directly linked to providing access to education to all learners; multi-grade teaching is not confined to rural or farm schools, but co-exists with mono-grade schools in urban areas or large town schools (Berry, 2001a; 2001b; Juvane, 2007, Little, 2006). Therefore, the practice of multi-grade teaching can be defined as a situation when a teacher is expected to deliver the curriculum to learners differentiated in grade, age, abilities and capabilities within the same classroom (Berry, 2001a; 2001b; Hargreaves & Goodson 2003; Jordaan & Joubert, 2008; Joubert, 2010; Juvane, 2007; Little, 2001; Tsolakidis, 2010). Tsolakidis (2007) states that the terms rural and multi-grade schools overlapped, because many schools in rural areas practised multi-grade teaching.

Mono-grade teaching can, however, be defined as the traditional approach, in terms of which one teacher is responsible for delivering the curriculum to learners within one grade or subject in one classroom, of which the learner-teacher ratio is determined by educational departmental policies (Berry, 2001a; Jordaan & Joubert, 2008; Mariano & Kirby, 2009). From the literature reviewed, it seems as if the mono-grade teaching practice of teaching is the preferred method of instruction in most countries throughout the world (Mariano & Kirby, 2009).

2.3.2 Prevalence of multi-grade education

Multi-grade teaching is not a new practice, nor is it confined to one area, but stems from the necessity to provide access to education to learners in remote areas (Brunswic & Valérien, 2004; Little, 2006). Various authors concur that multi-grade teaching is a worldwide phenomenon and is practised as a means to provide access to education in developing countries, such as Colombia (Colbert De Arboleda, 2010), South Africa (Jordaan & Joubert, 2008), Botswana (Loeto, 2010), Namibia (Siririka, 2010), Sri Lanka (Vithanapathirana, 2010), and India (Yerravali, 2010), as well as in developed countries, such as Australia (Cornish, 2010), the United Kingdom (Little, 2005) and Greece (Tsolakidis, 2010). Multi-grade teaching allows more or less 30% of the children in the world an opportunity to receive basic primary education (Brunswic & Valerien, 2004; Commonwealth Secretariat, 2007; Jordaan & Joubert, 2008; Juvane, 2007; Little, 2007; Mulkeen & Higgens, 2009).

2.3.3 Focus: Why multi-grade education?

In the rural areas, people live on farms and in isolated locations. Schools in rural areas are forced to practise multi-grade teaching in order for education to be an economically viable option or, as Bhardwaj states, *"provide complete educational cycle at the lowest cost"* (Bhardwaj, 2008, p. 16). The migration of farm workers to urban areas in search for better schools, improved services, homes and improved opportunities, as well as the conditions and salaries for teachers, place a huge financial burden on governments and especially on educating a nation. Economics and the need to provide education for all necessitate the operation of these small schools (Bhardwaj, 2008; Brunswic & Valérien, 2004; Little, 2006; Titus, 2004). Governments therefore opt for the operation of small schools in order to provide education in terms of equity, access, quality and democracy. In recent years, there seems to be a growing tendency to provide, as an alternative, for the closure and/or merger of small or non-viable schools schools with less than 100 learners (Department of Education, 2009b).

The main foci of the practice of multi-grade teaching seem to be providing equity and access to education to learners in rural and isolated areas, which is a crucial part of reaching the Millenium Development goal of achieving universal primary education (Brunswic & Valérien, 2004; Commonwealth Secretariat, 2007; Juvane, 2007; Little, 2004 & 2006; Mulkeen & Higgins, 2009). There are countries in which multi-grade teaching is practised out of choice, such as Greece, England

and Canada (Brunswic & Valérien, 2004; Little, 2001 & 2006; Tsolakidis, 2010). In these situations, the benefits of multi-grade teaching are the main reason for practising multi-grade teaching (Little, 2006). The Commonwealth Secretariat (2007) views multi-grade teaching as an important educational reality that caters for the needs of all learners (Commonwealth Secretariat, 2007).

2.3.4   How teaching looks within the multi-grade classroom

It is important at this stage to have a look at how teaching within the multi-grade classroom presents itself. In the traditional mono-grade classroom, there are often thirty or more learners in the same classroom, taught by one teacher only. In the multi-grade classroom, there may be the same number of learners, with one teacher, but the learners will be differentiated in terms of grade, age, abilities and capabilities. In most instances, the teacher in the multi-grade classroom utilise the traditional 'chalk- and-talk' approach, and learners are grouped in grades (Barrett et al., 2007; Strauss, 1999)**.**

2.4   MULTI-GRADE TEACHING IN SOUTH AFRICA: A SHORT OVERVIEW

The rationale for including this section was to provide background that may provide a clearer picture for the section focusing on the challenges pertaining to multi-grade education. From the various literature on multi-grade teaching in the South African context, it seems that multi-grade teaching is predominantly practised in Grades One to Nine. Brown (2010) concurred, postulating that multi-grade teaching is also found at secondary school level. The South African multi-grade teaching context lies primarily within rural and farm schools, and to a lesser extent in urban schools (Jordaan & Joubert, 2008; Gardiner, 2008; Mathot, 1998). Brown (2010) highlights the fact that in South Africa some schools practising multi-grade teaching are not in inaccessible and remote areas, as is the case with the majority of multi-grade schools. Farm and church schools within rural areas, of which some are PSOPP (public schools on private property), provide access to education for learners in rural and isolated areas (Brown, 2009; Brown, 2010; Gardiner, 2008; Jordaan & Joubert, 2008; Titus, 2004). Brown (2010) concurred with the previous authors that the South African context for multi-grade teaching is a result of necessity.

The Department of Education does not regard education in rural areas as a separate entity, as is evident in the policies, practices in training, curriculum and support provided to schools and teachers (Gardiner, 2008; Republic of South Africa, 1996 b). One can deduct, therefore, that the South African education system is constructed with mono-grade classes in mind. The support that multi-grade educators receive is not different from that offered to mono-grade educators, partly because the officials who provide the support are also from mono-grade contexts and are not familiar with the multi-grade context (Gardiner, 2008).

Resourcing of multi-grade classes is based on learner enrolment and not on the grades or subjects offered in a school (Republic of South Africa, 1996b). Parents of the learners in the multi-grade classroom are usually uneducated farm labourers, or unemployed (Gardiner, 2008; Juvane, 2005; Little, 2006). Aggravating the poverty of these schools is the fact that they receive the lowest amount in terms of funding, due to their low learner enrolment. From various interactions with educators in schools practising multi-grade teaching, it seems that these schools are under-resourced because they cannot afford to buy much needed LTSM (learning and teaching support materials). Often, the teachers use their own funds to purchase such items.

In terms of the time-table, most primary schools follow a 30 to 35 minute period in a 27 hours and 30 minutes week, which is based on mono-grade practices. Within the multi-grade classroom, it would imply that two or more grades share this period, which results in less contact time for multi-grade learners than for mono-grade learners. Participation in extra-curricular activities also seems to be affected: since these schools are usually located in isolated areas, they cannot afford transport to sports activities or events or for educational excursions, and therefore the learners are not exposed to the 'normal' extra-curricular activities to which mono-grade learners are exposed.

In 2007, multi-grade teaching received renewed attention through the establishment of a Rural Education Directorate at the National Offices within the Department of Basic Education (Department of Education, 2007), as well as through the International Conference on multi-grade education, held in March 2010 in Paarl (www.adeanet.org). In most rural, farm and some urban schools in all the provinces, multi-grade teaching forms part of the curriculum delivery (Jordaan & Joubert, 2008; Gardiner, 2008). The Eastern Cape, KwaZulu-Natal and Northern Cape are regarded as the most rural provinces and have a high percentage of schools practising multi-grade teaching (Brown, 2009; Gardiner, 2008).

The Western Cape is regarded as the leader in multi-grade education, since the Cape Peninsula University of Technology (CPUT) has incorporated the Centre for Multi-Grade Education (CMGE) to assist multi-grade teachers through training, support and research towards successful multi-grade teaching delivery. The Western Cape Department of Education (WCDE) launched a training and support programme for multi-grade teachers to improve learner performance in reading, writing and mental mathematics (Jordaan & Joubert, 2008). The CMGE aims to design an intervention in pedagogical practices, curriculum repacking, teacher training, and resource materials (ICT) through an educational design research model in multi-grade rural schools in Southern Africa, to improve access and quality in these schools (Joubert, 2010). In general, the efforts made to improve multi-grade teaching have been minimal. The heading of an article in the *Mail and Guardian* dated 20 August 2010, aptly described the multi-grade context in South Africa as "*A reality we'd rather ignore*" (Chaka, 2010).

During 2009, the Department of Basic Education provided 100 multi-grade teachers in the Eastern Cape with laptops, promising them training at the CMGE. This study included twenty of the Uitenhage District participants of this programme who lived and worked in the Kouga and Koukamma municipal areas. The researcher's intention was to gauge whether an existing programme, such as the Intel® Teach programmes, could assist the educators in utilising their one laptop for teaching and learning. From personal interaction with educators in multi-grade classrooms and classroom observations, the researcher observed that these teachers coped by employing quasi-monograde and differentiation strategies in their multi-grade classes. In some instances, emphasis was placed on the exiting and entry grades, which implies that learners could face content gaps in the areas with which teachers could not deal. Learners would remain with the same teacher for more than one year, and the older learners assisted the younger ones.

2.5   CHALLENGES RELATED TO MULTI-GRADE TEACHING CONTEXT

There are many similarities pertaining to the challenges experienced in multi-grade teaching throughout the world, such as the neglect of multi-grade schools in terms of their physical and human resources and isolation (Aikman & Pridmore, 2001; Juvane, 2007; Little, 2006). Various authors concurred regarding the characteristics and conditions prevailing in multi-grade schools (Bhardwaj, 2008; Brunswic & Valérien, 2004; Jordaan & Joubert, 2008; Little, 2006; Ministerial Committee, 2005).

Benveniste and McEwan (2000), citing London (1993), Warwick et al. (1992), Craig (1990) and Psacharopoulos (1989), identified the challenges facing multi-grade education on two levels, namely the macro and micro levels. These authors (Benveniste & McEwan, 2000) recognised the challenges that negatively impact on the successful implementation of multi-grade teaching on the macro level as follows:

- The capacity of the organisation carrying out the reform

- The coherence and realism of the policy message

- The political environment facing the policy makers

- Resource constraints

- The incentives facing bureaucrats, and

- The type of planning model utilised

On the micro level, the important variables that affect successful multi-grade delivery are (Benveniste & McEwan, 2000 citing Craig, 1990; Warwick et al. 1992; McGinn, 1996; Fuller and Clarke, 1994):

- Perceptions

- Attitudes

- Incentives of teachers, students, and parents, and

- The 'fit' between local culture and the educational innovation

The researcher viewed these levels (macro and micro levels), as mentioned by Benveniste and Mc Ewan (2000), in the same context as the first order and second order barriers indicated by Ertmer (1999), since the macro level challenges affect external interferences over which the multi-grade teacher has no control and the micro level again refers to the attitudes and perceptions of the individual, i.e. the impact of these aspects on successful curriculum delivery within the multi-grade classroom.

Raffo, Dyson, Gunter, Hall, Jones and Kalambouka (2007) have identified three levels of barriers affecting education and poverty, including multi-grade education. These levels are the micro, meso and macro level challenges. They further stated that the macro level refers to governmental or third order challenges, which include challenges related to departmental support or *"structures linked to power"* (Raffo et al., 2007, p. 7).

The next section will focus on the challenges in terms of the three level typology, a typology that has also been used within the ICT domain (Balanskat, Blamire & Kefala, 2006; Ertmer, 1999; Kirkland & Sutch, 2006) and within the multi-grade context (Raffo et al., 2007).

2.5.1 First order challenges (school or meso level)

Schools practising multi-grade teaching have low learner numbers and even fewer educators. Therefore, the challenges at these schools will differ from the challenges mono-grade schools may have. The first order challenges relate to isolation, work overload and community challenges. These are discussed below.

2.5.1.1 Isolation

Compounding the invisibility experienced by the multi-grade practising schools, is the challenge of their isolated locations (Brunswic & Valérien, 2004; Juvane, 2005; Little, 2006). Although there are in-service training and support programmes for teachers provided by various departments of education world-wide, Cornish (2010) has highlighted the fact that multi-grade teachers' isolation is deepened by the following factors:

- They are often unable to access the type of support they need, since most administrators and planners are appointed per subject or in line with mono-grade teaching, which means that their support does not address their needs.

- They cannot obtain relief or substitute teachers on the day(s) of training and lose valuable teaching time when they are forced to close the school for the day of training; consequently the learners lag behind even more.

- The distance from in-service sites makes it difficult to attend and there is often no financial assistance to attend the training.

- Time and distance affect communication about in-service training, which often reaches them late or not at all.

The remoteness and rural nature of schools practising multi-grade teaching make it difficult to attract qualified teachers (Juvane, 2007). The isolation and distance from family and lack of socio-cultural community activities are challenging for teachers (Cornish, 2010). Due to this isolation, teacher retention levels are low, and teachers often leave multi-grade schools for better opportunities in cities to teach in mono-grade settings, for which they were trained (Cornish, 2010).

2.5.1.2 Work overload due to multiple roles

In mono-grade schools, the principals manage the administration and management of their schools and are not expected to teach the same amount as the teachers (Cornish, 2010; Little, 2006). In multi-grade schools, especially in one and two educator schools, administration, management and governance issues are often neglected, because principals are expected to teach full-time and also perform their duties as a principals (Little, 2006). The principals of multi-grade schools are expected to manage their schools in the same manner as monograde school principals, who are expected only to manage their schools (Cornish, 2010). It seems that there is a work overload at multi-grade schools, since the principals are expected to teach and also attend to the school administration (Brunswic & Valérien, 2004; Little, 2006). Both jobs (teacher and principal) are demanding and create a stressful working environment. Brown (2010) stated that workload and time management were major challenges for teachers dealing with multi-grade teaching.

2.5.1.3 Community problems

According to Jordaan and Joubert (2008), learners in schools practising multi-grade teaching invariably come from poor families; their parents are generally farm workers with low levels of education. The schooling communities are characterised by extreme poverty, and there is a lack of parental involvement in school issues (Cornish, 2010; Juvane, 2005; Little, 2006). The schools experience challenges in terms of low learner enrolment, high levels of absenteeism (both learners and educators) and high drop-out rates (Jordaan & Joubert, 2008; Little, 2006). The authors posit that the communities in these rural areas are plagued with major socio-economic challenges that affect teaching and learning, such as high pregnancy rates, alcohol and substance abuse, and domestic violence and illiteracy, which cause many learners to drop out without completing any formal education.

2.5.2   Second order challenges (individual or micro level)

Some multi-grade teaching challenges, which can be identified as second order challenges, relate to the individual teacher. These challenges are related to teacher attitudes, the multi-grade pedagogy, context and strategies. They are discussed below.

2.5.2.1   Negative perceptions of multi-grade education

In most countries, multi-grade practising schools are perceived as problematic and the quality of teaching is doubted, although such schools are deemed necessary to provide access to education for learners in isolated areas (Tsolakidis, 2010). International teacher perceptions of multi-grade teaching tend to be negative (Brunswic & Valérien, 2004; Little, 2006). Teachers have the impression that teaching multi-grade classes carries a greater workload and hence the context creates more stress in the work environment (Mulkeen & Higgins, 2009). Gardiner (2008) highlighted the negative perceptions multi-grade teaching, the terminology and its association with a rural environment. This in turn is perceived as negative and backward, due to the conditions under which many people in rural areas live (Cornish, 2010; Gardiner, 2008).

Teachers in multi-grade classes often start with negative attitudes and perceptions, because they feel unprepared to teach multi-grade classes (Juvane, 2005; Little, 2006; Mulkeen & Higgins, 2009; NWREL, 2001). Kazinczi (2009) contended that negative attitudes were among the challenges facing the multi-grade classroom. The author stated that negative perceptions and attitudes were demotivating and demoralising and created a lack of interest, which in turn mitigated against successful curriculum delivery in multi-grade classrooms.

Little (2006) and Pridmore (2007) have emphasised the stressful conditions with which multi-grade teachers are faced, such as curriculum adaptation, which result in an increased workload. This has lead to poor quality of teaching, which also has also impacted negatively on teachers' attitudes towards multi-grade teaching. Bhardwaj (2008), Juvane (2005), Thomas and Shaw (1998) and Tsolakidis (2007) have argued that teachers practising multi-grade teaching lack the time to cover all the work; the teachers feel overloaded, which is demotivating, and this ultimately creates a lack of interest in teaching.

2.5.2.2 Lack of multi-grade teaching skills

In most parts of the world, multi-grade teachers are not trained in multi-grade pedagogy; they are not trained specifically for dealing with multi-grade issues and challenges (Juvane, 2007; Little, 2006; Strauss, 1999). Miller (1991) has contended that the multi-grade classrooms have more challenges than mono-grade classrooms in terms of (a) skills; (b) behaviour of the educator; and (c) coordination of activities. Teachers are not trained in multi-grade teaching practices (Brunswic &

Valérien, 2004; Little, 2006; Strauss,1999). According to Thomas and Shaw (1998), Strauss (1999) and Tsolakidis (2007), multi-grade teachers often lack classroom management skills and do not have resources, which impact negatively on learners' achievements. Classrooms are grouped according to various levels, often mimicking groupwork in mono-grade settings (Strauss, 1999).

The complexities and demands of instruction, classroom organisation and management, the developmental differences of the learners and organisational demand are challenging to teachers (Miller, 1991). Little (2001) and UNESCO (2002) have contended that the specific needs within the multi-grade classroom present special challenges. According to Little (2006), a major challenge in multi-grade teaching is for teachers to look at teaching and learning from the learner's perspective. These needs, which result in challenges, are the various levels of the learners, large classes, multi-skilling, the function and roles of the educator, training and on-the-job-skills, the physical environment, learning environment and the social environment, which all affect multi-grade teaching.

2.5.2.3   Lack of multi-grade strategies

Strauss (1999) suggested that departments of education should re-train educators in how to handle multi-grade classes, *inter alia* in teaching techniques to involve learners actively in the multi-grade classroom. Mulryan-Kyne (2007) stated that "*teaching is a complex activity and involves more than the mere transmission of knowledge to pupils*" (Mulryan-Kyne, 2007, p. 511). The author emphasised that investment in teacher training is needed and necessary, but that training should be accompanied by ongoing support. Multi-grade teachers need specific training that address their special challenges and situations (Mulryan-Kyne, 2007).

The literature reviewed, illustrates that the multi-grade teaching context commands a different approach to teaching than mono-grade teaching. Many authors, such as Brown (2009), Brunswic and Valérien (2004), Cash (2000), Jordaan and Joubert (2008), Juvane (2005), Little (2006), Pridmore (2007) and Strauss (1999) emphasised that teachers practising multi-grade teaching generally lack strategies to deal with multi-grade teaching challenges. Cash (2000) proposed four strategies as a possible solution to the challenges posed by multi-grade teaching, namely (1) the individual workcard model; (2) holding activities; (3) a staggered start; and (4) differentiated direct teaching. Teachers within the multi-grade context are not well versed in these strategies, as they seem to be different from the mono-grade strategies they were trained in (Cash, 2000). As these strategies are not the focus of this research, they will not be further explored.

2.5.3   Third order challenges (system or macro level)

The schools practising multi-grade teaching have third order challenges related to a lack of system support, delivering a mono-grade curriculum in a multi-grade classroom, lack of training and

professional development, resource challenges, and lack of finances, aspects that will be discussed in the next section.

2.5.3.1 Lack of system support

In countries in which multi-grade education is practised, it is part of the existing educational system and operates marginally under challenging and sometimes unfavourable conditions (Juvane, 2005; Little, 2006; Pridmore, 2007). Although multi-grade teaching is part of the existing mono-grade educational system, educational departments and authorities hardly acknowledge its existence; neither in policy, the curriculum nor resources (Little, 2001).

Multi-grade teaching relies solely on the sense of duty of teachers who have to deal with educational, pedagogical and administrative work by themselves (Little, 2006). Little (2006) concurred with Strauss (1999), who stated that very little support was generally given to multi-grade teachers by educational officials. The support provided to multi-grade teachers is mostly of an administrative nature and does not cover the latest curricular developments. Therefore, the support given, does not address the needs of multi-grade teachers (Strauss, 1999).

2.5.3.2 Delivering a mono-grade curriculum in a multi-grade classroom

The international tendency is for teachers to teach the curriculum of that particular country in a mono-grade context. The curriculum does not make exceptions for multi-grade teaching, since all teachers are required to follow the same curriculum. Teachers in multi-grade contexts are therefore expected to deliver the same curriculum, cover the same deliverables, reach the same outcomes and complete assessments within the same timeframes as their monograde counterparts (Brunswic & Valérien, 2004; Little, 2004). The nature of the multi-grade classroom (one teacher is responsible for teaching learners of different grades, subjects, ages and abilities within the same classroom) is challenging to teachers, because they are expected to teach all subjects for all grades within the same timeframe allocated to mono-grade classes. There is no differentiated or separate curriciulum for schools practising multi-grade teaching; they are expected to teach the same curriculum in the quest for providing access to education for all learners (Brunswic & Valérien, 2004; Little, 2006).

In the South African context, all learners in Grade One, Grade Three, Grade Six and Grade Nine write the same graded Annual National Assessment (ANA) tests (Department of Basic Education, 2011). The training, learner workbooks and support are only based on mono-grade classrooms: there is no guidance on what to teach, how to teach, or what to combine or omit for multi-grade classroom contexts. All the learners write the same assessment examinations as mono-grade learners, and no provision is made for learners who are in multi-grade settings (Departement of Education, 2011). The report on ANA 2011 is silent on multi-grade education and the impact it has on learner performance in

these mono-graded assessments or what the learner attainment intervention strategy (LAIS) would be (Department of Education, 2011).

2.5.3.3 Lack of training and professional development

From the previous section, it seems that various authors concur that training in single-grade or mono-grade pedagogy negatively impacts on the multi-grade classroom, as mono-grade training does not empower teachers with the necessary skills needed in multi-grade teaching. According to Mulryan-Kyne (2007), "*the professional knowledge and skills that are relevant and necessary to teaching effectively in single-grade contexts are also relevant and necessary for effective multigrade teaching*" (Mulryan-Kyne, 2007, p. 501). Little (2006) stated that teachers in multi-grade settings are either untrained to teach in the multi-grade context or trained in the mono-grade context only. Therefore, many teachers within the multi-grade context have limited teaching and learning resources (Little, 2006). Brown (2010) postulated that the lack of preparedness and training escalates the frustration experienced by multi-grade teachers, stating, *"The lack of training in multigrade teaching was a major handicap for the teachers"* (Brown, 2010, p. 206). Lingam (2007) and Little (2006) agree, postulating that teachers in multi-grade classes generally feel unprepared to work in multi-grade classrooms.

Little, Pridmore, Bajracharya and Vithanapathirana (2006) have posited that, in most countries, teacher education (training and professional development) for multi-grade teaching either does not exist at all; in a very few countries it is only offered as part of in-service training. These authors have highlighted the fact that pre-service multi-grade training is currently not a requirement for teacher training. According to Bennel (2004), teachers in multi-grade contexts are not adequately trained to meet the demands of multi-grade teaching. Cornish (2010), Hendron (2009) and Juvane (2005) concurred, contending that teachers in multi-grade classes are untrained to deal with the multi-grade classes; i.e. they are not trained specifically for multi-grade teaching. Kazinczi (2009) also emphasised training as a major challenge. Lingam (2007) concurred, while Benveniste and McEwan (2000) have added that the success of multi-grade teaching depends on the teacher and the school's access to self-instructional textbooks, as well as training in multi-grade instructional techniques.

When comparing the availability of training material for mono-grade and multi-grade teaching, there seems to be very little material for multi-grade teaching in comparison to mono-grade teaching (Little, 2006). According to Berry (2001b), four documents are available that provide guidance to multi-grade teachers, namely the (1) *UNESCO/APEID Multiple class teaching in primary schools: A methodological guide* published in 1988; (2) *The multi-grade classroom: a resource handbook for small rural schools* by Miller in 1989; (3) *Multi-class teaching in primary schools: A handbook for teachers in the Pacific* by Collingwood (1992); and (4) Birch and Lally's book (1995) with the title *Multi-grade teaching in primary schools*. Although these documents are available, many teachers do not have access to them or are not aware of their existence.

It seems that although efforts have been made to address the multi-grade professional development of educators, the onus is on the multi-grade teacher to kick-start self-training, whereas in mono-graded systems, this is not the case (Little, 2006). Initial teacher training and in-service training programmes available from Higher Education Institutions (HEIs) and education departments focus on single grade or single subject teaching, rather than multi-grade teaching (Brown 2010; Cornish, 2010; Mathot, 1998). Various authors, such as Brown (2010), Cornish (2010), Kazinczi (2009) and Little, et al., (2006), concurred that teacher training, both pre-service and in-service teacher training, is aimed at mono-grade teaching and learning.

From the literature consulted above, it seems that training is not provided according to the needs and the context of multi-grade settings. This therefore presents a major challenge for teachers in multi-grade teaching settings.

2.5.3.4   Resource challenges

Gardiner (2008) and Jordaan and Joubert (2008) concurred with Little (2006) regarding the lack of infrastructural and physical conditions at schools in which multi-grade teaching occur. The often rual and isolated areas where these schools are located, are characterised by poor roads, temporary structures, and a lack of basic services, such as electricity and sanitation (Kruss, 2009; Ministerial Committee, 2005). Gardiner (2008) concurred that schools practising multi-grade teaching are often housed in temporary structures, stating that they are sometimes located in permanent institutions recognised by the education authorities. These schools often lack specialised classrooms such as a library, computer room, staffroom and science laboratory (Gardiner, 2008; Little, 2006).

2.5.3.5   Lack of finances

Tsolakidis (2010) contended that the resourcing of multi-grade schools is not geared towards multi-grade settings. The author states that educational authorities do not allocate specific funds for multi-grade schools. Various authors, such as Bhardwaj (2008), Juvane (2005), Kazinczi (2009), Little (2006), Thomas and Shaw (1998) and Tsolakidis (2007), concurred, stating that teachers in multi-grade classrooms do not have enough resources for teaching and learning. Strauss (1999) concurs, adding that the lack of textbooks and other resources like ICT impacts negatively on teaching and learning in multi-grade schools.

Schools practising multi-grade teaching have a low learner enrolment (Brunswic & Valérien, 2004; Gardiner, 2008; Little, 2006). Within the South African context, schools are resourced in terms of NSF (Norms and Standards for Funding), which are based on learner enrolment (Republic of South Africa, 1996 b). Therefore, schools with a low learner enrolment will receive very little funding and resources, which is not in line with what they need to deliver the mono-grade curriculum.

Brunswic and Valérien (2004) have identified educational conditions, such as adjustments to school programmes and hours, as well as resources (provision of teaching and learning materials), as among the major challenges in multi-grade teaching. The authors have highlighted the shortage of textbooks, workbooks, teaching materials and supplementary learning and teaching support materials (LTSM), including distance learning materials and the use of ICT.

2.6   BARRIERS OR CHALLENGES PERTAINING TO INFORMATION COMMUNICATION TECHNOLOGY (ICT) IMPLEMENTATION AND INTEGRATION

In this section, the barriers related to ICT integration or technology adoption and implementation are explored in more detail. However, before this is done, the term ICT must first be unpacked. The term ICT in terms of the South African school context could be described as:

"The term information and communication technology (generally abbreviated to ICT) includes the technologies which together support people's ability to manage and communicate information electronically"

(Biablobrzeska & Cohen, 2005, p. 12).

According to the Department of Education, ICT can be defined as:

"... the convergence of information technology and communication technology. ICT's are the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge"

(Department of Education (2004, p. 15).

From the above definitions, it becomes apparent that ICT integration entails more than just using a desktop computer or laptop. ICT therefore has communicative, management, information and knowledge creation dimensions. Within the school context, it seems that it could assist with teaching and learning.

Having unpacked the term ICT, it becomes important to examine the barriers or challenges regarding the usage of ICT. Ertmer (1999) posited that ICT barriers can be grouped into two categories, namely first order and second order barriers. Kozma (2003) and Kirkland and Sutch (2009) also referred to barriers or challenges, but group these as micro level influences, messo level influences and macro level influences. In a similar manner, Balanskat, Blamire and Kefala (2006) have grouped the challenges in terms of a three- level typology; school level barriers (meso or first order); teacher level barriers (micro or second order); and system level barriers (macro or third order); different names for a similar categorisation of the barriers or challenges.

In the following sub-sections, an overview of the barriers and challenges that may impede on ICT usage or integration from the literature is provided, followed by the first and second order barrier typology and then the three level typology, micro (teacher or individual level), meso (school level) and makro (system level) typology, which implies first, second and third order challenges.

2.6.1 General overview of barriers from literature

Although the educational arena presents itself as dynamic and changing, ICT integration is not a natural or smooth progression from the 'chalk-and-talk' style of teaching, but seems to be riddled with barriers from the onset. Various authors, such as Fong (2006), concurred that most ICT barriers relate to resources (Goktas, Yildirim & Yildirim, 2009; Pelgrum, 2001), knowledge and skills (BECTA, 2003; Plante, 2005), and attitudes and beliefs (Kula, 2010; Pundak, 2007). Baskin and Williams (2006) concurred, adding that the absence of professional development presents a barrier to ICT integration. In research conducted by Goktas et al. (2009), teachers identified (1) a lack of software and hardware; and (2) a lack of in-service training as more important challenges than a lack of appropriate course content, lack of time and lack of admin support. Butler and Sellborn (2002) identified the reliability of technology, learning to use technology, the value of technology and institutional support as barriers to ICT integration. Altun et al. (2011) stated that ICT integration is a multi-faceted and integrated process that is introduced at different levels and therefore poses challenges on various levels (institution, individual, and the system).

The next section will focus on the barriers impacting on ICT implementation in terms of Ertmer's (1999) first and second order barrier typology, as well as the three level (micro, meso and macro) typology, suggested by Balanskat, et al. 2006.

2.6.2 First and second order barrier typology

In the two sections below, a short overview of the first and second order barriers is provided, based on Ertmer (1999).

2.6.2.1 First order barriers

First order barriers are those barriers that are extrinsic to teachers and over which they have no control (Ertmer, 1999). Bingimlas (2009), Donnelly, McGarr and O'Reilly (2011), and Goktas, et al. 2009) concurred with Ertmer (1999) that these first order barriers include aspects such as (1) lack of access to appropriate software and hardware; (2) lack of resources; (3) lack of time (Baskin and Williams, 2006; BECTA, 2004; Beggs, 2000; Bingimlas, 2009; Schoepp, 2005; Tearle, 2003); (4) lack of support; and (5) lack of training (Boakye & Banini, 2008; Ertmer, 1999; Mishra & Koehler, 2008; Sang, Valcke, Braak, & Tondeur, 2010). Sang et al. (2010) related first order barriers to technology training and supports.

Leggett and Persichitte (1998) concur with Ertmer, also mentioning that the challenges related to ICT integration are linked to the attitudes of teachers (enthusiasm and the will to succeed; expertise; access to technology; and the fact that teachers should be prepared to sacrifice their time). Teachers are seen as change agents in schools in terms of ICT integration, and therefore Plante (2005) concurred with Ertmer (1999) that teacher training is one of the first order barriers that negatively impact on ICT integration.

2.6.2.2   Second order barriers

Whereas first order barriers are extrinsic to teachers, second order barriers are intrinsic to teachers (Ertmer, 1999). Various authors concur that second order barriers refer to aspects such as (1) attitudes; (2) beliefs related to teaching; (3) beliefs related to learning; (4) practice; and (5) resistance of teachers (Ertmer, 1999; Ertmer, Ottenbreit-Leftwich & York, 2007; Evoh, 2009; Higgins & Moseley, 2001; Loveless, 2003; Prestridge, 2010). These barriers can be identified as those 'interferences' that are related to educators' deep-rooted beliefs about teaching and learning, which from the onset seems to suggest that second order barriers are more difficult to identify and address, since they are not as apparent as first order barriers (Berry, Loughran, Smith & Lindsay, 2009; Ertmer, 1999). Sang et al. (2010) concurred, stating that intrinsic barriers relate to an individual's philosophy about teaching and learning. Ertmer (1999) has further suggested that second order barriers seem to be closely related to teacher's vision of what they envisage for their learners through the introduction and use of technology in their teaching and learning experiences. This could include how they envisage the various roles of the teacher and learner and even the technology (Ertmer, 1999).

Ferrero (2003) concurred with Ertmer (1999) on support, identifying a lack of technical support and professional development at school level as important factors that could affect ICT integration. Although there may be generation gaps between teachers, age does not seem to affect the way in which teachers engage with ICT (Ferrero, 2003). Vallance (2008) affirmed Ertmer's(1999) argumentation that teacher training and support is vital, emphasising that teacher support through ongoing professional development programmes - supported by schools and education departments - are imperative. The author has argued that good, informed leadership is essential in the implementation of policies that could transform education.

2.6.3   Micro (teacher or individual level), meso (school level) and macro (system level) typology

Various authors are in agreement that the categories of barriers to ICT integration can be labeled as the micro (teacher or individual level); meso (school level); and macro (system level) typology (Balanskat, Blamire, & Kefala. 2006; Kirkland & Sutch, 2009; Kozma, 2003). Eickelmann (2011) categorised the barriers to ICT integration in terms of input level, context level and process

level. Zhao, Pugh, Sheldon and Byers (2002) identified eleven factors that affect classroom innovations and place them in three interactive domains, relating to the teacher as the micro domain, the innovation itself as the meso domain, and the context or school as the macro domain. Wang and Woo (2007) identifed ICT integration, with reference to the lesson, topic and curriculum as operating at three levels, which they in turn call micro (lesson), meso (topic), and macro (curriculum). This study utilised the three level typology; first order, relating to the school (meso); second order, relating to the individual (micro); and third order, relating to the system (macro) as a theoretical perspective and lens to look at the findings pertaining to research questions one to four.

2.6.3.1   First order (school-level or meso level)

According to Kirkland and Sutch (2009), the barriers that affect ICT integration on the meso level are management, culture, infrastructure and community. The authors contend that social support is very important on the meso level. The absence of social support in terms of sharing information and learning from peers, which would have encouraged collaboration, and not being able to solicit support outside the school environment, hinders ICT integration (Kirkland & Sutch, 2009). Therefore, various authors have identified a variety of school-level barriers that affect ICT integration, such as the lack of resources (BECTA, 2004; Pelgrum, 2001), a lack of administrative support (Butler & Sellborn, 2002), a lack of institutional support by leadership, and a lack of training focusing on learning and teaching in the classroom (BECTA, 2004; Van Fossen, 1999).

Although many teachers are capable and confident ICT users, many also have challenges on the meso level in implementing ICT integration (Bingimlas, 2009). These challenges as experienced at school, are a lack of time (BECTA, 2004), a lack of effective training (Balanskat et al., 2006; BECTA, 2004), a lack of accessibility to other peripherals, which could be used in conjunction with a computer (Balanskat et al., 2006) and a lack of technical assistance (BECTA, 2004; Pelgrum, 2001). Bingimlas (2009) argued that there is a relationship between the various barriers, of which some seem to affect ICT integration more than others. For example, there may be resources in the school, but the teachers may not be allowed to use them; or, due to time constraints, they are not able to access these resources.

Although Zhao, et al. (2002) presented barriers in terms of micro, meso and macro domains, their third domain, the context, can be associated with the meso level, since it involves the context within which ICT integration takes place: the school. Barriers at context level relate to distance and dependence: distance, referring to deviation from school culture, available technologies and existing practice; and dependence, relating to the support and assistance from other people and other resources (Kirkland & Sutch, 2009; Zhao et al., 2002). It therefore seems that on the meso level, support is a main barrier that affects ICT integration and implementation.

2.6.3.2   Second order (teacher, individual or micro level)

Micro level barriers are those interferences that relate to the individual teacher, such as the lack of confidence, competence, resistance to change and negative attitudes that hinder ICT integration and implementation (BECTA, 2003; Bingimlas, 2009). Teachers' nature and inability to innovate could present barriers to the development of interpersonal relations with learners and fellow teachers (Kirkland & Sutch, 2009). This inability to relate to learners and fellow teachers negatively impacts on ICT integration. Balanskat et al. (2006) viewed teachers' attitudes and the way in which they approach ICT as a barrier to ICT integration, and this is therefore categorised as a micro level barrier (Balanskat et al., 2006).

Micro level barriers do not refer to teachers only, but also include school principals. Papaiounnaou and Charalambous (2011) identified school principals' attitudes towards ICT and their perceptions about ICT facilitating factors at their school as barriers to ICT integration. These ICT facilitating factors include the decision to include ICT integration as part of the school curriculum, the principals' ability to lead as ICT implementors, the provision of support through the allocation of sufficient resources, and the technical maintenance of ICT at school.

According to Beggs (2000), ICT integration is affected by a lack of confidence, which is influenced by teachers' fear of failure. Teachers' competence is also affected by their inability to incorporate ICT in their teaching and learning (Balanskat et al., 2006; BECTA, 2004). Balanskat et al. (2006) identified the lack of ICT knowledge and experience in utilising ICT, whilst BECTA (2004) highlighted the lack of ICT skills as barriers to ICT integration. According to BECTA (2004) and Gulbahar and Guven (2008), teachers resist the introduction of ICT in their classrooms, because of negative attitudes and resistance to change.

Zhao et al. (2002) presented their teacher argument related to micro level barriers in terms of teachers' proficiency, compatibility and social awareness. According to Zhao et al. (2002) teacher proficiency relates to teachers' knowledge of technology, and their ability to use technology and incorporate it into teaching and learning in the classroom. Compatibility relates to their pedagogical beliefs about the ICT they are utilising. Social awareness refers to their ability to use and influence the use of technology at their school the purpose of teaching and learning, administration, management and all other aspects (Zhao et al., 2002). Therefore, their first domain is associated with the teacher level (micro) barriers.

2.6.3.3   Third order (system- or macro level)

Kirkland and Sutch (2009) contended that macro or system level barriers refer to governmental interventions and initiatives enshrined in governmental policies, the national curriculum and research. Therefore, these macro level challenges refer to technical infrastructure and human

infrastructure - which also includes the necessary support in terms of staffing, policies and procedures - as well as to the organisational culture (Zhao et al., 2002).

Altun et al. (2011) states that macro level challenges affect ICT integration *"both at administrative and instructional levels"* (Altun et al., 2011, p. 230). According to Van As (2009), there is a lack of ICT integration content in terms of curricular learner and teacher suport materials (LTSM) for multi-grade schools. Khambari, Moses and Su Luan (2009) highlighted the importance of issues such as laptop ownership, safety, and technical maintenance in governmental laptop initiatives. Concurring with all the sentiments above, the authors contended that the lack administrative support was one of the factors that hindered ICT implementation and integration. The macro level therefore also refers to lack of governmental support, which implies that the absence or lack of support could be at either district, provincial or national level.

2.7 SUGGESTIONS ON WHAT CAN BE DONE TO AMELIORATE THE BARRIERS

In section 2.6, the barriers were indicated and examples from the literature were provided. In this section and subsequent sections, possible ways are explored to ascertain what has been suggested by the literature regarding how these barriers may be addressed. Ertmer (1999) and Schoepp (2005) have agreed that once educators are aware and understand their 'personal' barriers to ICT integration, they can be assisted in developing strategies to overcome them. According to Bingimlas (2009), successful ICT integration and implementation require resolving the barriers and removing the reasons for their occurrence.

Despite the increase in the availability of and exposure to ICT, educators are not implementing ICT integration as one would expect. During 2004, an online survey conducted, identified that many of the teachers who were ICT trained did not implement what they learned from their training in their classrooms. This could be perceived as one of the reasons for the non-implementation of ICT integration in their classrooms (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005). These barriers and/or challenges pertaining to ICT integration were categorised in the previous section as first order or extrinsic barriers and second order or intrinsic barriers, by using the two barrier typology of Ertmer (1999) or as the micro (teacher or individual level, similar to the second order or intrinsic barriers), meso (school level, similar to the first order or extrinsic barriers) and macro (system level, linking also to the meso level, but also extending it) typology (Balanskat et al., 2006; Kirkland & Sutch, 2009; Kozma, 2003).

Since the context of this study resided within the multi-grade realm, it was also necessary to look at ways in which the barriers mentioned in section 2.5 could be ameliorated. The success of multi-grade teachers in their multi-grade classrooms is just as important as the success to which mono-grade

teachers aspire. In order for teachers and their schools to become users and integraters of ICT, the barriers mentioned in both section 2.5 and section 2.6 have to be addressed. Hence, in the following sub-sections, ways of ascertaining what has been suggested by the literature regarding how these barriers may be addressed, are explored.

2.7.1 Ely perspective on addressing barriers or challenges in general

Ely (1999) identified eight conditions that could assist in implementing and adopting educational technology. It is important to note that if these conditions are not met, they actually serve as barriers. Hence, one has to plan and take note of these conditions, as they could assist with melioration. The eight conditions that could assist with the ICT implementation process are as follows (Ely, 1999):

- Dissatisfaction with the status quo

- Sufficient knowledge and skills

- Availability of resources

- Availability of time

- Rewards or incentives

- Participation

- Commitment

- Leadership

Hence, in order to assist with the implementation of technology, these eight conditions have to be planned for or harnessed. For example, when teachers are not happy with the teaching within their current *status quo* classroom, exposure to ICT related usages within the classroom context may serve as a 'push lever' to consider adoption.

2.7.2 Suggestions to address barriers through using first order, second order and third order typology

In section 2.6.2, it was indicated that the barriers to ICT implementation could be categorised as first and second order barriers (Ertmer, 1999) or as micro (teacher or individual level), meso (school level) and macro (system level) typology (Balanskat et al., 2006; Kirkland & Sutch, 2009; Kozma, 2003). For the purpose of this study, the term 'barrier' was retained, as suggested by Ertmer (1999). However, another level was added to Ertmer's, namely third order barriers, which refer to the system level. The next sections provide suggestions related to addressing first order barriers (school level), second order barriers (teacher or individual level), and third order barriers (system level).

2.7.2.1   Addressing first order barriers (school level)

First order barriers are concerned with issues extrinsic to teachers (Ertmer, 1999). Although they may be extrinsic and outside the control of teachers or educators, it requires educators' input and contribution in terms of time, support and training, planning and development. Therefore, in the implementation of ICT, integration would be promoted if these barriers were resolved and prevented from recurring (Bingimlas, 2009). The next sub-section explores various ways and suggestions on how these first order barriers may be addressed.

2.7.2.1.1 Provision of strong leadership and support from the top

Tondeur, Van Keer, Van Braak and Valcke (2008) emphasised the vital role of the principal in implementing ICT integration. In many instances, the principal has the power to assist with the ICT integration process and with the establishment and implementation of an ICT vision. Principals should be innovative, provide leadership, be proactive, and goal orientated towards ICT implementation and should therefore support teacher ICT development by looking for or creating opportunities for teacher development (Gibson, 2002; Schiller, 2002). However, principals cannot do this alone; hence Scrimshaw's suggestion (2004) of a collaborative leadership approach, i.e. an approach that seeks support from beyond simply the principal, in the form of inclusive decision-making. It seems that principals should use the 'power' of ICT pioneers as well as those teachers who are positive towards ICT innovation in order to create the necessary 'pull' factors. Kirkland and Sutch (2006) accentuated the importance of strong leadership as essential in realising ICT objectives.

2.7.2.1.2 Providing opportunities for professional development support

In recent years, the term 'Continuing Professional Development' (CPD) has become the new buzzword in education, but the practice of in-service training has always been part of many institutions. The definition of CPD can be derived from the need for or role of CPD, but, according to Gray (2005), it refers to the continuous improvement in skills and knowledge, which goes beyond the initial training, or lack thereof, to meet the demands of teaching. CPD therefore supports individual needs and seeks to assist teachers in enhancing their professional teaching practice (Gray, 2005). This need for improvement or development in teaching may be referred to as "in-service training" or INSET.

In-service training is very important for the successful implementation of ICT integration (Bingimlas, 2009; Goktas et al., 2009). This could be provided either by the school, through peer educators, by the Department of Education, higher educational institutions, non-governmental organisations and/or other organisations. Various organisations, such as Microsoft, provide technical training, while Schoolnet SA offers training for teachers, with the emphasis on ICT integration through Intel® Teach professional development courses. According to Creighton (2003), while computer literacy training is important, the main emphasis should be on ICT integration in the classroom.

The concept *'change'* is an uncomfortable one for many people. Fullan (2006), and Surry, Porter, Jackson and Hall (2004) regarded change as creating the conditions to embrace new ways of doing existing practices; as a developmental process, not just a once-off event. Therefore, teacher development is a process and not an event (Fullan, 2006). Implementation of ICT within the classroom context would also require change. Teachers are seen as change agents in schools in terms of ICT integration. Therefore, Plante (2005), Ertmer (1999) and Vallance (2008) suggested that teachers should be capacitated through continuous professional development programmes, supported by schools and education departments, to implement ICT integration.

Teacher development seems to be a key that could unlock the resistance to change or a new technology. Teachers should be provided with *"opportunities to engage in developing a theoretical understanding of the knowledge and skills to be learned"* (Valli & Hawley, 2002, p. 91). Evans (2002) stated that the developmental process is influenced by attitudinal and functional development. Attitudinal development is influenced by intellectual and motivational aspects, whereas functional development is influenced by productive and procedural aspects (Evans, 2002). Hinson, Laprairie and Heroman (2006) cautioned against an attitude that views technology as a luxury, not a necessity. In an online article entitled *"Mentoring for Creativity and Innovation"* by Jarrard (2008), the author highlighted the unearthed possibilities of mentoring; Cuerrier (2004) concurred regarding the importance of mentoring as part of professional development and support in the workplace, especially in organisations.

2.7.2.1.3 Establishing professional learning communities and collaboration

Maistry (2008) highlights that many INSET training programmes seem to be ineffective and raises the issue of the importance of establishing informal communities of practice, in terms of which teachers group themselves to share in their experiences, in order to assist with developing themselves. Cordingley, Bell, Rundell and Evan (2003) argue for the importance of Collaborative Continuing Professional Development (CPD) whereby teachers work with other teachers regularly and thus provide peer support, observing and providing feedback to one another and building collectively on existing knowledge, thereby also motivating and supporting one another (Department of Education, 2004; Jonassen, 2003). When teachers work together and share, they establish a network of peers who also understand what they do and where the gaps are, hence they complement one another or, as Birman, Desimone, Porter and Garet (2000) put it, *"Collective participation may contribute to a professional culture in which teachers develop a common understanding of the instructional goals, methods, problems and solutions"* (Birman et al., 2000, p. 32).

The importance of professional learning communities and CPD was also highlighted by Gulbahar and Guven (2008), who argued that the provision of hardware, software and in-service training was not enough. What was important, they contended, was that CPD had to be followed up by

on-going support, peer coaching and peer dialogue to ensure the usage of the new technology, e.g. laptops. They advocated the introduction of workshops promoting cooperative learning within the multi-grade context, collaboration and the sharing of experiences and expertise. On-going support and modelling have also been proposed by the Commonwealth Secretariat (2007) and Aikman and Pridmore (2001), as teachers within the multigrade context seem to be underprepared for their multi-grade contexts. According to the Commonwealth Secretariat (2007), teachers of multi-grade classes usually receive no specific training and learn to deal with multi-grade situations on the job. Aikman and Pridmore (2001) suggested that the isolation as experienced by multi-grade teachers can be alleviated through demonstration lessons by facilitators, trainers of fellow peers, and lesson planners.

From the literature studied, it seems that if teachers are encouraged to form learning communities, they can also develop themselves towards creating solutions to specific problems and challenges experienced within the contexts of their classrooms.

2.7.2.1.4 Establishing a shared vision

Many authors concur on the importance of the establishment of a shared vision, or buy-in into the implementation of technoogy and its integration into teaching and learning (Fishman & Zhang, 2003; Fullan, 2006). A team effort to create a shared vision and an ICT school policy is very important (Fishman and Zhang, 2003). With the emphasis on whole school development, this ICT policy should find expression in schools' crafted vision and mission statements, as well as in development plans and subject improvement plans. In this shared vision, the emphasis must be on improved learning through the implementation of ICT integration (Schiller, 2002; Tondeur et al., 2008).

2.7.2.1.5 Strengthening strategic planning

As mentioned above, it is important to have an overview of the broader picture in mind when planning for implementation. It is vital to plan together on which educational goals should be achieved within specified timeframes. The incorporation of the curriculum within the planned activities and the desired outcomes for learners need to be taken into consideration (Earle, 2002). Learning materials should be in line with the curriculum and should address specific needs. Vallance (2008) argued for aspects like instruction and assessment to be included in planning for ICT integration. Earle (2002) and Salomon (2002) emphasised that ICT integration does not happen automatically, even though schools may have ICT resources. According to Gulbahar and Guven (2008), teachers must be part of the decision-making process to implement ICT innovations (or an ICT school policy), and access to resources and strategies must be related to 'how to' use the tool.

2.7.2.1.6 Assisting teachers with time constraint issues

Many authors suggest that teachers need to allocate more time to ICT integration (Baskin & Williams, 2006; BECTA, 2004; Beggs, 2000; Bingimlas, 2009; Ely, 1999; Ertmer, 1999; Schoepp, 2005; Tearle, 2003). Scrimshaw (2004) suggests the appointment and introduction of ICT teaching assistants to support teachers. Bingimlas (2009) posits that teachers should allocate sufficient time to implement ICT integration in their classrooms. Rodden (2010) advises that training should be done during schools hours, providing educators assistance and support to stay in touch with hardware and software applications, and an introduction to specific training within the real context. From the various sources consulted, it can be deducted that more time on task is needed for succesful ICT integration. This simply implies that teachers should dedicate specific time slots on their time-tables for specific ICT integration sessions in their classroom.

2.7.2.1.7 Providing appropriate training

Various authors view training as an enabler to assist in eradicating ICT integration barriers (Albirini, 2006; Balanskat et al., 2006; Beggs, 2000; Demetriadis, Barbas, Molohides, Palaigeorgiou, Psillos, Vlahavas, Tsoukalas & Pombortsis, 2003; Ertmer, 1999; Ozden 2007; Pelgrum, 2001; Schoepp, 2005; Toprakci, 2006). Training is vital to assist with ICT implementation (Bingimlas, 2009). According to Bingimlas (2009), training is not an isolated activity, but consists of complexities such as time for training, training in pedagogy skills and exposure to the use of ICT in initial teacher training programmes. Pelgrum (2001) concurred that training is vital and highlighted the important of the provision of teacher training opportunities in the use of ICT in the classroom. According to Rodden (2010), training should include more than just basic computer literacy training. The author has suggested that training should be frequent and form part of teachers' professional development, and must therefore include pedagogical aspects. Schoepp (2005) suggested that teachers should receive training on how to use that specific technology when they receive new equipment such as laptops; hence providing resources without appropriate training is not the route to follow. Gomes (2005) highlighted the importance of training within context, also stating that the full value of ICT training is realised when such training focuses on pedagogical issues. Creighton (2003) and Newhouse (2002) held a similar stance, positing that teachers need both computer literacy and ICT integration skills; therefore, teachers/educators need training in technology education (in the technology itself), as well as using educational technology (teaching in the classroom), i.e. the 'how to'.

2.7.2.1.8 Improving classroom management

According to Tondeur et al. (2008), teachers should be trained to manage their classrooms within an ICT context. Mumtaz (2000) highlighted the importance of classroom coordination and cooperation, i.e. management procedures. Therefore, communication systems, coordination and support in the classroom are important to ensure successful ICT integration. This means that teachers should be

able to co-ordinate and manage classroom activities so that these will not hinder ICT integration. Mouza (2006) suggested that classroom re-arrangement and routines assist in successful ICT integration. Multi-grade classrooms should also be arranged so that the learners derive the maximum benefit, which means that classroom arrangements will change from time to time (Mouza, 2006).

2.7.2.1.9 Providing adequate resources and access to resources for ICT integration

Various authors concur that adequate resources must be available for ICT integration to be successful (BECTA, 2004; Bingimlas, 2006; Ertmer, 1999; Goktas et al., 2009; Pelgrum, 2001; Schoep, 2005). Rodden (2010) emphasises the importance of access to resources such as data projectors, internet facilities, software and other peripherals that could assist in the implementation of ICT integration. BECTA (2004) suggests that users should have access to resources and that these resources should be available when the teacher requires them. The provision of resources is directly linked to the provision of adequate finances allocated to ICT (Rodden, 2010). Therefore, it is important that schools allocate sufficient funding for availing resources to ICT users.

2.7.2.1.10   Providing technical support

From the literature, it is suggested that technical support should be available for teachers who are implementing ICT integration (Khambari et al., 2009; Rodden, 2010; Silvernail & Lane, 2004). Korte and Husing (2007) and Mumtaz (2000) highlighted that support motivates educators to use ICT for teaching and learning in their classrooms. It enables them to plan and focus on their instruction, instead of worrying about dysfunctional computers or viruses. According to Butler and Selborn (2002), ICT integration is possible if the technology is reliable; teachers can use the technology; they value the technology; and there is technical support available when the teachers need it.

Ertmer (1999) and Goktas et al. 2009) suggested that infrastructure should be available with sufficient software and hardware materials and a technology plan to support ICT integration. Ferrero (2003) concurred with Ertmer (1999), stating that technical support at school level is an important aspect in enabling ICT integration. Prior to the provision of resources to teachers, there should be clarity on issues such as the physcial loss of and damage to the laptop, and the possibility of virus attacks (Khambar et al., 2009; Mouza, 2006). Therefore, technical support and maintenance should be in place when providing resources such as computers or laptops in resourcing initiatives.

2.7.2.2   Addressing second order barriers (teacher or individual level)

It seems that second order barriers are more difficult to address and overcome than first order barriers, because they are not as apparent as first order barriers. They are related to educators' deep-rooted beliefs about teaching and learning. In addition, these barriers are closely related to teachers' vision of what they envisage for their learners through the introduction and use of technology in their

teaching and learning experiences (Bai & Ertmer, 2004; Ertmer, 1999). The second order barriers could include how teachers envisage their various roles (as teachers and learners) and even of technology (Ertmer, 1999). Second order barriers could develop because many teachers were trained in an era in which there was very little exposure to computers, if any, as a result they are still teaching in the same way in which they were taught (Bai & Ertmer, 2004). This section will be investigating the possible ways that could resolve second order barriers in terms of teacher confidence, teacher attitude, adoption of innovation, teacher development, self-efficacy, motivation, leadership and collaborative efforts.

2.7.2.2.1 Improving teacher confidence

BECTA (2004), Rodden (2010) and Scrimshaw (2004) concurred that ICT confident educators are more likely to implement ICT integration in the classroom. Utilising ICT tools, such as laptops, bring about a change in traditional teaching. Teachers often resist this change, because they are not prepared to take risks and prefer to continue with what they were trained to do (Pundak, 2007). This resistance seems to be indirectly linked to the confidence level of the teachers (Beggs, 2000; Benveniste & McEwan, 2000; Pundak, 2007). Benveniste and McEwan (2000) agreed with the above, arguing that resistance to implementing innovations in education could be attributed to the change in what teachers understand as the essence of education. Beggs (2000) posited that teachers fear failure, and that this fear affects their confidence levels. Teachers might be scared of ICT, because it might expose their weaknesses.

Balanskat et al. 2006) highlighted that educators lack confidence due to their limited ICT knowledge. This causes anxiety, which affects their confidence. Rodden (2010) concurred, stating that lack of confidence leads to fear, which in turn causes educators not to use ICT at all. Kazinczi (2009) also agreed with the above, suggesting that mentoring could assist multi-grade teachers in developing their ICT competence by using virtual collaborative tools. Therefore, from the literature reviewed, it is evident that confidence is important for ICT integration, since a confident educator becomes a confident implementor of ICT integration.

2.7.2.2.2 Developing positive teacher attitudes towards ICT classroom usage

Gulbahar and Guven (2008) identified teacher attitudes as an important enabler for ICT integration. Zhang, Aikman and Sun (2008), as well as Rogers (2003), concurred that prior attitudes and behaviours could have an effect on current attitudes and behavioural intentions. Rogers (2003) postulated that people's attitudes towards new technology are often linked to the features of such technology. This suggests that when a teacher is positive about a resource, such as a laptop, and is able to identify its potential uses for classroom and personal purposes, then that teacher would most likely use the resource in the classroom for ICT implementation. According to Benveniste and McEwan (2000, p. 31), *"teacher will",* which includes motivation and commitment, may influence the adoption

of innovations. Therefore from the literature reviewed, it would assist in empowering teachers towards developing positive attitudes towards ICT and ICT integration.

2.7.2.2.3 Assisting with adoption of new technology – practical aspects from theory

The decision whether or not to use new technology is a cognitive one. Innovations or new technology is not automatically accepted or easily embraced, even if they represent an improvement on existing practices (Baron & Bruillard, 2007; Rogers, 2003). According to Rogers (2003), five basic features affect acceptance and ultimate adoption, namely relative advantage, compatibility, complexity, observability and trialibility. Teachers' natural instincts enable them to count on practices that worked in the past. Therefore, when technological glitches occur during the introduction of a new technology or idea, teachers are apprehensive towards embracing the new technology (Baron & Bruillard, 2007; Rogers, 2003).

Rogers (2003) posited that when people are exposed to new technology, they need to have information about that technology that could persuade them towards it; once they are persuaded, they will be positively or negatively influenced and decide to either use or reject it. Once they accept it, then they will start implementing the innovation and, finally, they will confirm this implementation or reject it.

From the literature reviewed, it therefore seems that new technology, such as laptops, could be gradually diffused if the teachers perceive that such laptops (1) provide them with an advantage over previous ways of doing; (2) are compatible with current practices; and (3) are easily understandable and easy to use. In addition, teachers can see how others are using it and that it is making sense. Through using the laptops practically, they can be tried out before they are adoped as tools (Rogers, 2003). Therefore, it seems to be important to expose educators to positive experiences, role models of successful ICT users and best practices.

2.7.2.2.4 Encouraging self-efficacy

According to Ertmer (2004), teachers' belief about their ability to use computers in the teaching and learning environment in the classroom is very important for ICT integration. Bandura (1997) claimed that self-efficacy is a person's belief about his/her ability to perform actions at specific levels. Therefore, self-efficacy relates to what the person believes he or she can or cannot do, based on his/her skills levels. Ertmer (2004) concurred with Bandura (1997), stating that this inherent personal belief about their ability would affect teachers' decision about whether or not to use the technology. Bandura (1997) suggested that self-efficacy could be developed through successful performance accomplishments, vicarious experience, verbal or social persuasion, and emotional arousal. The aim is to develop teachers' confidence, so that they experience the new innovation positively (Bandura, 1997; Schunk, 2004).

2.7.2.2.5 Motivating to improve performance

Ormrod (2004) defined motivation as an internal trigger that starts an action, thought or behaviour. According to Mills, Mills, Bratton and Forshaw (2007), motivation is a process that initiates, guides and maintains goal-oriented behaviours. Bandura (1997) viewed self-efficacy as the central cognitive mediator of the motivational process. According to McCloy and Wise (2002), motivating employees to improve performance through learning is essential for improving individual performance. Alderman (1999) and Ryan and Deci (2000) identified two types of motivation, namely intrinsic motivation and extrinsic motivation. Alderman (1999) cautioned against interpreting intrinsic motivation as the opposite of extrinsic motivation. Ryan and Deci (2000) concurred with Alderman (1999) that extrinsic motivation refers to doing something that has a separate outcome, like doing something to obtain certification, while intrinsic motivation refers to doing something out of enjoyment, satisfaction, interest and challenge. From the literature consulted, it may be deducted that it is important to motivate educators both intrinsically and extrinsically so that they will be motivated to use ICT integration in the classroom.

2.7.2.2.6 Developing teacher leadership

Fullan (2006) placed the teacher central in the change process. Hargreaves and Goodson (2003) and Prensky (2008) concurred that teachers are the drivers of the change process and act as facilitators for improving learning. As previously mentioned, (section 2.7.2.1.1), when addressing first order barriers, the principal takes on the primary role of innovator and integrator. Hinson, Laprairie and Heroinman (2006) argue that the principal's ICT competence influences the staff's attitude towards ICT integration and implementation.

Lingard, Hayes, Mills and Christie (2003) have contended that leadership was not the principal's domain only, but should be inclusive of teachers, learners, parents and the broader community. Surry et al. (2004) concurred with Lingard et al. (2003) that leadership involves all stakeholders associated with a school. Two types of leadership are identified, namely leadership as pedagogy and pedagogy as leadership (Lingard et al., 2003). According to Lingard et al., (2003), leadership as pedagogy refers to the involvement of a whole school to enhance teaching and learning. The same can therefore be said about ICT implementation, because it also requires the involvement of the whole school in order to enhance teaching and learning. Pedagogy as leadership refers to the innovative ways in which school stakeholders can lead and assist one another to become leaders in teaching and learning processes (Lingard et al., 2003). Once again, it seems that a parallel can be drawn in terms of ICT implementation, where the teachers share the responsibility for ICT implementation as part of the teaching and learning process. ICT implementation and integration is therefore the responsibility of all educators, and not just a single educator, such as the computer literacy teacher.

2.7.2.2.7 Embracing change

Toffler's (1970) futuristic statement currently rings true for teachers of technology, "The illiterate of the future will not be determined by those who cannot read or write, but by those who can "learn, unlearn and relearn" (Toffler, 1970, p. 505). Cuban (2001) posited that teachers experience difficulty when confronted with change to their teaching practice, since teaching practice is, according to Gamache (2002), ingrained in a theoretical framework and teachers therefore need to be able to 'unlearn and relearn'. Fullan (2006) claimed that this is not an easy process. The factors that affect decisions on this process are understanding teaching and learning theories; experiencing the benefits of a new practice (Mumtaz, 2000); and a conviction that the new practice is a solution to the teachers' challenges (Rogers, 2003). Therefore, when resources such as laptops are provided to teachers, it will result in conflicting ideas and challenges that will move the teachers positively or negatively. It is important, therefore, to manage these changes as they occur.

2.7.2.3   Addressing third order barriers (system level)

When considering third order barriers, it seems that these barriers are a result of the broader system. These barriers include issues relating to resourcing (Hargreaves & Goodson, 2003), ownership, accountability (Bennel, 2004), policies (Altun et al., 2011), administrative support (Samuel & Abu Baker, 2006) and curriculum content issues (Wang, Su, Liu, Chen & Lee, 2008). From the literature reviewed, it seems as if these barriers are beyond teachers' control and are located at a level where decisions regarding the educational system are made, for example, the provincial and national levels of the DoBE in the South African context. These as such directly or indirectly affect educators. The next section will therefore look at ways in which these barriers could be addressed.

2.7.2.3.1 Providing adequate funds

BECTA (2009) emphasised the key role that dedicated funding for projects plays in stimulating innovations. Therefore, it is suggested that governmental departments set aside sufficient resources and funding for ICT implementation. Hargreaves and Goodson (2003) concurred, suggesting that governmental institutions should identify areas of transformation and attach incentives to these. Therefore, resourcing schools with ICT software and hardware and setting up the necessary infrastructure, maintenance and training should be done in a planned and funded manner by the governmental departments (Hargreaves & Goodson, 2003).

From the literature reviewed, it seems that there is a need to develop an alternative resourcing model specifically geared towards schools practising multi-grade teaching so that they will be able to purchase hardware and software supportive of their multi-graded context.

2.7.2.3.2 Promoting ownership and accountability

Khambari et al. (2009) and Cunningham, Kerr, McEune, Smith and Harris (2003) have posited that issues regarding ownership and security of resources such as laptops need to be clarified, because such issues often cause great distress among teachers in laptop initiatives in South Africa. Bennel (2004) contended that educators should be encouraged to become accountable and take ownership of the resources they receive. Mouza (2006) and Khambari et al. (2009) suggested that issues such as physcial loss and damage and the possibility of virus attacks should be addressed when resources are provided to teachers in resourcing initiatives. Hence, training in these areas seems to be vital.

2.7.2.3.3 Developing and improving policies

Vallance (2008) suggested that the introduction of a new policy should offer opportunities for embracing change. Altun et.al., (2011) concurred with Kirkland and Sutch (2009) regarding the introduction of and development of policies (i.e. policies outside the school realm at system level), suggesting that the following should be catered for:

- ICT objectives should be clear and concisely written, within a specific timeframe.

- Policies should have a "roadmap", i.e. ways on how to realise these.

- The ICT objectives should include and make provision for training personnel, materials, and the upgrading and maintenance of equipment.

- Administrative processes should address issues related to technical, legal and administrative infrastructure.

Kirkland and Sutch (2009) suggest that the system level objectives must be in place and be clear and unambiguous. These should also be addressed by innovators. Policies should therefore be developed to include and invest in technological advances; the expectations held of the implementers, the teachers, must be made clear (Kirkland & Sutch, 2009). This implies that teachers should be aware and informed of policies, such as the e-Education Policy in the South African context (Department of Education, 2004), and understand their role in the implementation thereof.

2.7.2.3.4 Developing appropriate curricular content

Nangue (2011) highlighted the importance of developing appropriate content for ICT integration, expecially in developing countries like South Africa. Tinio (2003) emphasised that while most ICT content is in English, the content should be made available in the official languages used in a country, especially in the mother tongue, which is taught at primary school level. Wang et al. (2008)

emphasised the importance of the development and implemetation of Web-based learner and teacher support materials (LTSM). Therefore, schools should incorporate the use of the Internet in their planning and funding processes. Van As (2009) encouraged the development of multi-grade specific content, learning programmes and resources. Little (2006) encouraged the development of content, stating that the adaptation of the curriculum is an integrated process and not something undertaken by multi-grade educators in isolation; this implies that education departments should be more pro-active in assisting teachers in the classroom.

2.7.2.3.5 Improving administrative support

According to Samuel and Abu Baker (2006), support should be provided by school administrators, with no external examination pressure, as in the case of Annual National Assessment (ANA); sufficient time should be provided for completing the syllabus. The focus should not be overmuch on administrative tasks. Furthermore, these authors suggest that ICT integration should be monitored by school administrators and officials, and that a school management system should be in place (Samuel & Abu Baker, 2006). Khambari et al. (2009) concurred that administrative support at all levels plays an important role in ICT integration and implementation. Cowie and Jones (2005) highlighted the importance of support from the departmental head (e.g. a ICT related specialist from the DoBE that supports schools in the South African context) in the form of guidance in terms of sharing and developing of lesson materials for classroom use. In terms of classroom administration, the appointment of support staff, like teacher assistants, or using learners as leaders in the classroom, could assist with the administrative work done in the classroom and free the teacher to focus on his/her core business of teaching and learning.

2.7.3 Framework and heuristic to assist with implementing and with addressing barriers

In the previous section, an overview was provided of suggestions on addressing the various barriers pertaining to ICT implementation. In this section, two frameworks are provided from the literature, highlighting an integrated approach. Firstly, the RIPPLES Framework (Surry, Ensminger & Haab, 2005) is presented, followed by a South African framework, to which Du Plessis and Webb (2012a; 2012b) referred to as a heuristic. These frameworks suggest what should be taken into consideration and also highlight aspects that should be kept in mind and planned for to assist with implementation.

2.7.3.1 RIPPLES Framework as a plan to address challenges or barriers

Surry et al. (2005) provided a model, the RIPPLES framework, that suggests that the following aspects have to be planned for and put into place, as these aspects could assist with the amelioration of barriers with reference to higher education institutes. Surry and Ensminger (2009),

(citing Surry, 2002) and Surry et al. (2005) explained that the RIPPLES model is a framework that supports the implementation of innovations. This RIPPLES model is based on Rogers' (2003) diffusion of innovations, Ely's (1999) implementation conditions and the Concerns Based Adoption Model (CBAM) of Hall and Hords (Surry & Ensminger, 2009). According to Surry and Ensminger (2009), there are seven components of the model embedded in the RIPPLES acronym. These seven acronyms are related to resources, infrastructure, taking people into consideration, policies, learning of new strategies, and regular evaluation of progress and support.

2.7.3.2   Heuristic or framework for ICT implementation: South African perspective

In the previous section, the RIPPLES framework suggested aspects to be taken into consideration for ICT implementation. In this section, an overview is provided from a South African context, as this study focused on a sample of multi-grade teachers in the Uitenhage District in South Africa.

Du Plessis (2010) and Du Plessis and Webb (2012a) provided a heuristic or framework to assist in planning for ICT implementation and integration within the South African context, arguing that a multi-faceted approach is required and that focusing on just the first- and second order barriers is not enough. Their heuristic or framework, presented in Figure 2.1, suggests a *'step-by-step'* process that could be followed to assist with ICT implementation (Du Plessis & Webb, 2012a, p. 322). Their process implies that the barriers are all addressed in a holistic manner. The framework is summarised in the subsequent paragraphs (Du Plessis & Webb, 2012a, p. 322).

Their first step involves the formation of ICT support teams, comprising ICT passionate educators. The second step involves an analysis of schools – their strengths, weaknesses, opportunities and threats relating to physical and human aspects, such as educator beliefs, learner behaviour, ICT integration possibilities, infrastructure, and classroom dynamics.

FIGURE 2.1: Proposed ICT implementation heuristic for schools in disadvantaged contexts (Du Plessis & Webb, 2012a, p. 322)

PROPOSED ICT IMPLEMENTATION FRAMEWORK

Create passionate ICT support team (NGO or Department of Education)
- Extra 'milers'
- ICT believers

Conduct initial SWOT Analysis (NGO or Department of Education)
- School structure
- Classroom dynamics
- Teacher beliefs
- Learner beliefs

ICT Support Team: Qual & Qant analysis (NGO or Department of Education)
- School needs
- Teacher needs
- Learner needs

Appointments (NGO or Department of Education & School)
- Technical ICT person serving cluster of schools
- One teacher responsible for whole school initial basic training of leaners & to support teachers

Plan Collectively: Adaptable unique implementation strategy for each school (NGO or Department of Education & School)
- Goal setting
- Vision
- Time lines
- Envisioned ICT teaching strategies/ styles
- Training schedule

Computer Resources: Access at what point?

Sharing Spaces (NGO or Department of
- Opportunities to share success, challenges & needs — facilitator(s) and teachers
- Collective solutions

Start small at school level (NGO or Department of Education)
- Keep ICT team's capacity in mind
- Start with the positive teachers

On-going Training & School based Support (NGO or Department of Education)
- Monitoring: Classroom visits
- Feedback

Rewards (NGO or Department of Education)
- Laptop access
- Internet connectivity

Realistic Training (NGO or Department of Education)
- Good basic foundations
- See fruitfulness
- Raise self-efficacy: Experience success

The third step involves the identification of the ICT skills of both the learners and the educators. In the fourth step, the school should be planning strategies based on the needs identified. The fifth step allows for volunteerism; ideally, there should be at least five to ten volunteering teachers, depending on the school's needs, to become involved with ICT. The sixth step deals with training with the classroom in mind, from basic literacy to administration and, finally, ICT integration. Here, the

educators should be exposed and be allowed to experience the benefits of using ICT, to encourage and enable self-efficacy. The seventh step allows for the incorporation of incentives, with the emphasis on resourcing and support. The eighth step encompasses continual and continuous on-site support, monitored, evaluated and managed weekly. The ninth step involves access to computers, restricted to evidence of training, goal setting, time-tabling and a vision having been developed. The tenth step encourages collaboration and corroboration among teachers and the establishment of networks and platforms for sharing and discussion. The final step, step eleven, requires the staff establishment to include ICT maintenance and support by appointing an ICT technical support person and ICT lead teacher (Du Plessis & Webb, 2012a). The researcher concurs with step eleven, drawing from personal experience and interaction with schools and educators, that an ICT technical support person is vital at each school, but holds an opposing view regarding the allocation of one ICT lead teacher per school for training, because in schools where an ICT lead teacher was identified and appointed, it appeared as if that person was often reluctant to share new information and assist peer educators in training. These eleven steps, as proposed by Du Plessis and Webb (2012a), should form part of an ongoing process and not be interpreted as a calendar event.

It seems that the implementation and integration of ICT will not happen overnight; it is an on-going process. In the following section, aspects pertaining to what is required from teacher professional development related to ICT training are highlighted.

2.8 TEACHER PROFESSIONAL DEVELOPMENT OR TRAINING AS A MEANS TO ADDRESS BARRIERS: GENERAL SUGGESTIONS, THE CRAR^{3}FS^2 AND EXTENDED C^{2}RHOAR^{3}FS^{2}R^2 HEURISTIC OR FRAMEWORK

In this section, an overview of general suggestions regarding to teacher development pertaining to ICT is presented, with special reference to the CRAR^{3}FS^2 framework of Du Plessis (2010) and the improved C^{2}RHOAR^{3}FS^{2}R^{2}heuristic (Du Plessis & Webb, 2012b).

The concept 'change' seems to be an uncomfortable aspect in life. Fullan (2005; 2006) and Surry et al. (2004) regarded change, i.e. creating the conditions to embrace new ways of doing existing practices, as a developmental process, not just a once-off event. The usage or implementation of ICT within the classroom context would therefore seem to require a change of 'mind'. Teacher training seems to be key in achieving this.

Herrington and Oliver (1997; 2000) and Herrington and Kervin (2007) highlighted the importance that teacher training for the use and implementation of ICT within the classroom context be situated in authentic real life situations, i.e. showing how it can be implemented within the real classroom context. Furthermore, they add that ample opportunities should be provided for discussions

and questions, as well as the use of reflection as a learning opportunity for participants. Hoban (2002) concurs, encouraging reflection as a learning opportunity, for example, providing participants with time to write down their experiences and needs during the training and then making it explicit, a strategy that Du Plessis (2010) has implemented and suggested as vital in the $CRAR^3FS^2$ framework. Burns (2002) highlights the importance of reflection, adding that teachers should be provided with opportunities to share their experiences with one another. Burns (2002) added that training should be hands on, concurring with Herrington and Oliver (1997; 2000) and Herrington and Kervin (2007). Burns (2002) and Richardson (2003) also stated that ongoing support is paramount.

In the South African context, Du Plessis (2010) suggested the $CRAR^3FS^2$ framework for developing teachers in ICT usage. An improved $C^2RHOAR^3FS^2R^2$ heuristic (Du Plessis & Webb, 2012b) is presented in Figure 2.2.

The $CRAR^3FS^2$ Framework (Du Plessis, 2010) and $C^2RHOAR^3FS^2R^2$ Framework (Du Plessis & Webb, 2012b) is a heuristic that was developed in order to address the needs and concerns of teachers when teacher development commences related to ICT training, with a view to assist schools and their teachers in ICT implementation and integration. The term "learner" in the next section does not refer to children, but to anyone who is learning in the process and could therefore also include teachers in a workshop environment.

The $C^2RHOAR^3FS^2R^2$ Framework proposes aspects that should form part of the professional development training context (Du Plessis, 2010; Du Plessis & Webb, 2012b). These aspects are Care, Competence, Relate, Hands-on, On-going, Assessment, Reflection, Read, Re-plan, Feedback, Share, Support-ongoing, Recognition and Resources.

Care implies that those who facilitate or 'deliver' the training, should show that they care about the participants, i.e. that they carry their interests at heart and that the facilitator(s) believe and trust that the participants will be successful. Competence refers to a facilitator that is competent, i.e. well versed pertaining to ICT skills and pedagogy. In addition, the facilitator and learners should relate to and with one another. Learners (adults or school learners) should be trained in a hands-on manner within context, and the training should be ongoing.

FIGURE 2.2: Proposed phases and stages for teacher training and development (Du Plessis & Webb, 2012b, p. 7)
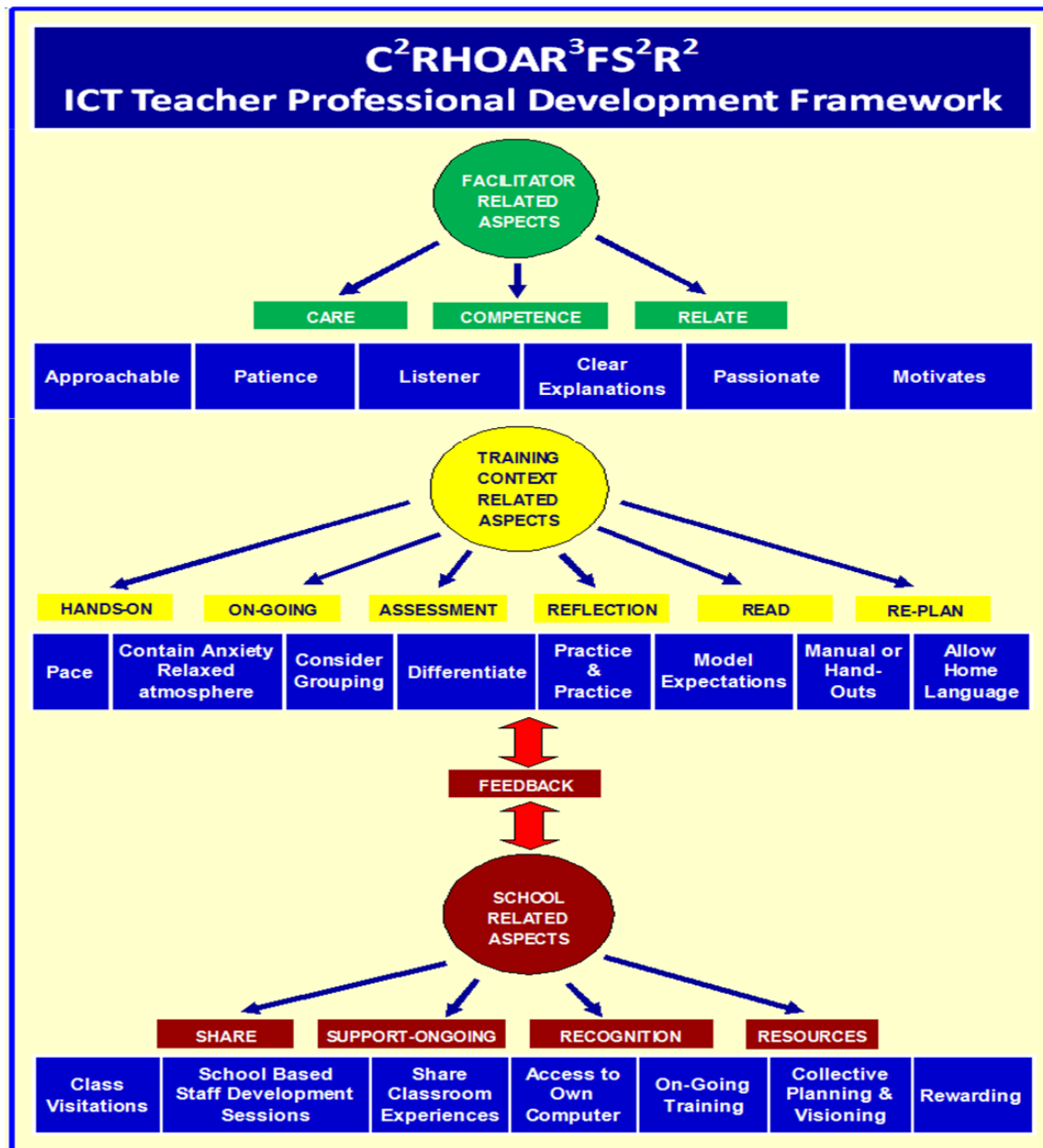
Du Plessis (2010) and Du Plessis and Webb (2012b) have contended that it is important to assess both positive and negative aspects during implementation, as assessment assists with taking the process and planning for the training forward. Reflection in written format by participants is also vital, as this provides insight not only to the participants, but also to the facilitator, as it provides a window that suggests where the participants are, their experiences, needs, etc. Reading refers to when the facilitator reads what the participants (adults or learners) have written in their journals, as this is important in assisting the facilitator in identifying areas that need attention – something that was also alluded to in the previous reflection sentence. According to Du Plessis (2010) and Du Plessis and Webb (2012b), re-planning, based on the reading of participants' reflection journal sheets that are completed

at the end of each training session, is important. The authors stated that they are inter-linked, which means that when the facilitator reads the reflective journals, he or she is able to re-plan the training accordingly. It is therefore also important that peer learners interact with each other's journal writing, because this will reveal to them that they are not unique in experiencing difficulties and they could assist one another towards reading a common understanding.

Feedback, from (1) the facilitator to participants about their progress; and (2) from participants to one another and to the facilitator, as a constructive activity, is also important on a continual basis in the training sessions, as it assists the facilitator in preparing for sessions (Du Plessis, 2010; Du Plessis & Webb, 2012b). Sharing creates opportunities for the learners to part with knowledge, experience success and solicit assistance. Opportunities should be created for participants to share their experiences, i.e. what they have written in their reflection journals, with the rest of the participants. Furthermore, it is important to note that support should be on-going and therefore should not be restricted to the workshop or training-based support. Within the workshop context and afterwards at school, the participants should support one another within the learning context. The facilitator becomes their support within the training context and should also provide support within the school context. Therefore, support is a natural progression that is created through the workshop among peer–learners and the facilitator. Outside the workshop environment, these participant-learners will be able to draw upon each other and the facilitator's knowledge, experience and expertise. Support beyond the classroom also includes support from the principal, staff, parents, the community and educational organisations (Du Plessis, 2010; Du Plessis & Webb, 2012b).

Du Plessis (2010) highlighted the following aspects, which can be sub-assumed under the previous aspects. These aspects are (Du Plessis, 2010, p. 427) a relaxed atmosphere, containing and limiting anxiety, consideration of the pace of the training sessions, making use of peer facilitators to assist the main facilitator, modelling-coaching and mentoring, and being patient, approachable, a good listener, motivator and compromiser. In addition, training should be on-going, and each session should provide opportunities for personal goal setting, reflection and sharing of how the session was experienced (Du Plessis, 2010).

According to Du Plessis (2010) and Du Plessis and Webb (2012a), all the above-mentioned aspects are vital and should be taken into consideration during all stages and phases.

2.9 PERSPECTIVES ON ICT IMPLEMENTATION AND ICT INTEGRATION

The terms implementation and integration have been mentioned during this chapter. The question arises '*What is the definition of integration?*' ICT integration can be defined as the convergence and integration of difference technologies in all aspects of teaching and learning (Department of Education, 2004; Pulkkinen, 2007; Shelly, Cashman, Gunter & Gunter, 2002). These

authors concurred that the focus of ICT integration is to enhance the teaching and learning process. Soule (2003) concurred with these authors, postulating that computers should be part of the learning process and not be regarded as something outside of it. ICT integration therefore entails more than simply using the computer for 'anything'. Therefore, the term 'integration' has to be clarified. From the literature, it seems that ICT integration is characterised as a process that requires new and innovative ways of teaching to bring about a new perspective on learning, in which the focus is on learning (Du Plessis, 2010, with reference to Shelly et al., 2002). According to Pundak (2007), traditional teaching does not achieve satisfactory results. Gulbahar and Guven (2008) agreed, postulating that ICT integration improves the quality of teaching and learning. Therefore, the educational environment should be the change agent to encourage learners to use the ICT available to them, in order to assist them with learning and understanding. In the following sub-sections, the types or levels of ICT integration are highlighted as well as the stages of implementation or integration.

2.9.1 Types or levels of ICT integration: Implementation

Hodgkinson-Williams (2006) has identified four types of ICT integration, namely integrating ICTs as representational tool; cognitive tool; meditational tool; and as transformational tool. Du Plessis (2010) has incorporated Hodgkinson-Williams (2006) suggestions to interpret the types or levels of ICT integration within the South African context. In the following sections, the ICT integration levels as identified by Du Plessis (2010) are used to provide a picture of the so-called ICT levels of integration.

The next section will present a short overview in terms of ICT implementation, in three areas; learning about computers; learning from the computer; and learning with computers (Du Plessis, 2010).

2.9.1.1 Learning about computers: Implementation without integration (computer literacy)

In this type of ICT implementation, the learning activity focuses on technical aspects, i.e. teachers teach the basics of computers, for example, computer literacy classes (Morton, 1996). According to Salomon (2002), no integration takes places and the learning comes across as boring and technical without taking the curriculum into consideration, or as Lockard and Abrams (2001) state, mere infusion takes place, and no integration. Salomon (2002) summarised the above, stating that in this type of 'integration' the learning experience revolves around teaching computer literacy and using the computer as a typing tool (Du Plessis, 2010; Salomon, 2002), with no relation to the curriculum (Jonassen, 2000; Salomon, 2002). The White Paper on e-Education cautions against the use of ICT as an add-on or overemphasis on teaching computer skills in this manner (Department of Education, 2004). Based on the above, it is clear that this is not integration, as ICT is not used to enhance learning within the curriculum context.

2.9.1.2 Implementation with integration to achieve traditional goals (Using the computer as a tool: 'learning from')

One of the traditional ways in which computers are used in the classroom, is as 'tutors' (Taylor, 1980), i.e. the information is provided to the learners by computers (Salomon, 2002). Here, teachers use the computers to achieve the outcomes and goals of planned lessons (Watson, 2001). The learners are not contributing to the knowledge that is created and are dependent on the teachers and computers for the direction of the learning process. This is the typical usage of Computer Assisted Instruction (CAI) or Computer Based Instruction (CBI), to be referred to in section 2.10.1.

2.9.1.3 Implementation with full integration to achieve the newly envisaged goals of constructivism (Using the computer as a tool: 'learning with')

The White Paper on e-Education suggests that computers should be used as an enhancement to teaching and learning and in ICT integration (Department of Education, 2004). According to Jonassen, Carr and Yueh (1998), learners should be encouraged to use computers in all subjects as a mind tool for engaging them in reflective, critical thinking. This revolutionary way of learning with the computer is different to the abovementioned ways, because the skills learnt, are employed in order for learners to construct their own learning, to be able to provide solutions to their learning challenges; it encompasses meaningful, thought-provoking processes that take cognisance of prior learning (Jonassen & Reeves, 1996). Within this context, learning is transformed from traditional computer literacy to integration, where knowledge is generated through active participation and learning with the aid of computers (Hokanson & Hooper, 2000; Jonassen et al., 1998). These calls are not new, as these authors argued for full implementation already fourteen years ago.

The ideal therefore seems to be the third level. At the same time, Baron and Bruillard (2007) state that in spite of new strategies or examples of 'good' or 'best' educational practices being available to teachers, these so-called new approaches have seldom been "infectious by their own virtue" (Baron & Bruillard (2007, p. 80). Sotiriou and Dalmagkas (2007) and Dierking (2007) have agreed that ICT is offering many new learning opportunities for learners, while Dierking (2007) added that schools are the central locations where ICT basic skills should be learned in order to improve learning, as well as to prepare learners to use ICT skills in the broader society. Yet, in spite of all the possibilities that ICT affords, many barriers still need to be addressed before the power of ICT is fully realised and harnessed.

2.9.2 Stages of ICT integration: a short perspective

The previous section examined the different types of ICT integration. This section aims to portray an overview of the stages of ICT integration. ICT integration does not happen automatically, even though educators may have access to state-of-the-art technology and skills. According to Rogers (2003), diffusion of an innovation is a process that takes time before it is widely used or accepted within

society. Innovations like ICT seem to be integrated at a slow rate, and there are various factors why the diffusion of a new innovation takes time. Rogers (2003) argued that only once the benefits of the innovation are experienced, will the innovation be diffused more rapidly. Dwyer, Ringstaff and Sandholtz (1991) concurred with Rogers (2003), indicating that when teachers are confronted with new technology, they go through various stages from initial uncertainty until they become confident and comfortable with the technology. This impacts on the implementation of ICT integration. The ACOT (Apple Classrooms of Tomorrow) model for integration (Dwyer et al., 1991) states that teachers generally progress through five stages, namely (1) the entry; (2) adoption; (3) adaptation; (4) appropriation; and (5) invention (Dwyer et al., 1991). The Toledo model is another, yet similar, model. It also identifies five stages, namely (1) pre-integration; (2) transition; (3) development; (4) expansion; and (5) system-wide integration (Toledo, 2005). These five stages are very similar to the ACOT model. The UNESCO model, on the other hand, identifies four stages in ICT integration, namely (1) emerging; (2) applying; (3) infusing; and (4) transforming (UNESCO, 2002). There seems to be some similarities among these models; for example, each level indicates a different and higher level of competence and usage. These models suggest that ICT integration is a process and not something that can be 'fast tracked', as teachers and the implementation process have to move through the various levels. As each phase constitutes a higher level, it takes quite some time, sometimes even years, before the highest stage is achieved.

2.9.3   ICT usage levels: A South African perspective

A publication by the South African Institute for Distance Education (SAIDE), issued in 2005 and titled *'Managing ICTs in South African schools: A guide for school principal'* by Bialobrzeska and Cohen (2005), suggested that a large number of schools still do not have computer access, concurring with the statistics of the Department of Education (2004) and of Howie et al. (2005). Howie et al. (2005), as well as Bialobrzeska and Cohen (2005), stated that in the majority of schools in which computers are implemented, ICT usage or integration is still at a very low level. The term computer – not ICT – has been used, as the majority of South African schools still lack internet connectivity (Department of Education, 2004; Howie et al., 2005; South African Institute for Distance Education, 2003). Nangue (2011) suggested that ICT usage all over the African continent is not where is should be. Bialobrzeska and Cohen (2005, p. 49, 101-114) suggested the following scenarios of computer usage that can be planned for the South African context:

Use 1	*The school administration use computers*
Use 2	*The teachers use computers for administrative purposes*
Use 3	*Teachers use computers to prepare worksheets and tests for their pupils*

Use 4	*Teachers access on line resources to support teaching and learning in their subject*
Use 5	*Learners are taught how to use computers in order to develop IT skills and knowledge*
Use 6	*Learners apply basic IT skills to work across the curriculum in their IT lessons, and informally outside formal teaching time*
Use 7	*Learners use computers to do work on non-IT subjects from time to time, in a loose way, and arrangement are made by their teachers as needs arise and when the required resources are available*
Use 8	*Learners use computers to do work in non-IT related subjects lessons in a sustained and well-integrated way"*

Bialobrzeska and Cohen (2005, p. 49, 101-114).

The above seems to be in line with a statement by Stevenson (1997), namely that computers (including ICT) can be used for administration, training of learners (students), access to information outside the classroom context, and teaching and learning – including transforming how teaching and learning occurs. This also seems to be aligned with the seminal classification of Hawkridge, Jaworski and McMahon (1990), namely, that computers can be used for a social rationale, vocational rationale, pedagogic rationale and catalytic rationale, as it is possible to link each of the above to a rationale. It becomes clear that, given the backlog of ICT related resources, as indicated by the Department of Education (2004) and Howie et al. (2005), that the majority of schools still have a long way to go in order to achieve the highest levels indicated above.

2.10   HOW ICT CAN BE USED WITHIN THE EDUCATIONAL CONTEXT

ICT usage is on the increase in general society and is becoming a part of everyday life. Weaver and Nilson (2005) contended that computers and laptops have become standard use in every day teaching. The Western Cape Education Department (WCED) (2008) viewed the main uses of ICT as storing, sharing information and knowledge. Khambari et al. (2009) argued that teachers use laptops mainly for lesson preparation, planning and adminstration. In the following sub-sections, ICT usage will be unfolded in terms of behaviourist and constructivist usage in order to obtain an understanding of how ICT, including laptops, could be used to subscribe to various learning theories.

2.10.1   Behaviouristic usage

Taylor (1980) suggested three uses for a computer, namely as tutor, tool and tutee. He also suggested that computers be used as toys. In the tutor mode, the computer takes over the role of the

teacher, i.e. having a teaching role, something Jonassen, Myers and McKillop (1996) and Jonassen (2000) referred to as *'learning from'* the computer. According to Hodgkinson-Williams (2006), ICT is used in behaviourist usage as a representational tool, mirroring a naïve-realist view of reality ontologically; epistemologically, that knowledge is static and/or unchanging. The assumption is that the role of ICT is for transmission or instructing (Hodgkinson-Williams, 2006). Jonassen (2000) posited that software using this approach (also referred to as Computer Based Instruction or CBI or Computer-Assisted Instruction or CAI), often includes *"following steps in a linear manner"* (Alessi & Trollip, 2001, p. 7). The information is received by the software; the learners is guided by the software to master the content, the learners practise what needs to be learned using the software, and then, finally, an assessment is done to ascertain whether they can progress to the next level.

Alessi and Trollip (2001) stated that drills, simulations, tutorials, games and even computer based tests are examples of CBI. Since CBI has been categorised as instructivist or behavouristic in nature, the abovementioned examples could be associated with traditional or behavouristic usage or learning. As previously stated, this implies that in traditional teaching (Salomon, 2002), the computer is the main source of information; the learners become consumers of knowledge (Du Plessis, 2010). At the same time, this instructivist mode also becomes prevalent when, for example, learners use a software package, such as CAMI Maths. CAMI seems to make use of similar steps, as suggested by Alessi and Trollip (2001) above. It is important to note that when teachers use a PowerPoint presentation and then present content in a traditional manner, PowerPoint becomes a behavourist tool. The Internet could also be used within the traditional context. For example, when a teacher provides learners with a a web address or hyperlink and the learners have to read the article or reading piece and then have to answer the questions that the teacher has set; individually, the learners are not co-constructing knowledge, as the Internet and computer have taken the place of the traditional comprehension pen-and-paper based test.

2.10.2   Constructivist usage

In contrast to the behaviourist or instructivist usage of the computer, the constructivist approach requires that learners become active constructors or builders of knowledge (Von Glasersfeld, 1995). In the constructivist domain, knowledge is therefore not seen as absolute, but as something than can be ever-changing – it is not absolute. Therefore, knowledge is constructed socially and mediated by cultural tools (Bodner, 1986). As a result, it can be argued that multiple realities or perspectives are possible. Several strands or faces of constructivism have been identified, such as trivial constructivism or cognitive constructivism, radical and social constructivism, cultural constructivism, critical constructivism and constructionism (Dougiamas, 1998). However, for the purpose of this study, constructivism was viewed from the social dimension.

Learning within the constructivist perspective can be regarded as an active process; a process during which a learner has to make sense, and sense-making here seems to imply to come to know, which implies that language plays a vital role, as learning is mediated through the use of language. The role of social interaction cannot be underplayed here (Gergen, 1995). The role of the teacher within this learning approach is not that of a transmitter, but that of a facilitator who guides the learning process or, as Hodgkinson-Williams (2006, p. 10) stated that the teacher becomes a *"listener, critical questioner, facilitator and prompter of 'cognitive conflict' "* or a guide or scaffolder (McGhee & Kozma, 2001). Hodgkinson-Williams (2006) posits that within constructivist learning contexts, computers or ICT should be used as a generative tool – learners should therefore be actively involved during the learning process and collaborative and cooperative learning strategies should be incorporated (Hodgkinson-Williams, 2006), similar to what Hokansen and Hooper (2000) have proposed.

The question therefore arises how computers can be used to embrace constructivist principles. Only a few usages will be mentioned. The computer can be used in tool mode (Taylor, 1980) to construct something. Jonassen et al., (1996) and Jonassen (2000) referred to using the computer as a tool when learners create or make something as *'learning with'* the computer. When learners embark, for example, on a WebQuest (Dodge, 1997), the teacher implements Eisenberg and Berkowitz's (2004) Big Six model, uses Project Based Learning (Blumenfeld, Soloway, Marx, Krajcik, Guzdial & Palincsar, 1991) or asks learners in groups to design a hypermedia product (see Carver, Lehrer, Connell and Erickson, 1992; Lehrer, 1993; Lehrer, Erickson & Connell, 1994). In these ways, constructivist principles are evident, as the learners are actively and socially involved in design and finding information.

PowerPoint, or even Microsoft Word, could also be used as a constructivist tool. For example, teachers use PowerPoint as a presentation tool to pose questions that learners have to discuss and come up with an answer, the software is used as a constructivist tool (Du Plessis, 2010). In this context, the teachers are the main users of ICT, as they create the PowerPoint. However, the constructivist usage can be extended when, for example, the learners start to present their answers to the PowerPoint questions to their peers and their teacher using PowerPoint, or when learners design Cyberhunts (Du Plessis, 2010; Du Plessis & Webb, 2012b). This last example and the examples in the previous paragraph are some of the constructivist learning that should be envisaged or, as Perkins (1986) has suggested, a designing to learn usage (Perkins, 1986), similar to what Papert (1991) referred to as constructionsim, i.e. the active and creative creation of products or artefacts.

In the previous section, it was stated that CBI is behaviouristic in nature. The question that arises, is whether CBI applications could be used in a constructivist manner. Let us take the following scenario: a teacher uses a CBI tool, such as CAMI, during which two to three learners are grouped together. These learners have to collectively decide on the correct answer through discussion. Whenever

the answer they present is incorrect, they have to jointly discuss where they went wrong. Surely this seems to suggest that CAMI has been used in a constructivist manner. Hence, it is argued that teachers will have to be assisted in using different computer tools and software in other ways than the intended ones, as it seems that the learning context can be structured in constructivist ways only through creative thinking on the teacher's side. In a similar manner, the internet can be used in a constructivist manner, for example, when learners have to complete a Web Quest in their groups or have to find an answer to a problem by using a browser as a tool in order to search for information on the internet and then present their answer(s) by using a computer-based or internet-based piece of software.

2.11   HOW ONE DESKTOP OR ONE LAPTOP CAN BE USED WITHIN THE EDUCATIONAL CONTEXT

The idea of using a single laptop for ICT integration is not new (101 Acivities for the one-computer classroom http://www2.drury.edu/dswadley/101/; One computer classroom http://www.webtech.kennesaw.edu/jcheek3/onecomputer.htm; The one computer classroom http://www.teachnet.com › Power Tools › How-To › Getting Organized ; Strategies for teachers using one computer classroom http://www.lburkhart.com/elem/strat.; Teaching in the one computer classroom http://www.gsu.edu/~eslmlm/onecomputer2.html; One computer classroom lessons http://www.internet4classrooms.com › Links for K-12). However, many teachers still seem to be cognitively shackled by the idea that they need a fully-fledged computer lab with 30 computers in order for ICT implementation to take place. Examples from literature indicate that one computer can be utilised optimally for ICT implementation. The next section will deal with teacher usage of one computer (desktop or laptop) for teaching and learning and possible learner usage of the one computer (desktop or laptop) for teaching and learning.

2.11.1   Possible teacher usage of the one desktop or laptop for teaching and learning

Rearding one-computer classrooms, Rao (2003) has envisaged teachers who plan creatively with technology. The key element in utilising the one computer is finding a purpose for each activity (Rao, 2003). According to Lujan-Pincomb (2011), teachers play a central role in the utilisation of one computer in the classroom; the situation demands that teachers must adopt a facilitating role so that they can address individual needs. It is therefore important for teachers to know their classroom, so that they can group the learners according to the purpose of the lesson. Lujan-Pincomb (2011) suggested that teachers design a two to six week programme with a theme, unit or project of study. Rao (2003) recommended the following teacher uses for the 'one' computer:

- Data collection – spread sheets and assessments and using basic packages on the computer, such as Microsoft Office, to prepare and plan for lessons and administration

- Classroom/ lesson presentation – using interactive PowerPoint presentations.

- Grouping learners as an instructional strategy to support learners of different abilities and capabilities; in these groups, learners are encouraged to collaborate, communicate and support each other's learning

- Using the computer as an information and learning station to complete activities

- Using the computer with other peripherals, like a digital camera, to bring the outside world to the classroom or expose the learners to realities outside their own milieu or to support science learning through digital pictures

The methods, as suggested by Rao (2003), are constructive in nature, since they all require learners to contribute towards creating their own understanding and involve learner participation and interaction. Van Wyk (2009) identified two ways in which laptops may be used; first, as an assistant during the lesson as a teaching tool and, second, as a preparation tool before classroom usage (help during lesson preparation) and in the preparation of assessment tasks. Van Wyk (2009) concurs with Rao (2003) that laptops can be used for lesson presentation, adding that informal teacher networks can be encouraged by the sharing of lessons with colleagues. Of the seven categories in which one computer can be utilised in the classroom, as presented by Ashmus (2004), the following present opportunities for utilisation in a constructivist way:

- Presentation tool

- Communication station

- Information station

- Publishing tool

- Learner centre

- Simulation centre

Burkhart (1999) also suggested the following teacher uses for the 'one' computer:

- Multi-media chalk-board or flip-chart

- Learning centre

- Cooperative learning tool

These suggestions by Ashmus (2004) and Burkhart (1999) could be implemented to *'simulate'* the behaviouristic tradition or the constructivist tradition, depending on the manner in which the computer is used.

2.11.2   Possible <u>learner</u> usage of the one desktop or one laptop for teaching and learning

Possible learner use for the one computer, as suggested by Johnson and Lamb (2007), could include the following :

- A creation tool whereby learners produce and publish their own projects by using spread sheets, graphics, multimedia, word-processing skills, and collaborating with other learners outside the classroom

- As a learning tool, whereby learners source information via the Internet, on CD-ROM, video clips, etc.

- As an activity centre to reinforce what has been learnt in classroom lessons through drill and practice, problem-solving, decision-making and simulation software.

The examples above could be both constructivist and behaviourist in nature, depending on how the tools are implemented. Johnson and Lamb (2007) suggested that both teachers and learners can use the one computer, in large classrooms for assessment, presentation, accessing information, communication, producing and publishing projects and collaborations. Burkhart (1999) suggested that learners use the one computer when they do individual work, such as when they are assessed, when they do individual work as a project; and as a learning station for then they need to source information.

2.12   USES OF ICT IN MULTI-GRADE CLASSROOM: AN OVERVIEW

This research involved teachers who practised multi-grade teaching and had received one laptop for ICT integration. Therefore, it was necessary to view examples of the implementation of ICT integration practices abroad, as well as in South Africa. The European Union (EU) has programmes in place to support ICT in multi-grade schools through MUSE (Multi-grade School Education), NEMED (Network of Multigrade Education) and KPLab (Knowledge Practices Laboratory) (Kazinczi, 2009). In the following sub-sections, a short overview of EU programmes is presented followed by a short report on ICT in multi-grade teaching within the Portugese context, by Duarte (2006), as well as the one computer used in a multi-grade classroom in the Philippines, by Aligaen (2009).

2.12.1   Short overview of projects

In the MUSE Project, the focus is on designing and implementing programmes, specifically for the training of multi-grade teachers in Europe (Kazinczi, 2009; Tsolakidis, 2007). It relies on collaboration between pedagogical expertise, trainers, policymakers and teachers (Kazinczi, 2009; Tsolakidis, 2007). Through this Project, multi-grade teachers' skills and abilities in using ICT are enhanced as supporting tools in teaching and learning (Kazinczi, 2009; Tsolakidis, 2007).

The NEMED Project has as it foci multi-grade schools and the development of a multi-grade schools' network (Kazinczi, 2009). This network allows schools to partner, collaborate, communicate, access training and upload materials from the NEMED platform (Kazinczi, 2009). Altogether six working groups are responsible for research and training material development, with the ICT group aiming to research possible ways of embedding ICT in multi-grade education (Kazinczi, 2009).

In the KP-Lab Project, the foci are on the enhancement of the professional skills of multi-grade teachers and the development of their abilities to utilise ICT as supporting tools in their daily teaching and learning in the classroom (Kazinczi, 2009). This Project endeavours to develop a multi-grade curriculum for Integrated Arts Education, Authentic Mathematics and ICT skills (Kazinczi, 2009).

2.12.2   Short report on multi-grade teaching and ICT in Portugal

Duarte (2006) stated that ICT usage in the Portugese multi-grade system is at the *"beginning of its development"* (Duarte, 2006, p.6). It seems that very few teachers in Portugal use ICT in the classroom (Duarte, 2006). According to Duarte (2006), it seems that Portugese learners are generally more proficient in ICT and use it more than their teachers. Learners use ICT to search for information, using the internet. Teachers who use ICT do so mostly outside the classroom for their own personal purposes and not for classroom-related activities (Duarte, 2006). ICT equipment is often not used to its full potential, due to a lack of hardware and software. ICT integration therefore seems not to be the norm. In many schools, there is only one computer in the classroom, located in a corner (Duarte, 2006). According to Duarte (2006), these computers are often not utilised, as many teachers are not trained to use them and do not understand the applications they need for their teaching and learning. ICT is used to support the 'chalk-and-talk' style of teaching, and computers are used as tutors (Duarte, 2006). ICT is also used to acquire information. Duarte (2006, p. 7) established that teacher training pertaining to computers and ICT in particular was comptetency based, i.e. focusing on computer literacy and 'learning from', as suggested by Jonassen, Peck and Wilson (1999) and Du Plessis (2010). Duarte (2006) stated that ICT training concentrated on literacy and using ICT as a tool to learn from; ICT integration was not incorporated. According to Duarte (2006), the Portuguese educational system had not realised the full potential of ICT integration within the multi-grade context: the computer was used a tutor and the skills learnt were not associated with the curriculum. Computers in the Portuguese context were used as add-ons and not part of the curriculum. Therefore, the way in which the computers were used ascribed to the behaviouristic use of ICT, as discussed in section 2.10.1.

2.12.3 One Computer in Multi-grade Classroom Case of Buan Elementary School: Philippines

The Philippinian educational system, like the South African educational system, has been subject to numerous changes. A study by Aligaen (2009) has confirmed that transformation is possible when innovations are harnessed and the way in which children even in rural multi-grade schools can learn. The focus of Aligaen's (2009) study was (1) to recognise ICT as a 21st century tool; and (2) the importance of developing and preparing educators to be able to use ICT in the classroom, irrespective of access to a computer or whether only one computer is shared by learners.

The emphasis in this model was on ICT integration in the classroom (Aligaen, 2009). Aligaen (2009, p. 10) stated that "The objective of the project was to support the learning of students to develop their life skills through ICT and to decrease the digital divide among the teachers, students and the community" (Aligaen, 2009, p. 10). According to Aligaen (2009), the learners were divided into pairs to work together on a topic for an hour, while the teacher was teaching the rest of the classroom. Since one Grade 5 learner was paired with one Grade 6 learner, the learners could share experiences and show one another what to do, irrespective of the grades they were in. Therefore, learners' learning was not grade dependent; the emphasis was on mastering the learning context. In this way, learners used the computer to learn new skills, while peer learning took place. Learners incorporated their new skills and were allowed to present their mastery of the selected topic in the form of a presentation. It was found not only that the learners were very keen to explore and discover, but that their self confidence was also enhanced (Aligaen, 2009). The educators used the computer to improve and master their ICT skills to enhance their teaching and learning. This project allowed the learners to escape their world and enter another by using ICT, enabling these rural and isolated learners to become part of the global learning environment (Aligaen, 2009). Hence, this project incorporated computer integration to some extent. In this instance, the way in which ICT was incorporated and used by the learners reflects a constructivist use of ICT, as discussed in section 2.10.2.

2.13 INTEL® TEACH: AN OVERVIEW

Intel® Teach to the Future was launched in 2000 as an international project, aiming to assist educators in integrating ICT into their classrooms as an enhancement to teaching and learning (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005). The Intel® Teach Programme consists of formal training for educators in the form of modules that focus on ICT integration, using the project-based approach. The Intel® Teach Programme is geared towards educators, as it focuses on training teachers how to use ICT in the classroom, i.e. when and where to integrate ICT tools and resources according to their lesson plans in such a manner that it is aligned to their curriculum [CAPS, in the South African context] (Intel® Corporation, 2009). The Intel® Teach Programme has been adapted in different countries to suit the needs of teachers and is concerned with training teachers to implement ICT

integration throught project-based learning as referred to in the Intel® Teach to the Future Training Manual (Intel® Corporation, 2009).

According to Wilson-Strydom et al. (2005), hands-on learning is emphasised, which means that the educators' own teaching units, on which they work in the training sessions, can also be used in their classrooms. The Programme includes ICT learning assessment and rubric development and therefore provides an authentic learning context for the implementation of ICT. Teamwork, problem solving and peer involvement are encouraged. The focus is project-based learning, which allows for exploration through ICT. ICT is used to enhance learning. The project-based apporach makes cross-curricular planning possible (Wilson-Strydom et al., 2005).

The next section provides an overview of the Intel® Teach Programme courses to which the participating teachers were exposed. On completion of each Intel® Teach professional development course, each participant receives a certificate accredited by the South African Council for Educators (SACE) (Intel® Corporation, 2009). A detailed overview of each Intel® Teach course can be found at http://www.intel.com. In the following sub-sections, a short overview of the various Intel courses will follow.

2.13.1   Intel® Teach ICT Skills for Success

The Intel® Teach ICT skills for Success requires twenty four hours of training and has as its goal empowering teachers with ICT skills, such as ICT literacy, critical thinking and collaboration. Problem solving relevant to participants' situations form part of this course, which focuses on ICT in the community and ICT in the workplace. The main focus of this course (Unit 1) is on how ICT can be used in the community (typing CVs in MSWord, accounting with Excel, etc.). In Unit 2, the focus is on ICT at work, teaching the learners (referring to the teachers) the skills to be successful at work (in the classroom) and life in the 21st century. Graphics, word-processing and multimedia are incorporated to create interactive presentations, and the participants are provided with the opportunity to incorporate PowerPoint presentations during the course (Intel® Corporation, 2009). This course therefore allows teachers to use MS Word, Excel and PowerPoint creatively to draw up class lists, do simple accounting, type question papers, and compile simple PowerPoint lesson presentations.

2.13.2   Intel® Teach Getting Started

The Intel® Teach Getting Started course requires 24 to 32 hours of training. This course consists of twelve modules, focusing on developing 21st century skills, learning computer basics, such as MS Word, applying this in the classroom, searching the Internet for lesson ideas, higher order thinking and collaboration, discovering and applying word processing and spreadsheets pertaining to the interactive lesson, discovering and applying multi-media, for instance, using pictures or video's to show the learners, and developing 21st century approaches and facilitation skills. The course includes

the planning and implementation of action plans. Another important aspect emphasised in this course is reviewing and sharing action plans by the participants (Intel® Corporation, 2009). Intel® Teach Getting Started teaches teachers to use the Internet and, through search engines such as Google, to find ideas on the Internet or share them with their peers through emails.

2.13.3   Intel® Teach Elements

The Intel® Teach Elements training programme is a professional development programme that requires 24 to 32 hours of training and targets teachers with technological experience. The instructional design of this course includes animated e-learning tutorials, interactive learning exercises and off-line activities to apply concepts. The Elements course's foci are on project-based approaches, assessment in the 21st century classroom, collaboration in digital classrooms, educational leadership in the 21st century, and thinking critically about data (Intel® Corporation, 2009). This allows the teacher to create interactive lessons, which allows for increased and enhanced learner participation.

2.13.4   Intel® Teach Essentials

The Intel® Teach Essentials programme requires 40 hours of training and consists of eight modules, which provide educators with technical and pedagogical skills useful for changing their teaching. Intel® Teach Essentials guides teachers to use computers to encourage learners to become creatively involved in their learning (Intel® Corporation, 2009). According to Light (2009), the Intel® Teach Programme has as its goal *"to prepare teachers to integrate ICT across the curricula as a tool for learning and to design and implement inquiry-driven, project-based learning activities"* (Light, 2009, p. 4). Teachers develop complete unit plans, using a project-based approach, and are engaged in a number of ICT activities. Learning is organised around an "essential question" on a given topic. This essential question guides inquiry and exploration. Time is allocated for learners to conduct the research and share the final product. Light (2009) stated that the course also addresses classroom management with technology and learner-centered learning environments and approaches to assess learners' technology products. Light (2009) posited that teachers increase their technical skills and prepare around implementation in their classroom during the development of unit plan processes. This enables teachers to teach the curriculum through various ICT activities using a project-based approach, in terms of which the learners are more actively involved in their learning.

2.14   POSITIVE ASPECTS AND CHALLENGES PERTAINING TO INTEL® TEACH TRAINING (INTERNATIONAL AND SOUTH AFRICAN PERSPECTIVES)

According to Guskey (2002), the Intel® Teach Essentials course enables educators to evaluate and experience new teaching methods. Wilson-Strydom et al. (2005) stated that teachers who implement what they learnt in the Intel® Teach training courses enjoy a higher success rate for ICT

integration in their classrooms. The Intel® Teach programmes help educators improve their ICT skills and confidence, and also assist in preparing them to develop technology-enriched projects and use project-based approaches, which promote 21st century learning. An evaluation conducted in 2011 concurs that teachers' ICT skills and their use of ICT increased when they are exposed to Intel® Teach training courses (http://www.intel.com/content/www/us/en/education/evaluations/intel-teach.html).

Light (2009) contended that teachers exposed to the Intel® Teach Essentials Programme generally experience the Programme positively. Teachers show a shift in their beliefs about how their students are learning, and have a better understanding of a variety of teaching strategies. Their knowledge and use of ICT as a learning tool is improved, and their ICT skills are sharpened. According to Light (2009), ICT implementation is more successful in schools in which strong ICT leadership is displayed by the principal.

However, there are also barriers to the Intel® Teach Programme, such as a lack of access to resources, e.g. computer facilitites, which affect their use (Light, 2009). Another challenge to the Intel® Teach Programme is that it is very loaded and covers too many topics and activities, which contributes towards a lack of confidence in terms of ICT skills (Light, 2009). Although the Programme assists with and improves the management and administration in schools, it does not assist in the anticipated student learning, because it does not focus on integrating the curriculum (Light, 2009).

Light (2009) stated that there is a general disjuncture in the support experienced in the workshop environment and the classroom environment. The lack of support beyond the workshop environment impacts negatively on ICT integration in the classroom. Teachers are motivated to implement ICT integration after the exposure to the workshops, but lose interest, due to a lack of ongoing instructional and technical support (Light, 2009). According to Butcher and Associates (2008), the main challenges of the Intel® Teach Programme are the aim and pedagogical background. Butcher and Associates (2008) contended that the Programme is aimed at in-service teachers. When the Programme is presented to pre-service students, they cannot engage in classroom activities in the same way as in-service teachers, because they do not have classroom experience or the pedagogical background. According to Butcher and Associates (2008), the challenges for in-service teachers could lie in finding the time to complete the Intel® Teach Programmes.

2.14.1   Intel® Teach Essentials as a strategy conducted in Chile

Research conducted among educators in a multi-grade school in Chile during 2010, using the Intel® Teach Essentials course, identified the intricacy of bringing about transformation in multi-graded classrooms. The Chilean Education Department created enabling conditions, such as a new curriculum and, extended school hours, providing professional development and promoting the use of ICT

integration. Ttherefore, the Programme helped educators integrate ICT into their curriculum in the classroom (Light & Mendez, 2010).

Light and Mendez (2010) have identified the following in their evaluation of the Intel® Teach Essentials course regarding participating multi-grade teachers: (1) these teachers show a change in their beliefs about how learners are learning; (2) they seem to have a greater understanding of the new teaching strategies (computer/ICT utilisation); (3) it seems that they have improved their knowledge of how to use ICT as a learning tool; and (4) they have acquired new ICT skills. Teachers' learners start using ICT as a tool for learning by creating PowerPoint presentations and conducting internet searches. Therefore, in this case study, the participants utilised the computers and the training as such in a constructivist manner. The Essentials course seemed to have moved the teachers from their traditional 'chalk-and-talk' approach to a more learner-centred approach, transforming their beliefs about the learning environment.

2.14.2   INTEL and South Africa

Wilson-Strydom et al. (2005) stated that the adoption of ICT is not just a local challenge, but also an international one. The White Paper on e-Education introduces and commends Schoolnet and INTEL for their contribution towards breaking the digital divide (Department of Education, 2004). The INTEL relationship with South African teachers dates back to 2003 (Department of Education, 2004). INTEL focuses not only on preparing classroom educators for ICT integration, but recognises the importance of developing a relationship with higher educational institutions such as universities, in their pre-service and in-service training programmes (Wilson-Strydom et al., 2005). According to Wilson-Strydom et al. (2005), these Intel® Teach to the Future Programmes are aligned to the National Curriculum Statement (NCS), and are endorsed by the South African Council for Educators (SACE) and supported by the National Department of Education. This collaboration seems to emphasise the importance of ICT integration for curriculum transfer and also suggests a continuation and link in the development of pre-service and in-service educators.

From the literature reviewed, there seems to be ample evidence of the success of the Intel® Teach Programme in mono-grade schools, but very little evidence that this Programme has been successfully completed, if at all, in multi-grade schools in the South African context. Therefore, this study aimed to provide some insight into the possibilities that this Programme could offer multi-grade educators; to which extent the Programme should be adopted or adapted to suit the needs of multi-grade teachers with access to one computer; and how educators could implement ICT integration successfully in a multi-grade classroom. This study also aimed to provide insight as to whether multi-grade teachers need something totally different from what is provided by the Intel® Teach Programme.

2.15   LINKING LITERATURE PERSPECTIVES FOR THIS RESEARCH: A SCHEMATIC THEORETICAL PERSPECTIVE

In this section, a schematic diagram is presented to show the link between the research questions and literature. This serves as a heuristic, not only to explore and analyse the data, but also as a possible framework based on the literature, especially on the work of Du Plessis (2010), Du Plessis and Webb (2012a; 2012b), Ertmer (1999), Kozma (2003), and Kirkland and Sutch (2009), to ascertain whether their suggested framework within the South African context has the ability to assist with ICT implementation within the multi-grade context.

This framework, as presented in Figure 2.3, is based on the ideas indicated in section 2.6.2 (first and second order barriers), section 2.6.3 (macro, meso and micro typology), sections 2.7.3 and 2.7.3.2 (heuristic for South African context) and section 2.8.1 ($C^2RHOAR^3FS^2R^2$ heuristic). The perspective in Figure 2.3 implies that it is important to ascertain what the first, second and third order barriers are in order to plan and implement teacher development pertaining to ICT implementation. This framework proposes that the heuristic for ICT implementation in the South African contexts could be useful for the process of ICT implementation. In addition, this framework further suggests that teacher development within this framework should be embedded in the $C^2RHOAR^3FS^2R^2$ heuristic (Du Plessis & Webb, 2012a; 2012b) and that the entire proposed framework could be useful to achieve ICT implementation and even integration. Hence, this figure and the first, second and third order lens (Balanskat et al., 2006; Du Plessis & Webb, 2012a; 2012b; Ertmer, 1999; Kirkland & Sutch, 2006; Raffo et al., 2007) seem to be an appropriate manner through which to present the findings pertaining to research questions one to four.

Based on the ideas of Balanskat et al. (2006), Bialobrzeska and Cohen (2005), Du Plessis (2010), Du Plessis and Webb (2012a; 2012b), Ertmer (1999), Kozma (2003), Kirkland and Sutch (2009), and Raffo et al. (2007), the ICT implementation framework (Figure 2.4) highlights that in the multi-grade context there are barriers on the meso level (first order barriers extrinsic to the teacher, or school), micro level (second order barriers intrinsic to the teacher) and macro level (external barriers relating to the system). For ICT implementation to realise, these barriers need to be addressed. The Intel® Teach was utilised as a vehicle to address these challenges and barriers and to achieve the envisioned outcomes (learner and teacher laptop utilisation). Through the Intel® Teach training programme, it became evident that there are very important aspects which need to be addressed when dealing with ICT teacher professional development in the multi-grade context, such as facilitator related aspects (care, comptence, relate), training context related aspects (hands-on, on-going, assessment, reflection, read, re-plan) and school related aspects (share, support-ongoing) recognition, resources). In addition, feedback is a very important aspect which could assist in achieving the outcomes.

FIGURE 2.3: Framework for looking at ICT implementation for multi-grade teaching

Sources: Balanskat et al. (2006), Bialobrzeska and Cohen (2005), Du Plessis (2010), Du Plessis and Webb (2012a; 2012b), Ertmer (1999), Kozma (2003), Kirkland and Sutch (2009), and Raffo et al., 2007.
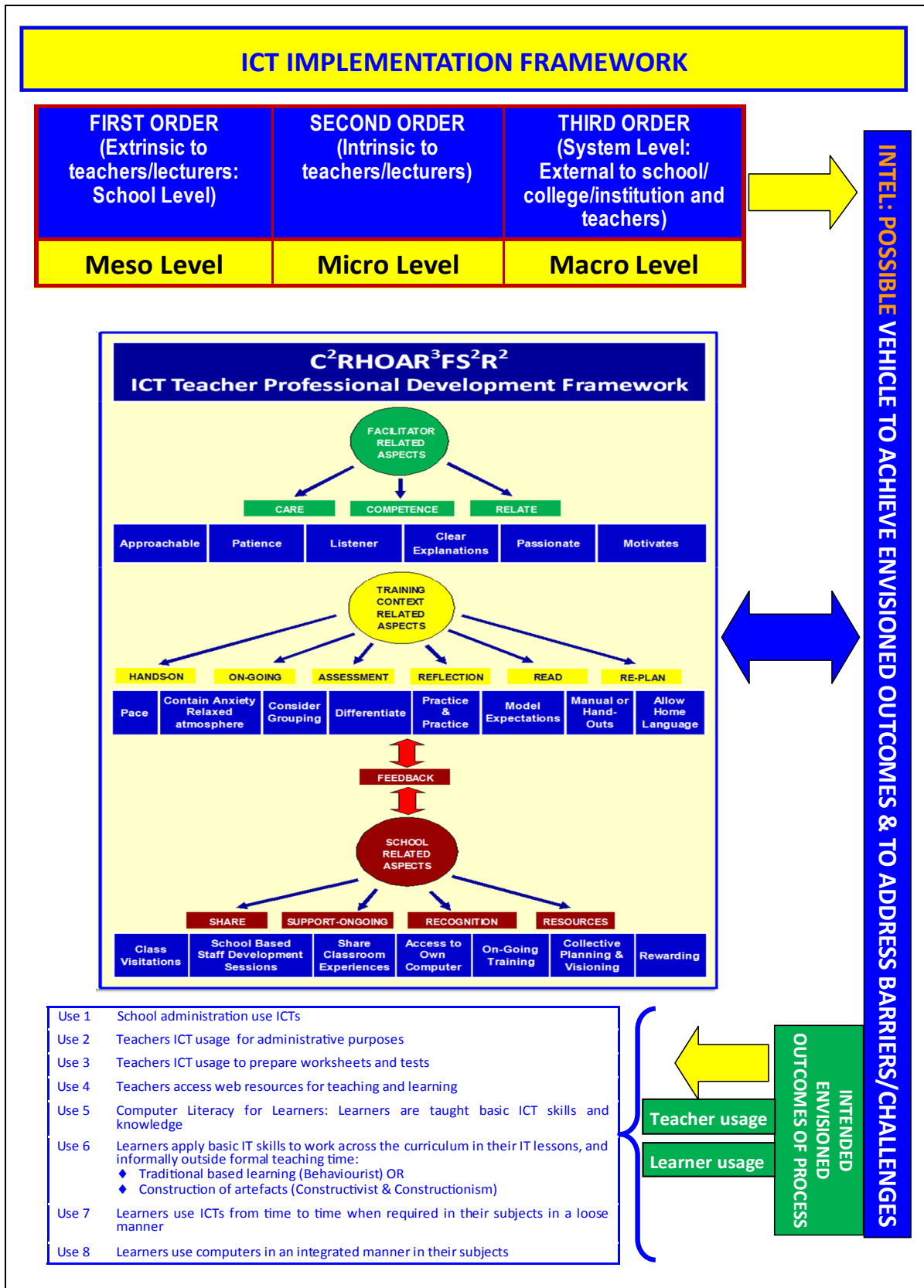
Another aspect that is paramount is resources. However, ICT resources seem to be a serious barrier within the multi-grade context. The lack of resources, e.g. ICT resources, has been highlighted by the Human Sciences Research Council (HSRC) and the Education Policy Consortium (EPC) (2005), as they state that the facilities in rural schools are scarce and that the large classes impact negatively on ICT implementation. The study by the HSRC and EPC (2005), as cited in Wilson-Strydom et al. (2005) identified that rural schools were *"approaching the Emerging stage and will need a great deal of support to move to other stages"* (Wilson-Strydom et al., 2005, p.5). The levels of use of Bialobrzeska and Cohen (2005) seem appropriate here to ascertain at what stage the participating teachers will be as it seems that their first three levels of use align with the emerging levels to which Wilson-Strydom et al. (2005, p.5), Dwyer et al. (1991), Toledo, (2005) and UNESCO (2002) refer. This framework of Bialobrzeska and Cohen (2005), as presented in section 2.9.2 as well as in Figure 2.3, seems appropriate to determine where the participating teachers can be positioned in general, based on the findings from the data.

2.16   SUMMARY

This chapter provided an overview of the literature in order to assist multi-grade educators by providing opportunities and solutions to the challenges they are experiencing in utilising the one laptop for teaching and learning in their classrooms. The literature review focused on addressing the research questions by giving a short overview of education in the South African context, referring to rural education, but specifically looking at multi-grade teaching realities in the world and in South Africa. The barriers to multi-grade teaching, including the barriers to ICT implementation, ICT integration, its definition, the barriers and how to ameliorate these barriers to ICT implementation, were also included. The uses of ICT in the multi-grade classroom, including the Intel® Teach training courses as a possible solution, were also presented.

This study also investigated the extent to which existing teacher training intervention programmes contributed towards teachers' utilisation of a laptop for teaching and learning in the multi-grade classroom. Therefore, it was important to portray what the various literature sources revealed in terms of multi-grade teaching, ICT implementation and integration and uses of ICT in the classroom, as this would inform how teachers could experience training interventions and how the laptop could be used. The chapter concluded with Figure 2.3 and an explanation why this three order typology was selected for the purpose of this study.

CHAPTER 3

METHODOLOGY: RESEARCH DESIGN AND METHODS

3.1   INTRODUCTION

In the previous chapter, chapter 2, the researcher positioned the study within the possible existing literature by reviewing literature relevant to the focus of this study, as well as by rendering a picture of aspects pertaining to multi-grade education. This chapter continues the journey by positioning the study in terms of the research design and methodology.

The next section will state the research problem, followed by the aims and objectives of this study and the primary and secondary research questions. These aspects were dealt with in chapter 1, but are repeated in this chapter to indicate the focus of the study to the reader. Next, an overview follows of the four paradigms, or philosophical world views according to Creswell (2009), within which one could position research. This is followed by the possible research approaches that could be followed, namely quantitative, qualitative or mixed approaches. Next, the research design for this study is indicated in terms of the paradigm, research approach and the research strategy. This is followed by a focus on the research method adopted, which include the research sample and context, the phases of the research, ethical considerations, as well as the data gathering tools. Data analysis, the limitations and delimitations of the research, as well as how trustworthiness was ensured, are also discussed and presented.

3.2   PROBLEM STATEMENT

The Department of Education provided laptops to teachers teaching within the multi-grade context. However, these teachers were not prepared for using these laptops in the classroom, despite the fact that basic ICT literacy training was provided in order to assist them in using their laptops. The basic literacy training was done by MSC, entailing a week-long training course in MS Word, MS Powerpoint and MS Excel. During school visitations, participants admitted that they did not use the laptop for teaching and learning, although they were expected to use the computers they were given to promote ICT implementation in their teaching and learning strategies in the multi-grade context. Basic training was provided by the Department of Education, but was apparently insufficient. The above seems to suggest that a technocratic view of technology (ICT), underpinned by technological determinism, i.e. that technology is a force that will drive change by itself (Surry & Farquhar, 1997), seems not to be plausible. Surry and Farquhar (1997) stated in this regard that the mere provision of technological resources would not necessarily lead to adoption or usage within the classroom context.

Literature suggests that many intrinsic and extrinsic factors have to be taken into consideration and addressed to assist with the usage of ICT resources (Ely, 1999; Ertmer, 1999; Du Plessis, 2010). In order to ascertain whether the existing situation could be 'turned around', this study investigated the challenges in terms of the multi-grade setting; the challenges pertaining to ICT implementation; possible solutions, as suggested by the multi-grade teachers; and, furthermore, whether exposure to Intel® Teach training had resulted in the increased use of the laptop for teaching and learning. In addition the participants' experiences regarding what they perceived as being positive and negative regarding the Intel Teach training were also investigated.

3.3 AIMS AND OBJECTIVES OF RESEARCH

The overall research aim of this study was to enable teachers to use the laptop in the multi-grade classroom by determining their needs, and employing an existing teacher assistance programme, such as Intel® Teach, for one-laptop implementation within the multi-grade classroom. From the main aim, the following research objectives emerged:

- To ascertain the perceived challenges and/or barriers that multi-grade teachers experience;

- To determine the perceived challenges or barriers that mitigate against the use of a laptop in the multi-grade classroom;

- To ascertain what can be done to address the perceived barriers in order to assist with classroom implementation of the laptop for teaching and learning, as perceived by the teachers;

- To expose the participating teachers to an existing ICT programme, Intel® Teach, with a view to assist the educators in using the laptop for teaching and learning in the multi-grade classroom;

- To determine whether exposure to the Intel® Teach Programme had promoted a change in the participating teachers' practice, i.e. whether evidence existed to indicate whether the teachers were using the laptop for teaching and learning;

- To sensitise and inform the Department of Basic Education regarding the issues that this study investigated and the research findings pertaining to the issues; and

- To provide recommendations to the Department of Basic Education regarding what could be done to assist multi-grade teachers within similar contexts to use the laptop for teaching.

3.4   PRIMARY AND SECONDARY RESEARCH QUESTIONS

The following main research question emerged from the problem statement and objectives of this study, namely: *Can the use of the Intel® Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in multi-grade classrooms?* In Chapter 1, section 1.4, the issue of the 'Can' question was raised, therefore it won't be dealt with further. In order to answer the primary research question and to obtain a picture of the participants' experiences and perceptions of the multi-grade context, the following subsidiary questions need to be answered:

- *Question 1: What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *Question 2: What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

- *Question 3: What are the teachers' perceptions of what can be done to meet these challenges?*

- *Question 4: What did they perceive as the positive and negative aspects of the Intel® Teach Training Programme?*

- *Question 5: Is there evidence that the Intel® Teach Training Programme enabled teachers to implement ICT into their teaching and learning in a multi-grade context?*

Having presented the primary and secondary research questions, the next section provides an overview of the different possible paradigmatic approaches within which the researcher can frame the research undertaken.

3.5   OVERVIEW OF DIFFERENT PARADIGMS

In Chapter 1, it was stated that a paradigm is a set of beliefs representing a world view (Denzin & Lincoln, 2000; Patton, 2002) or, as Maxwell (2005) stated, *"a set of very general philosophical assumptions about the nature of the world (ontology) and how we understand it (epistemology)"* (Maxwell, 2005, p. 36). Babbie (2005) suggested that the paradigm can be basic samples of the designs researchers use to organise their interpretation and explanations, whilst Punch (2009) postulated that a paradigm is *"a set of assumptions about the social world, and about what constitute proper techniques and topics for inquiring into that world; a set of basic beliefs, a world view, a view of how science should be done"* (Punch, 2009, p. 358). Blaikie (2010) concurred, contending that paradigms are *"major traditions in the natural and social sciences that incorporate particular ontological and epistemological assumptions and one or more of the research strategies"* (Blaikie, 2010, p. 9).

The paradigm provides the world view of research and determines what data collection tools will be used and how the data will be interpreted (Durrheim, 1999). It is important to note that each paradigm views reality differently and therefore purports a specific method and approach, which are reflected in the data gathering tools (Patton, 2002). Creswell (2009) posited that researchers approach their studies within a particular world view, led by certain assumptions that inform (1) the nature of reality; (2) the relationship of the researcher to that which is being researched; (3) the role of value in a study; (4) as well as the process of the research, i.e. the methodology.

The selection of a research paradigm therefore becomes the map or framework for the research, in other words, it directs how the research will proceed (Babbie, 2010). The research paradigm determines what questions will be asked, which data gathering tools will be used, and how the findings and knowledge will be created. From the literature, it seems that there are four main paradigms within which researchers operate, namely:

- Empiricism or positivism or post-positivism (Cohen et al., 2007; Creswell, 2003; Creswell & Plano Clark, 2007; Denzin & Lincoln, 2005; Guba & Lincoln, 2005; Healy & Perry, 2000; Mertens, 2005)

- Hermeneutics or interpretivism also referred to as constructivism (Cohen et al., 2007; Creswell, 2003; Creswell & Plano Clark, 2007; Denzin & Lincoln, 2005; Guba & Lincoln, 2005; Mertens, 2005)

- Critical theory (Cohen et al., 2007; Denzin & Lincoln, 2005; Guba & Lincoln, 2005; Healy & Perry, 2000)

- Pragmatism (Creswell, 2003; Creswell & Plano Clark, 2007)

Each paradigm has its own ontology, epistemology and methodological assumptions (Mertens, 2005). Ontology seeks to examine what reality is (Creswell, 2009). Epistemology relates to that which is considered to be knowledge that is acceptable and understood, or as Cope (2002) stated, *"Epistemology is a theory of knowledge with specific reference to the limit and validity of knowledge"* (Cope, 2002, p.43). Epistemology assists the researcher in answering the question, *"How do I know what is true?"* (Cope, 2002, p. 43), thus providing a lens to assist the researcher in how to gauge how people understand the world around them.

Each of the above-mentioned paradigms will be discussed briefly in the next section in terms of ontology, epistemology and methodology. In another main section, the paradigmatic stance of this study will be stated.

3.5.1   Empiricism, also referred to as positivism and post-positivism

The positivist ontological position is that it views reality as apprehensible, i.e. an ultimate reality exists (Denzin & Lincoln, 2005; Guba & Lincoln, 2005). Epistemologically, positivism posists an objectivist epistemology, i.e. findings are truthful, based on the establishment and verification of facts (Denzin & Lincoln, 2005; Guba & Lincoln, 2005). According to Mertens (2005), this view holds that the social world can be observed in the same way as the natural world, through being objective. Knowledge is gained by describing the phenomena (Trochim, 2006). Therefore, the role of science is the discovery of what can be measured and observed through objective deductions (Trochim, 2006). The focus is therefore on scientific facts, truths and laws through verified hypotheses (Cohen et al., 2007; Guba & Lincoln, 2005). Within this world view, experiments are conducted or large scale surveys are used to gather data; therefore quantitative data gathering tools are used (Creswell, 2003; Denzin & Lincoln, 2005; Mertens, 2005).

3.5.2   Interpretivism

Within the interpretive paradigm, reality is viewed as socially constructed, resulting in the acknowledgement of the existence of more than one reality or multiple realities, i.e. a reality presented by the researcher, as well as the realities represented by the participants' experience, resulting in a newly constructed reality (Creswell, 2003; Guba & Lincoln, 2005), viewing the world as that which is constructed, rather than found (Mc Farlane, 2000).

The interpretive differs from positivism and realism; it lies outside the domain of the scientifically, objective and value-free discovery of a single truth (Mertens, 2005). Interpretivists search for an understanding of human behaviour and the social world, in contrast to positivism, which searches for an explanation of a situation (Bryman, 2001; Creswell, 2003). The interpretivist acknowledges subjectivity and bias, at the same time, *"an appreciation of subjectivity and bias is therefore important to interpretivists"* (Tyler, 2006, p. 101). Tyler (2006) also recognised individuals as important agents who can transform social structures as, *"individuals within society are regarded as important actors who can change social structures"* (Tyler, 2006, p. 101). It therefore means that examining a phenomenon that is removed from human interpretations is not possible, as it is the core of the research (Tyler, 2006).

Mc Farlane (2000) viewed interpretivists as researchers who attempt to bring meaning to the experiences of people through their interactions and therefore conduct their interpretive research using qualitative methods of enquiry. Although the focus of the interpretive paradigm is qualitative in nature, quantitative data gathering may also be employed (Creswell & Plano Clark, 2007). Qualitative data gathering tools are used in order to render a picture of reality and therefore the research design is often in the form of a case study, ethnography or a phenomological research perspective (Creswell, 2003).

3.5.3   Critical theory

Critical theory holds a world view shaped by gender, politial, economic, cultural, ethnic and social values (Guba & Lincoln, 2005). It is underpinned by a subjective epistemology (Denzin & Lincoln, 2005). Therefore, research within this paradigm cannot be value free (Denzin & Lincoln, 2005). Cohen and Manion (2000) stated that critical theory and critical educational research had as their focus the interrogation of, for example, how inequality is perpetuated in schools, who are the definers of so-called worthwhile knowledge, how power is produced, and whose interest is served as a result of this perpetuation; therefore it has an emancipatory interest, with a strong reflective element (Cohen & Manion, 2000 with reference to Habermas, 1972). Basit (2010) concurred, stating that empowerment and emancipation are the focus, as inequality and discrimination have to be eradicated. It seems that, methodologically, action research could be a form of methodology (Cohen and Manion, 2000).

3.5.4   Pragmatism or mixed research

The pragmatists acknowledge single as well as multiple subjective realities (Creswell & Plano Clark, 2007). This pragmatic world view holds that both qualitative and quantitative data gathering tools can be used, as research should not be limited to one specific paradigm and the use of limited methodologies (Creswell & Plano Clark, 2007). This pragmatic approach opens up possibilities for multiple methods, different world views, different assumptions, and different forms of data collection and analysis (Creswell, 2003). Within this approach, qualitative and quantitative data can be given equal weight, or the one a greater weight than the other (Creswell, 2003). At the same time, it is also important to note that quantitative and qualitative data can be gathered concurrently or sequentially (Creswell, 2003; Creswell & Plano Clark, 2007). Several designs are possible within the mixed method or mixed research approach, namely the triangulation design procedure, embedded design, explanatory design and exploratory design (Creswell, 2003; Creswell & Plano Clark, 2007).

3.6   RESEARCH APPROACHES

In the previous section, the four main paradigms were identified and briefly described. In this section, an overview of the three main research approaches available to researchers namely, quantitative, qualitative and mixed methods is provided (Creswell, 2003).

3.6.1   Quantitative approach

The quantitative method of research deals primarily with quantifying the research in terms of numerical data (Creswell, 2003), basing its validity on statistics (Frankel & Wallen, 2003). It is underpinned by the positivist ideal that everything can be measured (Creswell, 2003). This study is not quantitative in nature, as it does not concentrate on quantifying the phenomenon in terms of inferential statistics, but it aims to provide a deeper understanding of the experiences and perceptions of the participants through descriptive accounts of their own experiences. Should any quantitative references

be referred to, the purpose is merely descriptive, i.e. indicating 'how many' concurred about something similar.

3.6.2   Qualitative approach

Qualitative research seeks an in-depth understanding (Flick, 2002; Patton, 2002), to examine a phenomenon within the context of the study, i.e. a real life investigation (Creswell, 2003), which Bogdan and Biklen (2003) described as *"an approach to social sicence research that emphasies collecting descriptive data in natural setting, using inductive thinking, and emphasising understanding the subject's point of view"* (Bogdan & Biklen, 2003, p. 261). It allows the researcher to pursue and report on multiple perspectives (Struwig & Stead, 2001) or multiple complexities (Creswell, 2003). According to Struwig and Stead (2001), the qualitative method allows for attention to detail and is suited for exploratory, descriptive and contextual research (Creswell, 2003). Lankshear and Knobel (2004) concurred, stating that the qualitative researcher aims to collect data within context; focusing on the natural setting, in this research, the multi-grade classroom.

Babbie (2001) and Mouton (2001) contended that qualitative research is most suited for conducting a study of social entities. Mouton (2001) suggested that qualitative methods provide the researcher the opportunity to gain better insight into the world of the participants, i.e. to better understand the participants' experience within their context. Leedy (1997) posited that in qualitative research, researchers should enter the study with an open mind and immerse themselves in the complexity of the context.

3.6.3   Mixed method approach

According to Silverman (2000), mixed method research allows researchers to obtain an in-depth understanding of the phenomena being studied. Mixed method research allows researchers to combine both qualitative and quantitative methods in their approach to research (Blaikie, 2003). This means that the mixed method research design utilises both qualitative and quantitative data gathering tools and that the researcher may focus on both quantitative and qualitative methods equally. Creswell, Plano Clark, Gutman and Hanson (2003), however, postulated that a researcher's focus is determined by the following:

- Priority (which method is emphasised more);

- Implementation (quantitative and qualitative data collection and analysis done in sequence or chronologically (following one another), in parallel or concurrently); and

- Integration (the phase in which the mixing of quantitative and qualitative data methods occurs).

Mixed method research seems to strike a balance in that the disadvantages of the one method may be compensated for by the advantages offered by another mehod, providing multiple perspectives and strengthening the findings and conclusions. Both qualitative and quantitative methods are employed in mixed method research in order to address the multiple perspectives (Creswell, 2003; Tashakkori & Teddlie, 2003).

3.7   RESEARCH DESIGN FOR THIS STUDY

Lankshear and Knobel (2004) viewed the research design as a guide for undertaking a study under certain conditions. They also stated that the design should include the purpose, aims and objectives of the study, the research problem and research questions (Lankshear & Knobel, 2004). Furthermore, they pointed out that the philosophical framework and data analysis process formed part of the research design. Burns and Grove (2003) highlighted the importance of a clear research design that could serve as a blueprint or framework for the research. Gibson and Brown (2009) stated that the research design referred to a specific or particular approach to research, such as experiments, case studies, ethnography and action research. Punch (2009) stated that the qualitative research design deals with four main questions, namely " *'Following what strategy?'; 'Within what framework?'; 'From whom?'* and *'How?'* " (Punch, 2009, p.113). Aspects such as the purpose and aims of the study, the research problem and research questions mentioned by Lankshear and Knobel (2004) have been indicated and addressed within this chapter. In the following section, the paradigmatic stance of this study, the rationale behind the use of a qualitative approach and the case study strategy (approach) will be presented.

3.7.1   Interpretive paradigm

The research paradigm of this study nestles itself within the interpretive paradigm, since it allows for a deeper understanding of the social phenomena (Denzin & Lincoln, 2000). The aim of this study was not to observe a direct cause and effect association, it acknowledged that there is no single truth or a single reality, since different realities were presented by the researcher in this study: those of the participants, and a constructed socio-cultural reality. This study therefore recognised an ontological perspective of having multiple realities (Creswell, 2003; Johnson & Onwuegbuzie, 2004), as it recognises the researcher and participants' realities, adding to the study another constructed reality (Creswell, 2003; Guba & Lincoln, 2005), i.e. the reality as presented by the text.

Henn, Weinstein and Foard (2006) contended that the interpretive paradigm has as its focus the ability to portray reality from the participants' view, in their own voice. As this study focused on obtaining the perceptions of the participants on the challenges pertaining to multi-grade education; their perceptions regarding the barriers or challenges related to using laptops for teaching and learning, their perceptions of what could be done to address these perceived challenges; their positive and negative

impression of the Intel® Teach training provided and, lastly, the participants' reflections on using the laptops after training, the interpretive paradigm seemed to be best suited for this study (the participants provided an account of their own views; and there was a margin of subjectivity and many perceptions of reality (Creswell, 2003; Johnson & Onwuegbuzie, 2004), hence multiple perspectives). This is based on McFarlane's (2000) position that the interpretive view assists the researcher *"to understand and interpret social situations by becoming part of the situation or close to the people involved with them, to listen to their stories and to share their perceptions and experiences"* (McFarlane, 2000, p. 27). McWilliam, Danby and Knight (2004) concurred, stating that, *"individuals structure their entire world by their perceptions and interpretations of what they conceived that world to be"* (McWilliam, Danby & Knight, 2004, p. 400). The abovestated views of McFarlane (2000) and McWilliam et al. (2004) seem to resonate well with the focus of the study, as stated in the first section of this paragraph. Denzin and Lincoln (2005) and Basit (2010) have posited that the interpretive paradigm enables an in-depth study of the perceptions and behaviour of smaller samples, based on the usage of qualitative data gathering tools. In this study, a small sample of 20 multi-grade teachers were used as participants and their perceptions and behaviour were captured through in-depth interviews, questionnaires and observations – all qualitative data gathering tools.

3.7.2   Qualitative approach

Qualitative research is not concerned about quantities or statistics, but deals with describing and portraying, often in the participants' own words, through direct and verbatim transcriptions that are presented as evidence from the data (Taylor & Bogdan, 1998). This is done in order to describe and interpret the participants' experiences or perceptions (Gerson & Horowitz, 2002; McMillan & Schumacher, 2006).

The researcher opted to employ qualitative data collection methods for the purpose of this study, as it investigated the perceptions and experiences of the educators in multi-grade practising schools in the Uitenhage District. The qualitative data gathering tools used in this study allowed for the exploration of the experiences and perceptions that the educators had towards the challenges in the multi-grade teaching context. The qualitative approach enables a better understanding of the research problem (s), by addressing the research questions, as it allows for the generation of descriptive and rich data (Johnson & Christensen, 2004), not simply for quantification through numbers. In a similar manner, Creswell (2006) contended that qualitative research gives mearning to the experiences of participants (people).

Taking the above-stated into consideration, this study focused on understanding the participants' views from their perceptions in their own words, thereby providing insight into their experiences (Cohen et al., 2007). It sought to interpret and provide an understanding of their realities, in order to be practical and relevant (Walsham, 2006; Yin, 2009), in their contexts. As the research aim

was to provide the perspectives, perceptions, suggestions and experiences of the participants, the qualitative approach seemed to be most appropriate for this study, as the participants' perceptions and experiences would provide a picture of their multi-grade context, the associated challenges, as well as how the participants perceived the intervention. In addition, qualitative artefacts, as well as qualitative interview data, provided data-rich information related to whether the intervention had assisted multi-grade teachers in using the laptops for teaching related purposes, as suggested and perceived by the participants. Quantitative data were used only related to research question 5, as this served to obtain a pre- and post training indication of ICT implementation and also assisted with triangulation related to research question 5.

3.7.3   Case study strategy

The research design for this research project is an interpretive exploratory case study, using qualitative data gathering tools to explore and interpret the experiences and perceptions of multi-grade teachers. Interpretive case studies enable researchers to undertake an in-depth investigation of phenomena in real-life context (Gilham, 2000; Picciano, 2004; Yin, 2009) and aim to provide interpretations of the findings (McFarlane, 2000; Walsham, 2006). The data gathering tools used, were mainly qualitative and some quantitative data. The quantitative data refer to or elaborate on the perceived positives or success (before and after usage), but not for inferential statistical purposes.

According to Gerring (2007), case studies work very well in social sciences and can be used in qualitative and quantitative research, as well as mixed method research. He argues that the purpose of case studies is to shed light on a particular aspect and that the unit of study may not be representative of the whole. Fiedler (2004), Tellis (1997) and Yin (2009) concurred that case studies could be used when the researcher wanted to know the *"what", "how"* or *"why"* of a contemporary issue. Yin (2009) supported this view, adding that case studies could be used in pursuit of exploring, describing or explaining complex social phenomena. Case studies can also be used to explain cause and effect, for testing purposes and to establish the effectiveness of an issue (Yin, 2009); however, this was not the aim of this study.

Cohen, Manion and Morrison (2007) and De Vaus (2001) concurred that researchers in qualitative research often employ case studies, especially within the interpretive approach. The interpretive nature of case studies allows researchers to understand the situation through the participants' eyes. McDonough and McDonough (1997) concurred, stating that case studies deal with people's interpretation of their perceptions and experiences.

The use of a case study approach has not escaped criticism. Cohen and Manion (2000) and Cohen et al. (2007) have stated that this approach has been criticised because its focus is on a single case only. Berg (1998) also cautioned against the limitations of the possible generalisation of case study

research findings. Kozma and Anderson (2002) contended that this was not necessarily a weakness, as the focus should rather be on what can be learned from the case study, for example, how technology could be supported and used to achieve change. At the same time, Pring (2004) and Mouton (2001) stated that the findings of a case study should not be seen as useless or even irrelevant, as although the results may be relevant for a specific case, they could be relevant in other cases. Stake (2005) stated that it is actually the readers of a case study who make generalisations from the study to their own context(s) when reading the case. Merriam (2009) agreed, positing that readers often relate the case studies that they read to their own context and experiences, i.e. whether what is reported, could be linked or related to their own circumstances or contexts. Stake (1995) put it as follows:

> *"The reader will take both our narrative descriptions and our assertions: narrative descriptions to form vicarious experience and naturalistic generalizations, assertions to work with existing propositional knowledge to modify existing generalizations"*

(Stake, 1995, p. 86).

The case study approach was deemed to be best suited to this research, since it allowed the researcher to conduct qualitative investigations (Gerring, 2007; Lichtman, 2010) in the real life context (Thomas, 2003; Yin, 2009) of twenty multi-grade teachers. The focus of this interpretive exploratory case study was to ascertain *'what'* (the perceived challenges and barriers) were and *'how'* (participants' suggestions on how these perceived challenges and barriers could be addressed) (Fiedler, 2004; Yin, 2009). The case study allowed the researcher to shed light on issues from the participants' perspectives and understand their context through their eyes. In addition, this study also tried to ascertain *'what'* the positive and negative perceptions were regarding the Intel intervention to assist the participants in using the laptops and, lastly, '*what'* evidence was available to suggest progress in the use of the laptops for teaching purposes.

Another possible positive aspect of this study is that it could assist the Department of Basic Education regarding the provision of ICT to schools, pre- and post-support, to ensure that ICT is utilised, as well as the specific type of support that would assist educators on entering multi-grade practising schools. It has the potential to provide administrators with a better understanding of multi-grade teaching challenges and, in so doing, encourage collaboration between multi-grade teachers and universities to collectively and through an integrated approach improve the quality of teaching and learning in rural education. The intention of this case study was not to provide a generalisation of issues pertaining to the multi-grade context, but to create a deeper understanding of the participants' own views, experiences and perceptions (Punch, 2009; Thomas, 2003); therefore the information gathered, cannot be viewed as irrelevant (Mouton, 2001; Pring, 2004). This particular case may portray issues

similar to other cases and different perceptions in similar issues in other cases; the readers will interpret this case based on the knowledge they wish to construct (Stake, 1995).

According to Merriam (2009), case studies have a particularistic, descriptive and heuristic character. This case study subscribes to Merriam's view by addressing the particular challenges a group of multi-grade educators experience in multi-grade classrooms; it gives an account of their own experiences, describes in their own voices how they experienced these challenges and barriers, provides data-rich information, and provides a deeper understanding of their context.

Since the success rate of the Intel® Teach Programme at many mono-grade schools had been well documented, the case study approach allowed the researcher to focus on its applicability in the multi-grade context. To conclude: This interpretive exploratory case study involved a group of educators practising multigrade teaching. More information about the sample is provided in the following sub-section.

3.8   RESEARCH METHODS

In the following sub-sections, the selection of the participants, the research context, the data gathering tools used, as well as the phases of the data collection process, are presented.

3.8.1   Selection of participants and research context

The problem that researchers face, is the fact that they cannot collect data from everybody; therefore, researchers have to rely on *"a small portion of the whole"* (Denscombe, 2003, p. 11), hoping that the data collected and the interpreted findings from this small portion of the whole would be representative and applicable to the rest of the 'population' (Denscombe, 2003). Therefore, it is important that the sample be very carefully selected (Denscombe, 2003).

Polkinghorne's (2005) contention that qualitative researchers should refer to *"selection"* rather than *"sampling"* as sampling, seems to imply that results have to be generalised and therefore seems to have a quantitative nature. Patton (2002) was also critical of the rules related to sampling size in qualitative research, arguing that sampling is determined on *"what you want to know; the purpose of the inquiry; what's at stake; what will be useful; what will have credibility and what can be done with the available time and resources"* (Patton, 2002, p. 244).

Two main tiers of sampling can be defined, namely probability sampling and non-probability sampling, each with specific sampling approaches (Denscombe, 2003; Burton, Brundrett & Jones, 2008). According to Gay and Airasian (2000), purposive sampling, which is a sampling strategy clustered under non-probability sampling, is mostly utilised by qualitative researchers. Johnson and Christensen (2004) and Struwig and Stead (2001) concurred, stating that purposive sampling provides

data-rich information, since the participants are knowledgable about the phenomenon under investigation. Purposive sampling refers to a sample that is *"hand picked' for the research"* (Denscombe, 2003, p. 15; Lankshear & Knobel, 2004, p. 148). This form of sampling refers to situations or contexts of which the researcher has knowledge regarding the people or events, and hence the selection is based on these participants, as they are viewed as likely to be able to provide valuable data to the researcher (Denscombe, 2003) or, as Burton et al. (2008) stated, that researchers are aware that the participants have the necessary traits required for the study to be undertaken. For this study, twenty educators who received laptops and who were responsible for teaching in multi-grade classrooms were '*handpicked for this research'* (Denscombe, 2003, p. 15; Lankshear & Knobel, 2004, p. 148), as the researcher had been working with these twenty participants before.

Convenience sampling refers to participants being easily or readily available and is one of the most widely used forms of sampling (Burton et al., 2008). However, it can also be 'dangerous', as the sample could not be the most appropriate to render rich and rigorous data (Denscombe, 2003). For the purpose of this case study, a combination of purposive and convenience sampling was used. In this case study, the participants were twenty multi-grade educators who had each received one laptop for teaching and learning from the Department of Education. These educators were teaching at schools within the Kouga and Koukamma rural areas of the Uitenhage Education District and practised multi-grade teaching. The participants worked and lived in the areas in which they were teaching and it was convenient to group them for conducting workshops and interviews. The research focused on their use of one laptop for teaching and learning. As the researcher was working in the Department of Education and had been assisting these multi-grade teachers previously, the researcher was aware that the participants had received the laptops and that they were in the best position to provide data-rich information on their perceptions related to the multi-grade context and the use or non-use of the laptop, their suggestions, experiences, etc. At the same time, the sample was also convenient, as the researcher had previous contact with the teachers who received the laptops.

Convenience sampling was used, taking into consideration the statement by Cohen et al. (2007) that the sample size, representativeness and parameters of the sample, access to the samples and the sampling strategy to be used, affect the researcher's choice in research samples. It would also be convenient for the participants to attend workshops close to their homes over weekends, thereby minimising travelling, disruption to their lives, and keeping it as close to the real-life context as possible.

This case study involved twenty educators practising multi-grade teaching in their classrooms, who had all received one laptop each for teaching and learning. All the educators were trained with MSC in a five-day basic computer literacy course (in MSWord, MSExcel, MSPowerPoint) provided by the Department of Education prior to receiving one laptop each.

Calkins (2005) cautioned against convenience sampling; while good results may be obtained, the data may be biased. This was noted in the selection of the sample group of twenty teachers practising multi-grade teaching in the Kouga and Koukamma areas of the Uitenhage District.

3.8.2   Ethical considerations

Cohen et al. (2007) postulated that ethical issues always arise when dealing with human subjects and that researchers need to take cognisance thereof. The following three factors should be addressed in this regard, namely permission, confidentiality and trust. According to Mouton (2001), research concerns a quest for knowledge and truth and should not be conducted at the expense of the participants. The researcher therefore has to abide by a set of rules (code of ethics), which protects the information and the participants involved in the research.

Prior to undertaking this study, the researcher approached the District Director and the Superintendent-General of the Eastern Cape Department of Education to obtain written permission (Denscombe, 2007) to conduct the research within the Uitenhage District. The District Director and each potential participant received a letter in which the purpose of the proposed research was explained. It was also stated that participation would be on a voluntary basis and that participants' anonymity would be guaranteed (Babbie, 2010; Grant & Sugarman, 2004; Henn, 2006; Mc Namee & Bridges, 2002).

Prior to data gathering, participants were assured of the confidentiality of their input (Creswell, 2003; Walsham, 2006) and that none of their personal information would be revealed (Babbie, 2010) at any stage, including in the analysis and presentation of the data. Reference to any data would be done anonymously (Babbie, 2010; Denscombe, 2007) in terms of MGT 1 (multi-grade teacher number 1) when reporting on the findings (Cohen et al., 2007).

A relationsip of trust was established from the onset, by the researcher being honest and open regarding the research. This relationship of trust was very important, because the success of this study relied on abundant, trustworthy and rich information. The participants and the Department of Education were informed of the aims and objectives of the research, as indicated above, and that at the end of the research, they would be provided with a broad overview of the research findings (Denscombe, 2003; Mc Namee & Bridges, 2002). None of the information in the data gathering tools requested from the participants contained any personal questions that could be deemed damaging or improper, or that could be used against them.

3.8.3   Research phases and data tools used during phases

The research was conducted in three phases. During the first phase, initial individual interviews with nine participants and focus group interviews with two groups of three participants were

conducted to examine research questions 1, 2 and 3. An open-ended questionnaire was also employed with all twenty participants to explore aspects pertaining to these three questions:

- *Question 1: What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *Question 2: What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

- *Question 3: What are the teachers' perceptions of what can be done to meet these challenges?*

The semi-structured individual interviews and open-ended questionnaire employed, allowed those participants who may have felt inhibited in group settings the opportunity to express themselves individually in their own words. The initial semi-structured individual interviews focused on open-ended questions and were qualitative in nature. It was necessary to, during some of the interviews, probe the participants to gain greater clarity on the situation; this enabled the researcher to create a more comprehensive picture of the multi-grade educators' experiences and to clarify their responses.

All the participants were also requested to complete an open-ended questionnaire (set 1) to provide data to address Questions 1, 2 and 3. The questions included in the open-ended questionnaire referred to the challenges experienced in a multi-grade classroom, the barriers related to laptop usage in a mutli-grade classroom, as well as to possible solutions from the participants' perspectives. The data extracted from the semi-structured interviews (set 1) and the open-ended questionnaire (set 1) provided answers to the first three research questions. The qualitative open-ended data determined the perceptions of the educators and gave insight into their multi-grade realities (challenges and problems). It also gave an account of what the educators perceived as potential solutions to their specific problems.

The second phase consisted of an existing Intel® Teach intervention, in the form of ICT training courses.

The third phase took place after the implementation of the intervention. During this phase, the researcher addressed the fourth and fifth subsidiary questions:

- *Question 4: What did they perceive as the positive and negative aspects of the Intel® Teach Training Programme?*

- *Question 5: Is there evidence that the Intel® Teach Training Programme enables teachers to implement ICT into their teaching and learning in a multi-grade context?*

Focus group interviews, with two sets of three participants each, were held to investigate how the intervention had assisted them in their multi-grade settings. In addition, an open-ended questionnaire was provided to all participants, on which they could reflect the open-ended questions related to research questions 4 and 5. These open-ended questions could be returned electronically via email, a method preferred by many of the participants, responses to in written format (the completed questionnaires were collected by the researcher from the participants). This open-ended questionnaire also posed some quantitative questions to determine their usage (ICT implementation in their classroom) after the Intel® Teach traning courses.

3.8.4   Data gathering tools and data collection

Struwig and Stead (2001) identified two types of data collected by researchers, namely *"primary and secondary data"* (Struwig & Stead, 2001, p. 80). They stated that *"primary data are the new data that are collected for the research project, while secondary data are available data from sources other than the current research project"* (Struwig & Stead, 2001, p. 80). In this study, primary data were collected by means of an open-ended questionnaire, semi-structured interviews, focus group interviews and the researcher's observations. This study has as its secondary data source the literature that has been reviewed.

Struwig and Stead (2001) postulated that it is important to consult with advisers about research issues. In this study, the researcher consulted with her immediate supervisor, Dr Du Plessis, with researchers from the relevant university, such as Dr McFarlane and Professor Webb, as well as with fellow research students and their supervisors during group discussions.

In the next section, the data gathering tools used within this study (semi-structured interviews, focus group interviews, open-ended questionnaires and observation) are discussed briefly. Struwig and Stead (2001) identified these data gathering tools as the primary data collection tools in qualitative research.

3.8.4.1   Interviews

Adler and Clark (2011) and Walsham (2006) recognized interviews as an integral part of interpretive studies and as appropriate data gathering tools to assess participants' perceptions and experiences. According to various authors (Adler & Clark, 2011; Creswell, 2003; McMillan & Schumacher, 2006; Walsham, 2006) interviews are data collection methods through which interviewers pose questions to interviewees and record their responses as evidence that is later transcribed, after which the data are analysed. Although interviews are commonly used by most researchers, Schostak (2006) cautioned against perceiving interviews as easy data collection tools. Semi-structured interviews were used in this qualitative study, as one of the primary data gathering tools for various reasons, which will be explained in this section (Merriam, 2009). In qualitative research, interviews allow the

researcher to "*bring new information and open windows into the experiences of the people you meet and is a way of finding out what others feel and think about their own world*" (Rubin & Rubin, 2005, p.1). Gilham (2000) and Flick (2006) viewed (semi-structured) interviews as fruitful data gathering tools, because the participants express themselves in their own words. Bogdan and Biklen (2003) contended that interviews provide interviewees with the opportunity to voice their experiences and perceptions in their own words. In this study, the interviewees vocalised their experiences and perceptions in response to the questions posed by the researcher. These responses therefore constituted rich data and provided the researcher with the opportunity to view the situation from within the participants' reality.

There is a conglomeration of views on the purpose of interviews. Denscombe (2007) and Schostak (2006) concurred that interviews allow researchers further insight into the experiences, knowledge and thinking of the interviewees, allowing the latter to raise issues they deem important (Denscombe, 2007; Schostak, 2006). Interviews allow for the construction of new information (Phan, 2008) and give insight into the experiences of the interviewees, and what they think and feel about their own world (Adler & Clark, 2011; Phan, 2008). Interviews also allow the researcher to gather valid data through the interviewees' own responses (Creswell, 2003; Esterberg, 2002; Frankel & Wallen, 2003), providing access to data that cannot be observed (Patton, 2002) and also allow for the sharing of information between the interviewer and the interviewees, including opposing views (Lambert, 2002; Schostak, 2006). Frankel and Wallen (2003) and Patton (2002) have concurred that interviews allow researchers to obtain information they would not have been able to obtain through other methods, such as observations. Creswell (2003) and Struwig and Stead (2001) concurred that interviews are versatile and flexible data gathering tools.

The advantages of using interviews in qualitative research were considered with reference to Denscombe (2007), because the interviews employed allowed, the researcher to:

- gather data-rich information*;*

- provide an in-depth understanding of the multi-grade context;

- vocalise the participants' opinions, in their own words;

- utilise the flexibility of adapting questions and probing by the interviewer, especially where the researcher wanted to know more;

- enable the participants to be actively involved and participate;

- record the participants' actual responses on dictaphone as a means to ensure truthful, accurate and correct data.

In this study, cognisance was taken of the advantages and characteristics of interviews in the selection of interviews as one of the primary data collection tools. According to Nardy (2006), interviews could be perceived as reactive situations in which discussions about personal opinions could be influenced by the interview itself. Bless, Higson-Smith and Kagee (2006) and Cohen et al. (2007) have expressed concern that factors such as time, language and the venue could negatively affect the interview process. Therefore, interviews were scheduled at a pre-determined time, venue and date most convenient to the interviewees to eliminate such factors. Interviews were conducted over weekends, at a location determined by the interviewees. This allowed the researcher the opportunity to contextualise the distances the interviewees traveled on a daily basis.

Schurink, Schurink and Poggenpoel (1998) suggested that a suitable space should be found for interviews. Dunne Pryor and Yates (2005) recommended that care should be taken in the selection and number of participants to be interviewed. Gay and Airasian (2000) emphasised the importance of following up. In this study, this was done especially in cases where clarity was needed or more information and data were required on a point of discussion. Kervin, Vialle, Herrington and Okely (2006) and Henn, Weinstein and Foard (2006) encourage probing during interviews, elicit data-rich information. In this study, probing questions were posed to participants where more information was needed to allow the participants to respond fully to questions posed or to clarify aspects.

Listening is an important skill for interviewers (Gay & Airasian, 2000). Although probing is encouraged (Kervin et al., 2006; Henn et al., 2006), Gay and Airasian (2000) cautioned against leading interviewees when posing questions. Adler (2009), Holstein and Gubrium (2003), Klenke (2008) and Roulston (2010) advocateD a shared understanding. In this research, a common understanding regarding the purpose of the interviews, both prior to and during the interviews, was established.

Reflection is an important aspect of interviews, since the interviewees are encouraged through the questions posed by the interviewer to *"reflect in detail, on events they have experienced"* (Rubin & Rubin, 2005, p. 2). Interviewees' reflections during an interview aim to give account of what they have experienced, their perceptions, and their attitude to future or anticipated events. In this study, the reflections during interviews did not only elicit similar viewpoints, but created opportunities for the participants to express contradictory views, allowing the researcher to create a picture of the multi-grade educators' experiences and perceptions (Humphrey & Lee, 2004; Rubin & Rubin, 2005; Schostak, 2006).

However, certain disadvantages associated with interviews were taken into account, such as the time it would take to transcribe and analyse the data, complications in the analysis of semi- and unstructured interviews, the effect the relationship with and personality of the interviewer would have on the participants and their responses, the intimidatory and inhibiting effect recoding devices often have on participants, and the time and location of the interview (Denscombe, 2007).

This study utilised two types of interviews, namely individual interviews, which are semi-structured in nature, and focus group interviews. These are discussed in the following section.

3.8.4.1.1 Individual Semi-structured Interviews

In this study, the individual semi-structured interview was selected for its potential to provide data in respect of research questions 1, 2 and 3. Johnson and Christensen (2004), Struwig and Stead (2001) and Taylor and Bogdan (1998) cited the advantages of semi-structured interviews as data gathering tools as follows:

- Both interviewer and respondent can elaborate on issues;

- New ideas are introduced as they arise and

- Confusing terms / issues are clarified in real-time (probing)

Johnson and Christensen (2004), Mouton (2001), Taylor and Bogdan (1998) and Wellington 2004) cautioned against certain disadvantages associated with semi-structured interviews, as follows:

- Conducting the interview and the transcriptions can be time-consuming process;

- The interviewing techniques are unstructured and uncontrolled;

- No guarantee can be given that the questions will be posed in the same manner to all participants (There may be differences in phrasing, intonation, etc.).

In this study, individual semi-structured interviews were employed to gather data for research questions 1, 2 and 3 from nine participants, since this type of interview was considered was best suited to explore these questions more freely by allowing individual participants the opportunity to express themselves in their own words (Creswell, 2003; Esterberg, 2002; Flick, 2006). In this study, the interview questions were well thought through, and were based on research questions 1, 2 and 3 (Struwig & Stead, 2001).

The nature of interviews provided an opportunity for dialogue, and allowed a shared understanding to be reached between the researcher and the interviewees (Holstein & Gubrium, 2003; Klenke, 2008; Roulston, 2010). The interviews were conducted at a time and place suitable for the participants (the interviews were conducted after school, on the premises of the various schools). The participants were comfortable and at ease with the researcher, since they had already developed rapport with her prior to the interviews, because of existing working relations. Prior to the interview, the researcher reassured and reminded the participants of the ethics guiding the research. Interviewees were first given the questions on paper for about two minutes to gather their thoughts on each question before answering. The interviews were recorded on a dictaphone, which enabled the researcher to transcribe

them as correctly and reliably as possible. Recordings on the dictaphone also allowed for playback, when the interviewee required it in order to recall what was said in order to be able to answer a follow-up question related to what had been said. The recorded data and transcripts present proof of the trustworthiness and reliability of the study (Kvale, 1996; Mc Millan & Schumacher, 2006).

The individual interviews were recorded, transcribed and analysed to gain an understanding from the interviewees' own perspectives in terms of the research questions. The interview questions were coded and categorised to assist with the data analysis process.

3.8.4.1.2 Focus group interviews

Focus group interviews were also used to provide insight into the participants' thoughts and opinions related to the research questions (Esterberg, 2002). The researcher wanted to know more about the participants' feelings, thoughts, perceptions and opinions and the focus group interviews allowed the researcher to gain multiple views and responses on the topic (De Vos et al., 2005; Struwig & Stead, 2001). Pre-prepared focus group interview questions were used as a guide in the interview process, but at times it was necessary to pose a probing questions at a specific point during the interview, to gain more insight and clarity on the research questions (Henn et al., 2006; Kervin et al., 2006).

Focus group interviews allowed a group to support each other's thinking, provide an opportunity for kick-starting a new idea and, in some cases, to expand on and support what has been said by another participant. De Vos et al. (2005) stated that focus groups allowed the participants to feel empowered and supported, because they were surrounded by others. Patton (2002) concurred with De Vos et al. (2005) that focus groups boosted participant confidence through participation. The interaction achieved through the focus group interview technique in this study, allowed the researcher to obtain in-depth data rich information, which would not have been possible during individual interviews (Rossouw, 2003). During the conversations and responses, the participants not only provided data in respect of the research questions, but also listened to one another's views, reflecting on these, allowing for shared viewpoints and experiences that highlighted their similar and different experiences as multi-grade teachers (Ritchie & Lewis, 2003).

According to De Vos et al. (2005), participant selection is based on common characteristics in relation to the research topic. In this research, two groups of three participants each were selected for the focus group interviews. The first group was located in the Tsitsikamma area, while the second group was from the Langkloof area. Prior to each group interview, the researcher contacted the participants and arranged a suitable time and place for the interviews. The interviews took place at a centrally located school and lasted about two hours. Prior to each interview, the researcher reassured and reminded the participants of the ethics guiding the research. As the participants and the researcher already knew one another, there was no discomfort or unease in the interactions. The focus group

interviews allowed the researched to gather data rich information in a shorter time than would have been possible using individual interviews (Cohen et al., 2007).

3.8.4.2   Open-ended questionnaires

Two open-ended questtionnaires were used in this study to gain information on all the research questions. The first open-ended questionnaire was used to conduct a preliminary examination of the situation prior to the intervention. This open-ended questionnaire was related to research questions 1, 2 and 3. The second open-ended questionnaire was employed after the intervention and was designed to provide information on research questions 4 and 5.

Adler and Clark (2011) defined a questionnaire as *"a data collection instrument with questions and statements that are designed to solicit information from respondents" (*Adler & Clark, 2011, p. 212). Many authors concur that the questionnaire, in its simplest form, is a set of printed questions used to collect information from respondents (Cohen et al., 2007; Thomas, 2003). Although questionnaires are viewed by Struwig and Stead (2001) as data gathering tools for quantitative studies, the questions posed in the questionnaire used in this study defined it as an open-ended questionnaire, not quantitative in nature, although the participants could indicate how important they pereceived some of the challenges, by indicating their importance on a scale from 1, being '*never*', to 5, being '*fairly often*'. The questionnaire aimed to seek understanding about the participants' perceptions about the challenges and barriers pertaining to ICT, as well as what could be done to address these barriers and challenges.

In this study, care was taken to consider the advantages of open-ended questionnaires listed by Creswell (2006) and Struwig and Stead (2001); advantages in the form of a rigid, confidential, printed open-ended questionnaire that provided participants with an equal opportunity for responding by asking the same questions.

Oppenheim (2005) and White (2002) encouraged the running of a pilot questionnaire. According to White (2002), *"A Pilot questionnaire will identify the ambiguous questions, alert you to the problems of analysis, and generally make the final version more relevant"* (White, 2002, p. 53). White (2002) further suggested that the pilot should be run among similar respondents. In this study, therefore, a pilot of the questionnaire was run with a different group of twenty teachers (who did not form part of the sample of this research), but that were similar in the sense that they also practised multi-grade teaching and had access to desktop computers or laptops.

All the participants that formed part of the sample of this research study (n=20) were requested to complete the open-ended questionnaire (set 1) to provide data pertaining to research questions 1, 2 and 3. Some of the questions included in the open-ended questionnaire referred to

common aspects regarding challenges and barriers. Participants was afforded an opportunity to write whether and how they experienced the challenges and were also requested to rate how severe they perceived these challenges to be. Hence, the qualitative open-ended data assisted in providing participants' perceptions relating to their multi-grade realities as well as to ICT integration challenges and problems. It also provided an account of what the educators saw as possible solutions to their specific problems. Hence, the data gathering tool provided the respondents with the freedom to respond without restraint and account in their own words what their point of view was (Neuman, 2000; Denscombe, 2003).

However, Creswell (2006) cautions against the mis-interpretation of questions and, time-consuming and lengthy questionnaires that affect responses and the non-return of questionnaires because participants do not attach value to the questionnaires. These disadvantages were considered, and the researcher posed questions related to the research questions only and allowed the participants five days to complete the questionnaire before collecting them personally from the participants. Another disadvantage the researcher experienced reagrding the return of the questionnaires was that five of the educators in the study had resigned, to find employment closer to their homes.

3.8.4.3   Researcher observations

Observation was employed as a secondary data gathering tool, but the open-ended questionnaire and semi-structured interviews formed the basis of data collection. Observation is a very important aspect in research, because it may reveal data that the researcher will not be able to collect otherwise (Merriam, 2009; Silverman, 2000). According to Patton (2002), observations aim to provide greater understanding of a situation. In this study, the research question *'How did they use the laptop after the Intel® Teach programme?'* formed the basis for utilising researcher observations as a data gathering tool, because this was the most appropriate to obtain information to address this question. Various authors concur, cautioning against relying on this as an 'only' data collection source, due to the risk of researcher bias (Denscombe, 2003; Patton, 2002; Walsh, 2001). The researcher's observational experiences were also recorded. Although observations were made to support the data collected during interviews and questionnaires, they were not the primary data source.

Merriam (2009) posited as an advantage of utilising observation as a data gathering tool the fact that the recording is done in real time, as it happens. This study took cognisance of Denscombe's (2007) caution against researcher bias by recording the participants' views. The researcher obtained the participants' permission and arranged suitable times for doing the observations. The observations were focused on which skills from the Intel® Teach Programme were used in the classroom; how these skills were implemented; whether the participants were confident and comfortable in using the laptop in the classroom; and whether it was used in a bahaviourist or constructivist way.

3.8.4.4   Quantitative Questionnaire

With reference to research question 5, some quantitative data were collected in order to ascertain whether the quantitative data supported the qualitative data collected. Participants could reflect both prior to and post the Intel® Teach training regarding their usage by completing a five point scale. This scale ranged from '*never*' to '*fairly often*'. The focus was not to collect inferential statistics, but rather just to obtain an overview to ascertain whether there was an increase in the laptop usage pre and post the Intel® Teach training.

3.8.4.5   Literature sources

Struwig and Stead (2001) viewed the literature sources as secondary data and a very important aspect of any research. Creswell (2006) was of the opinion that the literature review provides the researcher with a means of justification for the research study. It allows the researcher to view his/her study as in support of existing ideas or as transforming existing ideas and indicates the gaps, differences and similarities (confirmations) that have resulted from the research (Creswell, 2006). Woods and Cantazaro (1988) contended that research is enhanced if the findings were verified by a literature review. Creswell (2006), Leedy and Omrod (2001) and Struwig and Stead (2001) contended that the literature review provided perspectives and confidence from the literature on the topics at hand. However, Creswell (2006) stated that there were disadvantages, especially when the research covered issues that were not well documented, or when there was a lack of available literature or, when covering ground-breaking research, and sufficient literature on a topic were unavailable. For the purpose of this study, an extensive literature review has been provided in chapter 2.

3.9   DATA ANALYSIS, PRESENTATION AND INTERPRETATION

The data in this study were analysed in order to give greater meaning to and obtain greater understanding related to the research problem (Lichtman, 2010; Taylor-Powell & Renner, 2003). According to Trochim (2006), data preparation involves data capturing and the verification of data, as well as compiling brief summaries describing the data. Data analysis could be described as *"breaking up the data into manageable themes, patterns, trends and relationships"* (Mouton, 2001, p.108). Creswell (2003) concurred that data should be analysed according to themes or categories. Basit (2010) posited that data analysis and data interpretation were processes that could be undertaken simultaneouly in qualitative research.

Interpretation is different from analysis; Denzin (2006) stated that data interpretation entailed comprehending and making sense of what was learnt, whilst Patton (2002) postulated that data interpretation focused on a holistic understanding of and arriving at conclusions about a certain issue. Therefore, raw data must be interpreted in order for it to be meaningful (Struwig & Stead, 2001). Data interpretation would therefore follow after the data has been analysed, and could involve explaining

trends. At the same time, it is important that researchers ensure that the *"findings emerge from the data and not their own predispositions"* (Shenton, 2004, p. 63). Data interpretation is also concerned with the manner or process in which the researcher narrates the findings (Mouton, 2001). Patton (2002) highlighted the importance of data interpretation as follows:

> *"Interpretation, by definition, involves going beyond the descriptive data. Interpretation means attaching significance to what was found, making sense of the findings, offering explanations, drawing conclusions, extrapolating lessons, making inferences, considering meanings and otherwise imposing order on an unruly but surely patterned world"*

(Patton, 2002, p. 480).

Data interpretation therefore corroborates what is known by using supported data, clearing misconceptions and highlighting important aspects that we did not know, but that which we should know (Patton, 2002). Patton (2002) stated that data interpretation (of a qualitative nature) did not aim to predict, generalise or determine cause, but interpret the raw data from the participants' responses.

Before the interviews were analysed, they were transcribed in detail. These transcriptions were used to analyse the interviews. According to De Vos et al. (2005), data analysis is the process of ordering, structuring and bringing meaning to the collected data. Hence, the researcher utilised suggestions similar, but not identical, to Creswell's to analyse and present the data (Creswell, 2006):

- Each semi-structured and focused group interview was transcribed from the digital recorder. All the responses from the open-ended questionnaires were electronically typed.

- The completed open-ended questionnaires and the typed semi-structured interviews and focus group interviews were grouped into different piles. Each participant had a particular code assigned to him/her.

- Next followed reading and re-reading through the data gathering tools in order to get a sense of the participants' thoughts, experiences and perceptions. This entailed going through the responses to the questions posed in the questionnaires and the responses in the interview related data. A special code was assigned to each participant to identify the set to which the researcher could refer.

- While reading, codes were assigned to the data segments of the various data gathering tools. Coding refers to the process whereby similar names and tags are assigned during the analyses of the data collected (Punch, 2009). From the

participants' responses, codes were assigned to signify aspects that emerged. These codes were also written down in a notebook. As the various data were read, these written codes were consulted and when an existing code could not be used, a new code was created, the data piece was coded with the new code and the new code, was also entered into the notebook.

- The various codes were then grouped into categories. The categories were re-looked at and, when one category could be associated with another, further reduced, where possible.

- These main categories were associated with the various research subsidiary questions. The categories were then grouped with the relevant subsidiary questions, the subsidiary questions forming the main theme under which the categories were reported. Each of the categories was grouped for each of the first four questions by using the first, second and third order typology as indicated in chapter 2, Section 2.6.1. Below each category, sub-categories were indicated, where deemed necessary.

- Each category was reported more or less in the following manner: An introduction to the category was provided. This was followed by supporting data from the various data tools or, as Creswell (2006) states, by dialogue that supports the categories or themes. An interpretation of each of the categories followed. The categories were then validated by supporting them with literature relevant to the specific category. The researcher concluded by providing a personal reflection or final word about the meaning of the data when deemed necessary.

3.10   MEASURES TO ENSURE TRUSTWORTHINESS

Validity refers to whether the data gathering tools are valid or appropriate for the intended purpose, whereas reliability refers to consistency (Ary et al., 2006). Denscombe (2003) also referred to the importance of reliability and validity with reference to qualitative research. According to Denscombe (2003), the classic meaning of reliability refers to whether the instruments used are neutral and whether similar results would be obtained when used on another instance or when, *"applied to the same 'object' "* (Denscombe, 2003, p. 273). However, this is problematic within the qualitative research context, as the researcher is an integral part of the research instrument (Denscombe, 2003). Denscombe (2003) postulated that reliability referred to whether the research would produce the same results if it were to be repeated by another individual.

Instead of using terms such as validity and reliability (normally associated with the quantitative approach), terminology such as credibility, transferability, dependability and confirmability should be used when embracing a qualitative approach (Ary et al., 2006). This terms will be dealt with further below. Struwig and Stead (2001) postulated that there was no rule for for determining validity in qualitative research. According to Struwig and Stead (2001), certain criteria influence the validity of qualitative research, namely (1) descriptive validity; (2) interpretative validity; (3) theoretical validity; (4) triangulation; (5) researcher effects; and (6) generalisability or applicability. Merriam (2009) also highlighted the importance of validity and reliability within qualitative research, postulating that the following measures should be followed or adhered to, namely (1) triangulation; (2) member checks; (3) adequate engagement in data collection; (4) the researcher making his/her position public; (5) peer reviewing; (6) audit trails; (7) rich and thick descriptions; and, lastly, (8) thinking of maximising the variation in the sample selection. The criteria suggested above by Struwig and Stead (2001) can be encompassed by the terms credibility, transferability, dependability and confirmability.

These terms (credibility, transferability, dependability and confirmability) are dealt with separately in subsequent sections.

Denscombe (2003) stated that ensuring reliability within qualitative research could be dealt with in the following way:

- Providing a detailed explanation of for example the aims of the research (purpose),

- Explaining how the research was undertaken, and

- Highlighting the key decision making reasoning, such as, for example, the sampling used (Denscombe, 2003).

This then is why providing a comprehensive audit trail is vital, as it will assist another researcher in following the same process (Denscombe, 2003).

Ensuring validity within qualitative research can be determined by addressing the following (Denscombe, 2003, p. 274-275):

1. *"Do the conclusions do justice to the complexity of the phenomenon being investigated and avoid "oversimplifications", while also offering internal consistency?"*

2. *"Has the researcher's self been recognised as an influence in the research, but not a cause of biased and one-sided reporting?"*

3. *"Have the instances selected for the investigation been chosen on explicit and reasonable grounds as far as the aims of the research are concerned?"*

4. *"Have alternative possible explanations been explored?"*

5. *"Have the findings been "triangulated" with alternative sources as a way of bolstering confidence in their validity?"*

6. *"Have the research findings been fed back to informants to get their opinion on the explanation being proposed?"*

7. *"How far do the findings and conclusions fit with the existing knowledge on the area, and how far do they translate to other comparable situations?"*

In section 3.10.1 and onwards, the researcher dealt with aspects similar to the questions asked by Denscombe (2003) pertaining to trustworthiness and will indicate how this was ensured.

The importance of trustworthiness, as suggested by Denscombe (2003) was also highlighted by Guba and Lincoln (2005), as they also provided guidelines for trustworthiness, which are commonly applied in qualitative studies to verify the validitiy of the research. Their four guidelines or strategies refer to (1) truth-value; (2) applicability; (3) consistency; and (4) neutrality. These guidelines seem similar to those of Ary et al. (2006), indicated in Table 1. Ary et al. (2006) indicated how these guidelines, or as they are referred to *"Standards of rigour for research",* (Ary et al. 2006, p.504) related to the concepts validity and reliability in tabular format. This table is presented below (see Table 3.1).

TABLE 3.1: Standards of rigour for research (Ary et al., 2006, p. 504)

Quantitative	Qualitative	Issue addressed
Internal validity	Credibility	Truth value
External validity	Transferability	Generalisability
Reliability	Dependability or trustworthiness	Consistency
Objectivity	Confirmability	Neutrality

In the previous paragraphs, aspects pertaining to ensuring trustworthiness have been indicated. In Chapter 1, credibility, transferability, dependability and confirmability were briefly mentioned as methods to ensure trustworthiness, i.e. reliability and validity related to qualitative research. In order to be specific for this research project, these strategies are dealt with in a more

comprehensive manner below in order to indicate what each entails and how the researcher addressed each within this research project.

3.10.1   Credibility: Truth-value

Credibility in qualitative research (internal validity in quantitative terms) is concerned with how believable the observations, interpretations and conclusions are that the research provides or, stated differently, whether the researcher portrayed credibility and confidence in the findings based or founded on the research design, participants and context (Ary et al., 2006), hence, whether there is confidence in the findings. These concerns can be addressed by using various options. One option is data triangulation, i.e. data collected from one research instrument (e.g. semi-structured interviews) is confirmed by another research instrument (e.g. focus group interviews or open-ended questionnaire).

Another option is credibility through concensus, i.e. whether there is agreement that the description, interpretation and themes are credible. This can be done through peer review, by asking the following question to another researcher, *"Given the evidence presented, is there consensus in the interpretation?"* (Ary et al., 2006, p. 505). In addition to the above, member or participant checking could be used. In this study, the participants were given an opportunity to read through the transcriptions, listen to the recordings to verify if the results represent accurately what the participants have stated or the experiences that the participants have provided (Ary et al., 2006; Bryman, 2004). Some of the participants provided the researcher with a letter to confirm the credibility and correctness of the data (Appendix L). Another aspect to be addressed, is direct quotations from the participants, as these portray their real experiences and perceptions. Such thick, detailed and rich descriptions assist also in conveying the setting or context of the research and enable the reader to 'see' the setting and the experiences and perceptions (Ary et al., 2006).

The researcher ensured neutrality through group discussions and individual discussions with the supervisor to this research study, Dr. A. Du Plessis, who possesses extensive experience and expertise in conducting research. The use of a dictaphone ensured that the results were based entirely on data received from participants (De Vos et al., 2005).

Triangulation is regarded as an approved way of ensuring credibility in qualitative research. Creswell (2006) refers to triangulation as a primary form used by qualitative researchers to validate findings. De Vos et al. (2005, p. 341) cite Erlandson et al. (1993) as describing triangulation as a method whereby the researcher seeks out several different types of sources that can provide insight into the same events or relationships. Leedy and Ormrod (2005) described triangulation as applying more than one method of sampling data.

Triangulation is a process that aims to provide more credibility and reliability to the research (Bryman, 2004). Cohen and Manion (2000) defined triangulation as a detailed and complex description, from various perspectives, while Donoghue and Punch (2003) interpreted triangulation as a method of confirmation by considering information from many sources to find uniformity in the research data. Bryman (2004) concurred with the above, stating that the use of more than one method increases the reliability of research. According to Bryman (2004), triangulation can be defined as using more than one method in the gathering of the data in order to provide credibility to the data. Cohen and Manion (2000) suggested that triangulation refers to checking and re-checking of the results, using more than two methods. The researcher does this in order to check whether different methods will generate with the same result.

Patton (2002) encouraged triangulation, stating that *"triangulation strengthens a study by combining methods"* (Patton, 2002, p.41). Triangulation in research enables the corroboration of data through confirmation from more than two sources (Cohen & Manion, 2000). Triangulation uses cross-referencing in order to eradicate bias, and increases the credibility and validity of the results (Bryman, 2004).

Altrichter, Feldman, Posch and Somekh (2008) posited that triangulation provided balance and detail to the research. According to Denzin (2006), multiple data gathering tools can be used as a form of triangulation. In this study, triangulation was employed by means of the different methods of collecting data, namely the two sets of open-ended questionnaires, individual interviews with nine participants, focus group interviews with two sets of three participants, and the researcher's observations during meetings and/or interviews, including the literature review.

The data gathering tools employed in this study were utilised to investigate the research questions to confirm, emphasise or allude to differences (Kelle & Erzberger, 2004 and Flick 2006; 2007, as cited in Du Plessis, 2010, p. 19). It could also provide details on the professional development process that needs to be followed in order to engage an educator towards ICT integration and implementation.

3.10.2   Transferability: Applicability or Generalisability

Applicability in qualitative research (external validity in quantitative terms) refers to whether the findings of a study can be transferred to another setting (Ary et al., 2006; Guba & Lincoln, 2005). In case study research, this aspect has been a point of criticism, as alluded to and counter-argued in the 'Case Study' section in this chapter. However, Merriam's (2009) words seem to be very appropriate on the possibility of transferability or generalisability within a singe case study, *"a single-case … is selected precisely because the researcher wishes to understand the particular depth, not to find out what is generally true of many"* (Merriam, 2009, p. 224). She also made a case for the fact that

generalisability within qualitative research was not possible in a statistical sense, arguing that this does not imply that nothing can be learned from a qualitative study; in fact, she argued that a great deal could be learned (Merriam, 2009). Ary et al. (2006) concurred, stating that although generalisation did not seem to be the focus of qualitative research, the provision of detailed, accurate and rich descriptions assisted readers in making comparisons and judgements about possible transferability.

In this study, the researcher ensured applicability through the descriptions of the findings and research methods, in order to help other researchers determine whether the data could be transferred. A detailed and comprehensive description of the research methodology was given. Interviews were recorded on dictaphone while the transcriptions thereof provided a database.

3.10.3   Dependability: Consistency or Trustworthiness

According to Guba and Lincoln (2005) and Shenton (2004), consistency (reliability in quantitative terms) refers to whether the same results would be achieved if the study were to be conducted elsewhere in exactly the same manner. At the same time, it is important to note that the term dependability should rather be used in the qualitative context than the term reliability (Ary et al., 2006). Bryman (2004) concurred with Guba and Lincoln (2005) and Shenton (2004), pinning the reliability of the research to the achievement of the same results if it had to be applied again elsewhere (i.e. whether the answers would be confirmed).

The dependability or consistency (reliability) of the research refers to the uniformity of the investigation, or when the same results are obtained repeatedly (Shenton, 2004). Reliability therefore also addresses the consistency of the research. Ary et al. (2006) suggested that dependability or consistency (reliability) could be achieved through providing an audit trail. The audit trail indicates to others how decisions were made; hence the importance that the research design and research design process be well explained to the reader. It includes questions such as '*what was done*', '*why it was done*', '*when it was done*', '*who was studied*', '*why they were selected*' (Ary et al., 2006, p. 509). It also entails being able to show the raw data (Ary et al., 2006). It therefore refers to being able to assist another researcher in replicating the same study, as enough detail has been provided to conduct the study without any uncertainties. The triangulation of multiple data sources also assists with consistency, dependability and trustworthiness (Ary et al., 2006; Bryman, 2004; Shenton, 2004).

In this research, the researcher ensured dependability by providing detailed descriptions of the research methodology, the availability of the dictaphone recordings and transcriptions, and the triangulation of different methods of data gathering.

3.10.4   Conformability: Neutrality or Objectivity

Conformability in qualitative research (objectivity in quantitative terms) deals with the idea of neutrality (Ary et al., 2006) or objectivity (Shenton, 2004). The neutrality of a study refers to the extent to which the findings present itself, based on the participants and conditions of the research (Ary et al., 2006; De Vos, 2005) and whether the data collected and the findings, interpretations and conclusions made can be confirmed by other researchers researching the same situation (Ary et al., 2006). Hence, the findings should eminate from the participants' experiences and what they have stated regarding their experiences and perceptions; therefore, the findings should not be cluttered or manipulated to serve the preferences of the researcher (Shenton, 2004) or, as Ary et al. (2006) stated, the research should be "*free of bias in the procedures and interpretations of results*" (Ary et al., 2006, p. 511).

The audit trail is vital to demonstrate conformability (Ary et al., 2006), an aspect that was also highlighted as important under '*Dependability*'. Triangulation (mentioned under '*Credibility*' and '*Dependability*') is another strategy to assist with confirmability (Ary et al., 2006; Shenton, 2004). Guba and Lincoln (2005) highlighted the importance of confirming the findings of the study with another similar study.

The researcher ensured conformability in this study through record management, keeping all records of the raw data collected through questionnaires, individual interviews, focus group interviews and observation, including the records of the data analysis. The researcher planned the research, and debriefing sessions were conducted with the supervisor. These sessions provided valuable insight and information in terms of the research, since the supervisor, with his vast experience in conducting research, could assist in validating the findings.

3.11   RESEARCHER'S ROLE

In order to learn as much as possible about the situation, the researcher was immersed in the research. This underlying assumption guided the data and sequences of and the types of data collection methods used. The researcher collaborated and interacted with the respondents and gathered the data for the research. Therefore, the researcher recognises that there could be an element of bias and subjectivity in this study.

3.12   DELIMITATIONS AND LIMITATIONS

This case study was delimited to include only a small number (twenty) of multi-grade educators within the Uitenhage District as participants. The sample only included educators practising multi-grade teaching at selected schools in the Kouga and Koukamma areas (a section of the Uitenhage District) who had received laptops in the Department of Basic Education's 2009 laptop roll-out

programme for multi-grade teachers. This study excluded other laptop recipient multi-grade educators, due to time restrictions, the focus of the study, convenience of location for training and data gathering, as well as the logistics associated with this study. The delimitation was done in order to contain the scope of this case study.

One of the limitations of the study was obtaining consent from the Department of Education, sought during August 2010 through written correspondence to the District Director: Uitenhage and again in November 2010, through the completion of an 18-page document to the Superintendent-General: Provincial Office. This delayed the research, as consent was granted only during April 2011.

During one of the workshop sessions, six educators were absent, attending the funerals of family and staff members, which highlighted one challenge affecting staffing, especially in one- or two-teacher schools. Should one person be absent, supervisory problems would arise, potentially bringing teaching and learning to a standstill at such a school. It also highlighted the fact that should a workshop be presented for more than one grade, learning area or subject, it could be difficult to choose which workshop to attend, since the multi-grade teacher is expected to teach more than one grade or subject or phase in one classroom. Furthermore it also emphasised the great amount of teaching time lost when various meetings and workshops for different schooling aspects are held; learners lag behind when the teacher at these one- and two-teacher schools are absent, making it difficult to complete the syllabus.

The teachers had had no access to their laptops for a long period of time, because the laptops were taken back by die District Office, therefore the teachers could not practise nor implement the knowledge and skills, as required for homework. Due to this, many could not successfully complete the course with certification, as they had not submitted the required action plans. Teachers could not complete the Intel® Teach Essentials course, which was scheduled to be held at one of the rural schools practising multi-grade teaching, because the laptops had not been delivered to educators by July 2011. By January 2012, many of the teachers still did not have access to their laptops, while some of the educators' laptops had been allocated to other multi-grade educators not participating in this study. By March 2012, some educators still had not received their laptops and were informed verbally that these had been allocated to other educators; no reason was provided, and the laptops were not removed against these educators PERSAL, which left these educators worried about the security of the laptops.

In addition, another limitation was that the data gathering tools were conducted in a language that was not the home language of the participants. However, participants were free to respond to the questions in their language of choice. Every effort was made to ensure valid, truthful and reliable findings.

3.13   CONCLUSION

In this chapter, the research methodology, the research design and research design process were discussed and explained. The various data gathering tools used in the study were discussed. The sample, data analysis and data interpretation were also briefly discussed. The importance of validity, reliability and triangulation in qualitative research was also highlighted and discussed, as were the ethical considerations, limitations and delimitations. In chapter 4, the findings from the data are presented.

CHAPTER 4

DATA PRESENTATION AND DISCUSSION

4.1   INTRODUCTION

The focus of this study was guided by the main research question: Can the use of the Intel®
Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in
the multi-grade context? The following subsidiary research questions emerged from the main research
question, namely:

- *What are the perceived challenges that a sample of teachers experience when
  teaching in a multi-grade context?*

- *What are the perceived challenges that a sample of multi-grade teachers
  experience when attempting to implement ICT in their classrooms?*

- *What are their perceptions of what can be done to meet these
  challenges?*

- *What do they perceive as the positive and negative aspects of the Intel® Teach
  Training Programme?*

- *Is there evidence that the Intel® Teach system enable teachers to implement
  ICT into their teaching and learning in a multi-grade context?*

In the previous chapter, chapter 3, the research design and methodology were presented.
chapter 4 endeavours to continue the quest through the presentation, examination and interpretation of
the data and by linking the data findings to the literature via the methodology, as described in chapter 3.
During the data gathering, data analysis and data presentation processes, the researcher was constantly
reminded that *"the goal of social research is to develop an understanding of social life and discover
how people construct meaning in natural settings"* (Neuman, 2000, p.68-69).

The findings and interpretations pertaining to the first phase of the research (prior to the
intervention) attempted to understand the participants' perceptions regarding the challenges within their
multi-grade context, their ICT related challenges, as well as what they perceived as possible solutions to
these challenges, are presented in sections 4.2, 4.3 and 4.4. The findings and interpretations after the
exposure to the Intel® Teach training intervention are presented in sections 4.5 and 4.6. This chapter
also includes a discussion that links all the findings together.

4.2 THEME 1: MULTI-GRADE TEACHING CHALLENGES

This theme focuses on the secondary research question, *'What are the perceived challenges that a sample of teachers experience when teaching in a multi- grade context?'* The data were analysed by using the theoretical perspectives of first-, second- and third order barrier typology (Balanskat et al., 2006; Ertmer, 1999; Kirkland & Sutch; 2009; Law, Pelgrum & Plomp, 2008), a typology which also implies the micro, macro and meso levels (Balanskat et al., 2006; Kirkland & Sutch; 2009). Although Ertmer (1999) referred only to first and second order barriers, it is argued that the third order barrier, which refers to system wide or barriers beyond the school, could be implied as a subset of second order barriers. This has been referred to in the literature review in section 2.6.3.3. Du Plessis and Webb (2012b) have also argued in a similar manner that the first, second and third order barriers can be related to the micro-, macro- and meso levels, as the micro level refers to the self (second order), the meso level to the school (first order), and the macro level to the wider than the school level (third order). This theoretical perspective was used to analyse and group the data related to the first four sub-questions. Table 4.1 provides an overview of the findings pertaining to the first sub-question.

TABLE 4.1: Multi-grade teaching challenges grouped according to the three level typology

TYPOLOGY	CATEGORIES
4.2.1 First order barriers relating to extrinsic challenges or school level challenges, also called meso level challenges	4.2.1.1 Lack of resources
	4.2.1.2 Curriculum challenges
	4.2.1.3 Learner related challenges: enrolment, distance and absenteeism
	4.2.1.4 Isolation impacts on communication, teaching and extra-curricular activities
	4.2.1.5 Time constraints and work overload as a result of multiple roles
4.2.2 Second order barriers relating to intrinsic challenges or teacher related challenges, also called micro level challenges	4.2.2.1 Perceived uncaring attitude of the DoBE hurts teachers
	4.2.2.2 Unpreparedness for multi-grade teaching demotivates teachers
	4.2.2.3 Negative perceptions about the multi-grade learners
4.2.3 Third order barriers relating to system challenges, also refered to as macro level challenges	4.2.3.1 Lack of Departmental support from officials
	4.2.3.2 Lack of curriculum training for multi-grade contexts
	4.2.3.3 Lack of support from parents

4.2.1 FIRST ORDER CHALLENGES

From the literature reviewed in Chapter 2 and the responses from the participants, it seems as if the challenges experienced by this sample of multi-grade teachers occurred on various levels. These aspects, as summarised in Table 4.1, are presented in the following sub-sections. First order barriers

refer to challenges that are extrinsic to the teachers (Ertmer, 1999) and relate to the lack of resources, the curriculum, learners, their isolation and inadequate time as a result of the work overloaded.

4.2.1.1 Lack of resources

The data reveal that the participants lamented the fact that they had a grave shortage in terms of funding, which included the departmental NSF (Norms and Standards for Funding) allocation, and lacked the ability to raise sufficient funds. This became evident during a focus group interview, when a participant commented, "*Learner enrolment affects the funding − NSF model for funding multi-grade schools" (FGI, MGT 2).* Another participant concurred in the open-ended questionnaire, stating that being a *'No Fee'* school also affected their funding, since they had to wait very long for departmental deposits *(OEQ, MGT15).* This was also confirmed during a personal interview, when another respondent stated, *"Ons budget is te klein om hierdie goed aan te koop" [Translated into English: Our budget is too small to buy the necessary things] (PIQ, MGT 19).* From the responses, it seems as if financial constraints constituted a major challenge to the participating multi-grade teachers. This seems to be in line with Tsolakidis (2010), who contended that resources in the multi-grade context are problematic, as the resourcing of multi-grade schools is not geared towards multi-grade settings. The author stated that educational authorities do not allocate specific funds for multi-grade schools. Within the South African context, schools are resourced in terms of NSF, which is based on the learner enrolment of a school (Republic of South Africa, 1996b). Schools with a low learner enrolment will receive very little funding and resources, which is not in line with their need to deliver the curriculum.

Resource issues were not limited to financial aspects; infrastructure was also a concern. During the focus group interviews, this was highlighted by a participant who said:

> *"Lack of resources like computers, libraries, science labs, sport fields. When you look at the infrastructure, my school, for example, we have applied so many times for maintenance. The floors are falling apart, the roof is falling apart. One of my classrooms… You can't use the classroom on rainy days, because we are afraid of shorts and things like that" (FGI, MGT 3).*

During the focus group interview, another participant alluded to the lack of appropriate learner furniture, stating:

"Also the desks in the classrooms, maybe you are there for three Grades, Grades 4,5,6. The desks are sometimes too big or too small for the learners and especially when there are some learners, say, for instance, in Grade 6, they will have to sit in a Grade 4 desk or a Grade 4 learner have to sit in a Grade 6 desk ... they feel uncomfortable, because the desks are not suited for them, and I know of a learner in my class... that learner is so small, and the class which I have only have senior phase desks. And she can't, she must have to stand in that desk to write, and it is very awkward for her to do that" (FGI, MGT 1).

In addition, it became evident that the teachers were lacking resources to implement the curriculum. This became apparent during a personal interview, when one participant mentioned, *"...the resources, we are struggling. We are not having enough textbooks"(PIQ, MGT 11).* In the focus group interview, a participant concurred on the lack of learner and teachers support materials (LTSM), stating, *"At the same time, for the many learning areas, there are no textbooks or even teacher guides on multi-grade teaching"(FGI, MGT 2).* On the open-ended questionnaire, another participant concurred as follows regarding the lack of LTSM:

"Resources – in a multi-grade class, space and limitation of resources, such as textbooks, multi-media, chalkboards and LTSM, is a big challenge. Sometimes, learners have to wait for textbooks, whilst others have to first complete" (OEQ, MGT 16).

From the responses, it appears that the shortage of LTSM in multi-grade schools exacerbated the challenge to implement a mono-grade biased curriculum. This seems to be in line with the concerns of Brunswic and Valerien (2004), who identified educational conditions, such as adjustments to school programmes and hours, as well as resources (provision of teaching and learning materials), as among the many major challenges in multi-grade teaching. The authors highlighted the shortage of textbooks, workbooks, teaching materials and supplementary learning and teaching support materials (LTSM), including distance learning materials and the use of ICT.

The above was also confirmed by the responses elicited through the open-ended questionnaire. The researcher also observed two schools sharing the same location and ground facilities. From personal visits to the multi-grade schools, it seems as if a lack of infrastructure was one of the major challenges facing the participating multi-grade schools. The schools visited were dilapidated, mostly located in temporary wooden or prefab structures, and lacked proper sanitation facilities. The above seems to align with the sentiments of Gardiner (2008), Jordaan and Joubert (2008) and Little (2006) regarding the lack of infrastructure and the rundown conditions of the schools in which multi-grade teaching occur.

Human resources was another barrier identified by the participants. During personal interviews, it became apparent that not many teachers were prepared to teach within the multi-grade context; those who were, usually did not stay for very long. In a personal interview, one participant commented, *"Ons ondervind 'n tekort aan onderwysers en dit bemoeilik ons taak om by als uit te kom"* *[Translated into English: There is a shortage of teachers and this makes it difficult for those of us within this context to cover everything](PIQ, MGT 20).* Another participant in the focus group interview added, *"That is why when a new teacher comes here, he will only last three months – as soon as he gets a new post, he will leave" (FGI, MGT 3).* The above concurs with Juvane (2007), who stated that the remoteness and rural nature of schools practising multi-grade teaching made it difficult to attract qualified teachers to these schools. In addition, the comments of the participants also validate Cornish's (2010) argument that multi-grade schools find it difficult to retain teachers, due to their isolated location. As a result, teachers leave their multi-grade schools for better opportunities in cities, to teach in the mono-grade settings for which they were trained.

4.2.1.2 Curriculum challenges

Even though multi-grade schools are part of the South African educational diaspora, it seems as if the education system was constructed without consideration for the multi-grade context. During a focus group interview, one participant stated, *"Policies are only for the mono-grades and when we have CASS, they do not explain it enough for us how to implement these policies"(FGI, MGT 1).* Another participant concurred, stating during a personal interview, *"Die kurrikulum self, is ook 'n problem"* *[Translated into English: The curriculum itself is also a challenge] (PIQ, MGT 5).* Responding on the open-ended questionnaire, another participant concurred, stating, *"NCS and CAPS were designed for monograde context" (OEQ, MGT 4).* Another respondent concurred during the focus group interview, highlighting that the loaded syllabus did not allow them to do consolidation and that the expectations of multi-grade teachers were the same as for mono-grade teachers. She stated:

> *"Die sillabus is so gelaai dat jy nie werklik kans het om goeie vaslegging te doen nie. Dieselfde verwagtinge wat vir monograad is ... dat hulle dit ook van jou as multigraad-onderwyser verwag" [Translated into English: The syllabus is so loaded that it is not possible to do proper consolidation. The expectations for the multi-grade teachers are the same as for mono-grade teachers]" (FGI, MGT 6).*

From the responses, it seems as if the invisibility of multi-grade schools in terms of providing access to education through a suitable curriculum was being exacerbated by the mono-grade biased curriculum. The problem seems to be that the South African educational system was constructed with a mono-grade bias; therefore, the National curriculum poses an enormous challenge in the multi-grade context (Gardiner, 2008; Republic of South Africa, 1996b). The Department of Basic Education does not regard education in rural areas as a separate entity, as is evident from the policies, practices in

training, curriculum and support provided to schools and teachers (Gardiner, 2008; Republic of South Africa, 1996b).

4.2.1.3 Learner related challenges: Enrolment, distances and absenteeism

It seems that the fluctuating enrolment and inconsistent attendance are aspects that pose a challenge to some multi-grade schools, especially in areas where parents are reliant on seasonal work and learners have to walk long distances to get to school. During a focus group interview, one participant stated, *"Learner enrolment on a farm schools is always a problem, because parents do not always stay on the same farm" (FGI, MGT 3)*. During a focus group interview, another participant stated, *"These learners, they walk very far; they get to school very tired. And if it rains, because of the distance, you can't expect these learners to be at school or the river, and then those are all things that takes time away from actual teaching" (FGI, MGT 2)*. In a response on the open-ended questionnaire, another participant mentioned, *"High absenteeism towards end of the month when the parents go to town and on social grants days. Then the learners go with, because they need medical attention or to make sure the parents do not just buy drink with the money"(OEQ, MGT 17)*.

The responses seem to suggest that learner enrolment and learner attendance present challenges to multi-grade schools, since they influence staff establishments. Although the learners per grade may be few, the National curriculum prescribed for each grade and subject still has the same demands, whether there is one learner or fifty (Brunswic & Valérien, 2004; Little, 2004; Republic of South Africa, 1996b).

4.2.1.4 Isolation impacts on communication, teaching and extra-curricular activities

Multi-grade schools are generally not located in urban-areas, but mainly in rural areas. These rural areas are characterised as areas with a low population density, a lack of urban infrastructure and basic services. These schools are generally located far away from city centres or larger towns – the places where workshops take place and meetings have to be attended. During one personal interview, a participant stated that the distance from the school to the District Office caused information to reach them late, *"Ons is 180 km van die Distrik af. Afstandgewys, ja, dit affekteer ons. Sommige keer kom informasie laat by ons uit"[Translated into English: We are 180 km away from the District Office. The distance, yes, it does affect us. Sometimes information reaches us late] (PIQ, MGT 3)*.

Another participant concurred, stating that their school was basically unreachable and that information reached them late:

"Ek is basies onbereikbaar. Afstande is ver wat afgelê moet word. Ons het nie selfoonontvangs by die skool nie, so baie keer gaan opleidingsgeleenthede verby, maar ek is so te sê onbereikbaar, dis die rede. Ons is ver van die Kantoor af, en administratief is dit moeilik. Baie keer kry jy kennis van wat die volgende dag ingehandig moet word en dit bring groot onkoste mee, want dan moet jy ry". [Translated into English: I am basically out of reach. Distances are vast. We do not have cellphone reception. Therefore training opportunities often pass us by, but the main reason would be the inaccessibility. We are far from the office, and this affects administration. Often information on submissions that have to be submitted the following day reaches us late, which results in major expenses, because it means that you must drive to submit the next day] (FGI, MGT 7).

This was confirmed by another participant responding to the open-ended questionnaire, *"We are very far from town and the District Office. Information reaches us very late"(OEQ, MGT 11).* From the responses, it appears as if the distances from the District Office and workshops affected the participating multi-grade schools negatively in terms of the communication of sometimes vital information and submissions. Cornish (2010) stated that time and distance affect communication on in-service training, which often reaches them late or not at all. The data expose the negative effect that the isolated nature of these schools has had on multi-grade teaching, as learners are left alone when teachers are required to attend meetings in faraway cities or towns. This was highlighted on the open-ended questionnaire by one respondent, who stated, *"Whenever there is a meeting, workshop, etc. that need to be attended, the educators concerned have to leave the learners alone" (OEQ, MGT 8).* During a personal interview, another participant concurred, postulating, *"Disturbances from the Department – those last-minute invitations to meetings and workshops. It feels like they don't realize we don't have anyone to fill in when we are not there" (PIQ, MGT 11).* The data reveal that the teachers found these Departmental interruptions challenging, because they did not have a relief staff member or parent who could supervise to ensure that the work was being done. This caused time loss and learners miss out on valuable teaching time. Making up the lost time was very challenging and the learners would then lag behind even further. The issue of isolation and the challenges associated with it seem to be in line with the contention of Brunswic and Valérien (2004), Juvane (2005) and Little (2006), that the multi-grade schools' isolatedness presents challenges pertaining to communication.

The participants in this study also highlighted the fact that their isolated location meant that student teachers from tertiary institutions did not visit them for practice teaching. Hence, students are not exposed to this phenomenon and teachers teaching at these schools are not exposed to the latest ideas related to teaching – ideas that they could have obtained from visiting students. This was voiced by a participant, who stated on the open-ended questionnaire that, *"No teachers from universities come to school to practise teaching, because of the vast distance, big classes" (OEQ, MGT 3).* This view was

supported by another participant in the focus group interviews, who stated, *"No practice teachers from universities" (FGI, MGT 1).* From the responses, it seems that current and new knowledge, educational methodology and pedagogy were not filtering to the multi-grade schools through tertiary support during initial teacher training, in the form of practice teaching by students from universities, colleges and technikons. Therefore, there seems to be no new exposure to the educational dialogue and 'fresh' ideas from tertiary institutions, introduced by university students doing practice teaching at a school.

Isolation also seemed be to impacting on extra-curricular activities, as one participant highlighted during the focus group interview:

> *"By ons nie net onderrig nie, ons wat kleiner multi-grade skool is, is sport is ook 'n struikelblok, want jy sit met twee outjies in 'n groep. Ek het drie dogtertjies in my klas, so daar is nie 'n manier waarop jy netbal kan beoefen nie … al het jy die behoefte daaraan … of dit is ver weg, daar is nie 'n manier dat jy sport kan ry…. al het jy behoefte daaraan. Ons kan atletiek doen, maar spansport kan ons as multi-grade dit nie doen nie"* [Translated into English: With us not only teaching, but being a small multi-grade school – sport is also a challenge, because you have two learners in a group. I have three girls in my class, so there is no way they can play netball … even though we have a need for that ... or it is too far away, since there is no means to travel for sport… even if you want to. We can do athletics, but we cannot participate in team sport as a multi-grade school] (FGI, MGT 7).

The data suggest that it is difficult to expose learners to extra-curricular activities such as team sport, because there are not enough learners in an age group to make up a team.

4.2.1.5   Time constraints and workload overload as a result of multiple roles

During a focus group interview, one respondent stated, *"And there is a time constraint. Teachers do not have enough time to do proper planning for multi-grade classes; time constraint is a problem when you have to deal with one learning area for 30 minutes with 3 grades" (FGI, MGT 1).* Another respondent concurred in his response on the open-ended questionnaire, *"Time is another challenge. Our timetable is for a single class, yet we are expected to teach more than one grade in that time" (OEQ, MGT 18).* During a personal interview, another respondent concurred, stating that keeping to a timetable for a week was very challenging*, "Om in 'n week by 'n rooster te bly, is amper haas onmoontlik" [Translated into English: To keep to a timetable for a week, is basically impossible] (PIQ, MGT 7).* From the various reponses, it seems that designing a school timetable for a multi-grade teaching school is challenging, taking into consideration the various grades and subjects that have to be taught by one educator. Keeping to the timetable as planned, presents a challenge in itself. Teachers' concerns seem to be in line with the concern of Brunswic and Valérien (2004) and Little (2004), namely

that the curriculum does not make exceptions for multi-grade teaching, since multi-grade teachers are required to follow the same curriculum, cover the same deliverables, achieve the same outcomes and complete the same assessments within the same timeframes as their monograde counterparts. The aforementioned authors stated that the nature of the multi-grade classroom (one teacher is responsible for teaching learners of different grades, subjects, ages and abilities within the same classroom) is challenging to the teachers, because they are expected to teach all subjects for all grades within the same timeframe allocated to mono-grade. From the responses of the participants, it seems as if a lack of time is a major challenge for multi-grade schools.

The participants were also concerned about their multiple roles and responsibilities, and how these impacted on their time planning for teaching and learning. This was highlighted when a participant stated during the focus group interview:

> *"Yes, I am the principal of a school and also have a multi-grade class. But, you know, the multi-grade classes around here, is, about my class 41 learners, and is three grades. So how do you do three grades and you have to do your office work, you have to attend to the visitors, the admin and you have to do all those three learning areas for all three grades? It's impossible. So that is a real challenge"(FGI, MGT 3).*

During the personal interview, another respondent concurred regarding the heavy workload, stating that their principal had three classes, while the interviewee had four classes. They could not cover all the work and they could not cope. Responding on the open-ended questionnaire, another respondent concurred regarding the work overload, stating, *"Administration – with a multi-grade class, the administrative load upon the teacher is multiplied" (OEQ, MGT 16).* It seems as if the workload for the multi-grade teacher from the nature of this type of educational transfer is pre-destined to be one of overload. The overload is incrementally increased where there are fewer educators and maximised in one-teacher schools, where the principal is also the only teacher for all subjects and grades. Within the South African context, this means that this principal-teacher is reponsible for all teaching and learning taking place from Grade 1 to Grade 7. Apart from their teaching role, these teachers are also expected to perform the duties of principal and non-teaching staff. These concerns are in line with Bhardwaj (2008), Juvane (2005), Thomas and Shaw (1998) and Tsolakidis (2007), who have stated that teachers practising multi-grade teaching lack the time to cover all the work; the teachers feel overburdened, which is demotivating and creates a lack of interest.

4.2.2 SECOND ORDER CHALLENGES

From the data, it became evident that the participants highlighted more issues pertaining to the first order barriers than to the second or third order barriers. This does not imply that the second and third order barriers or challenges are less severe, as fewer aspects named, do not necessarily imply that

there are 'small' concerns. In the following section, the challenges pertaining to teachers, and those challenges intrinsic to teachers, are presented (Ertmer, 1999). An overview of these aspects was provided in Table 4.2.

4.2.2.1   Perceived uncaring attitude of the Department of Basic Education hurts teachers

Teachers want to be valued and experience that their plight is not only acknowledged, but that something will be done about it. The participants to this study felt that what they were doing, was not being valued by the Department of Basic Education and experienced it as uncaring. This was alluded to by a participant on the open-ended questionnaire, when she stated, *"Nobody cares about how we have to struggle to teach our children and make them learn"(OEQ, MGT 19)*. Another participant concurred during the focus group interview: *"You don't feel worthwhile"(FGI, MGT 3)*. From the responses and interaction with these multi-grade teachers, it seems that these negative perceptions had been created because they felt that nobody cared about what happened in small rural schools, because their conditions were deteriorating and nothing was being done about it.

4.2.2.2   Unpreparedness for multi-grade teaching demotivates teachers

During a personal interview, one of the participants stated that teachers did not have the necessary training in multi-grade teaching and that they consequently felt that they were out of their depth. *"Ek is nie getrain vir multigrade nie. Ek is in die diepkant was ek ingegooi" [Translated into English: I have not been trained for multi-grade. I was thrown in at the deep end] (PIQ, MGT 2)*. Another participant concurred, responding on the open-ended questionnaire:

> *"I am frustrated. I am not trained for multi-grade teaching. It is frustrating not to be able to complete all the work in a year, and you feel like a failure. We have too much work as principal and responsibility of teaching everything for more than one grade. I sometimes feel like quitting because it gets too much. And you get no assistance" (OEQ, MGT 16)*.

Another participant concurred on teachers being unprepared for the multi-grade classroom, stating in the focus group interview:

> *"I am not trained as a multi-grade teacher, trained for mono-grade teaching. Also when we were at colleges or universities, we were trained for monograde classes and not to teach multi-grade classes. Then multi-grade skills, as I have said, us as teachers have not received any training in that regard within the multi-grade. We don't have skills for the multi-grade classes. We need those skills" (FGI, MGT 1)*.

In responding on the open-ended questionnaire, another participant agreed on not having been trained to teach in a multi-grade classroom, *"I am not trained for multi-grade and I don't know*

where to go for help" (OEQ, MGT 18). Another respondent stated during the focus group interview, *"We teachers are demotivated, because we can't find any support" (FGI, MGT 3)* while another participant responded as follows on the open-ended questionnaire, *"I am frustrated in multi-grade, because it does not seem as if there is any progress. I am not trained as a multi-grade teacher, and there is no support for me. The workload is too much" (OEQ, MGT 11).* From the responses, it appears that although all the educators were trained teachers, they were trained in monograde teaching during their initial teacher training, and not in any multi-grade teaching strategy, pedagogy or skill. The data reveal that all the participants were very concerned about not being trained in multi-grade teaching and felt unprepared to teach in these multi-grade classrooms. From the data, it seems that the teachers' unpreparedness to teach in multi-grade teaching classrooms contributed towards the frustrations and challenges they experienced. Bharadwaj (2008) stated that one of the factors causing demotivation in teachers is inappropriate training. Teaching in multi-grade classes carries a greater workload, hence the context creates more stress in the work environment (Mulkeen & Higgins, 2009). Little (2006) and Pridmore and Vu (2006) concurred with the sentiments of these participants, emphasising the stressful conditions multi-grade teachers are faced with, such as curriculum adaptation, which result in increased workloads, which lead to poor quality of teaching, which also impacts negatively on teachers' attitudes towards multi-grade teaching.

4.2.2.3 Negative perceptions about multi-grade learners

In this study, the learners generally came from extreme poverty and were not stimulated at home, which seemed to create the impression that they were being 'labelled' as inferior to their urban counterparts by the teachers. This became apparent from various data sources. During the focus group interview, a participant alluded to the above, stating:

> *"The standard of work that you can do with the learner cannot compare with a child*
> *from the city of where bigger schools are, or near the offices, or where there is*
> *libraries and computers and those things… they will always stay behind" (FGQ,*
> *MGT 2).*

During a personal interview, another participant stated, *"Kinders wat feitlik onopvoedbaar is" [Translated into English: Children who are basically uneducable] (PIQ, MGT 7),* suggesting that these learners were perceived as different from learners from urban areas. Another participant stated in responding on the open-ended questionnaire that these learners were doomed and had no future, *"The learners have no role models, except us teachers. They drop out and fall pregnant. It's like they are doomed to have no future expectation" (OEQ, MGT 19).* Hence, it seems that the teacher was suggesting that teachers should not exert themselves in teaching the learners, as it seemed to be a waste of time. This could be an issue, as Little (2006) stated that a major challenge in multi-grade teaching is for teachers to look at teaching and learning from the learner's perspective. Therefore, teachers should

see their role as possible agents of hope to these learners. Cornish (2010), Hendron (2009) and Juvane (2005) concurred, contending that the teachers in multi-grade classes are untrained to deal with multi-grade classes; i.e. they are not trained specifically for multi-grade teaching. Teachers in multi-grade classes have negative perceptions, because they feel unprepared to work in their multi-grade classes (Juvane, 2005; Little, 2006; Mulkeen & Higgens, 2009; NWREL, 2001).

4.2.3 THIRD ORDER CHALLENGES

From the data gathered, it has become evident that there are also third order challenges that impact negatively on the multi-grade classroom and are presented in terms of lack of departmental support from officials, lack of curriculum training for multi-grade context and lack of support from parents.

4.2.3.1 Lack of Departmental support from officials

From the responses, it seems that multi-grade schools find support from departmental officials lacking. One participant commented on the open-ended questionnaire, *"No multigrade support person on departmental level" (OEQ, MGT 1).* During a personal interview, another participant concurred about the lack of support from the Department, *"Ek kry nie enige hulp van die Department af nie" [Translated into English: I do not get any help from the Department] PIQ, MGT 6).* This lack of support was further emphasised by another participant during the focus group interview:

> *"I don't know of any subject advisor around here that has any experience in multi-*
> *grade teaching, and now how can that person come in to your class and try to help*
> *you or tell you what to do when you have more experience than that person?"*
> *(FGQ, MGT 3).*

This clearly suggests that there is a need for multi-grade specific support. Little (2006) and Strauss (1999) concurred regarding the lack of support multi-grade teachers receive from educational officials. Strauss (1999) stated that the support multi-grade teachers receive, does not address their needs, whilst Gardiner (2008) attributed the non-specific multi-grade support to the officials' lack of experience of and familiarity with the multi-grade context. Although the Department has started a Rural Development Directorate, aimed at assisting rural schools, it does not seem as if this organisational grouping is duplicated at District level, where multi-grade schools can find departmental support.

4.2.3.2 Lack of curriculum training for multi-grade contexts

The data suggest that there is a lack of curriculum training for teachers in the multi-grade context. During a personal interview, a participant alluded to this fact, stating that during in-service workshops, multi-grade teachers did not get any assistance, because the training was usually geared at

the teacher with one grade, *"As dit kom by workshops en clinics en goed, dan sukkel ons, want niemand kan vir ons antwoorde gee nie. Die werkswinkels is net gerig op onderwysers wat een graad het"* [Translated into English: *During workshops, clinics and the like we struggle, because nobody can provide answers for us] (PIQ, MGT 19)*. The teachers therefore seemed to struggle to cope, as one participant stated, *"How can they expect us to survive?"(OEQ, MGT 18)*.

Within the South African context, there is only one recognised curriculum. However, there is not only one practice of curriculum transfer. Two different methods of curriculum transfer are being practised, namely mono-grade teaching and, to a lesser extent, multi-grade teaching. All legislation, policies and processes favour mono-grade teaching. This lack of recognition and planning for multi-grade as an educational reality through policies, systems and procedures, challenges the very existence of multi-grade teaching.

Multi-grade teaching relies solely on the sense of duty of the teacher who has to deal with all the educational, pedagogical and administrative work by themselves (Little, 2006). Curriculum adaptation is a process that is not done in isolation. All mono-grade teachers are supported and guided in curriculum adaptation and therefore multi-grade teachers should not have to adapt the system by themselves without any support (Little, 2004). On the open-ended questionnaire, a respondent stated, *"There is no support from the Department on how to deal with the changing curriculum for us as multi-grade teachers. We have to do everything" (OEQ, MGT 17)*. Another respondent concurred regarding the absence of assistance with curriculum adaptation, stating, *"I can't cut the curriculum for my specific situation" (FGI, MGT 1)*. During a personal interview, another respondent stated that the teachers had to find their own way, *"Ons moet onse eie pad vind" [Translated into English: "We must find our own way"] (PIQ, MGT 19)*, whilst another respondent highlighted specific curricular challenges, *"Moeilik om die leerareas te kombineer" [Translated into English: Difficult to combine the learning areas] (OEQ, MGT 6)*.

During a focus group interview, it was highlighted that there was a lack of multi-grade training, specific in-service training, by the Department of Education. This was noted by a participant, who stated, *"Subject advisors leave after a workshop when they finish with monograde and the multi-grade teacher does not reach all subjects and they are not sure if they are on the right track or not" (FGI, MGT 2)*. During the focus group interview, a participant was concerned that *"... the Department does not prepare for multi-grade" (FGI, MGT 3)* in in-service training. Another participant agreed with this statement in responding on the open-ended questionnaire, stating, *"They never prepared for us from the start" (OEQ, MGT 19)*. Another respondent, also responding on the open-ended questionnaire, stated, *"No training material received on multi-grade teaching" (OEQ, MGT 4)*. From the responses, it seems that these teachers attended the in-service training sessions and workshops offered by the Department of Education, but that these sessions and workshops were aimed at mono-grade teaching

and were not suited for their multi-grade contexts. From the responses and interaction with the respondents, it can therefore be inferred that the training provided, is not based on the needs and the context of multi-grade settings. This presents a major challenge for teachers in multi-grade teaching settings. According to Cornish (2010), the training offered by various departments of education world-wide is not specifically geared at multi-grade teaching, but forms part of the general in-service training and support to teachers provided by education departments, which address mono-grade teaching only. This focus on mono-grade teaching seems the preferred method of instruction in most countries throughout the world (Mariano & Kirby, 2009).

4.2.3.3 Lack of support from parents

A functional school needs to be supported in various ways. The data reveal that there was a lack of support from parents. During a personal interview, a participant revealed that parental support was lacking, due to the parents' inability to understand what was required, as they did not seem to have the necessary skills to assist their children in their school careers. In addition, the parents did not attend school meetings.

> *"En ons ouer 'support' is baie swak. Ons is op die plaas. Die ouers weet niks van die nuwe werk nie. Is vir hulle vreemd. As ons ouervergaderings het, dan is dit net een en twee ouers wat kom, die mense werk te laat. Hulle kom nie by die skole uit nie. Hulle kan nie in jou klas uitkom nie. Hulle weet nie wat gaan aan met hulle kinders se werk nie. Ons sukkel. Die ouers kan nie die kinders help nie. Die ouers werk lang, lang ure. Hulle werk van soggens. Baie val sesuur al in. Die mans val sesuur in en die dames val sewe-uur in en hulle werk tot sewe-uur saans. En dit is die tye wanneer ons meetings hou, want ons kan nie later as sesuur saans begin nie. Dan kom niemand nie; hulle is te moeg"* [Translated into English: And we have poor parental support. We are on the farm. The parents do not know about the new work. To them, it's something foreign. Only one or two parents attend parent meetings, they work too late. They do not get to come to the schools. They cannot come to your class. They have no idea of their children's work. We struggle. The parents cannot help their children. Parents work long, long hours. They work from the morning. Many of them start at 6 o'clock in the morning. The men start at six o'clock and the ladies start at seven o'clock and they work till seven at night. And this is the time we hold our meetings, because we cannot start our meetings after six o'clock. Then nobody attends, they are too tired] (PIQ, MGT 19).

During the focus group interviews, the above aspect was affirmed when a participant stated:

"Ongelukkig sit jy met groot hoeveelheid onbetrokke ouers. Ouers wat nie in staat is om hulself te help nie – hoe gaan hulle hulle kinders help? En hulle het nie befondsing om te sê hulle het boeke en goed wat die kinders kan navorsing doen" *[Translated into English: Unfortunately, you have a large number of uninvolved parents. Parents who are not able to help themselves – how are they going to help their children? And they do not have the funds for books and things the children need for researching] (FGI, MGT 5).*

The data suggest that support from parents was a challenge, for various reasons, ranging from uninvolvement and apathy, low literacy levels, long working hours and the inability to provide in the educational needs of their children. These sentiments seem to be in line with Jordaan and Joubert (2008*),* who have contended that learners in schools practising multi-grade teaching generally come from poor parents, mostly farm workers with low levels of education. The school communities are characterised by extrem*e* poverty, and there is a lack of parental involvement in school and academic issues (Cornish, 2010; Juvane, 2005; Little, 2006). Although the South African Schools Act (Republic of South Africa, 1996b) seeks to involve parents more in the schooling of their children, parental involvement and support in multi-grade schools remain a major challenge.

4.3 THEME 2: ICT BARRIERS IN A MULTI-GRADE CONTEXT

The secondary research question *"What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?"* drives this theme. Findings from the data are grouped according to the three level typology, each with categories and sub-categories where applicable. Table 4.2 provides an overview of the theme, namely ICT barriers in a multi-grade classroom, grouped into typology, categories and sub-categories related to the theme.

TABLE 4.2: ICT Barriers in a multi-grade classroom

TYPOLOGY	CATEGORIES	SUB-CATEGORIES
4.3.1 First order barriers relating to extrinsic challenges or school level challenges, also called meso level challenges	4.3.1.1 Lack of suitable infrastructure for ICT implementation	
	4.3.1.2 Lack of peer support	
	4.3.1.3 Lack of access to appropriate hardware and software	
	4.3.1.4 Lack of time	
4.3.2 Second order barriers relating to intrinsic challenges or teacher related challenges, also called micro level challenges	4.3.2.1 Negative beliefs about the self	4.3.2 .1.1 Lack of confidence
		4.3.2.1.2 Fear of the laptop
		4.3.2.1.3 Lack of motivation
	4.3.2.2 Negative perceptions about the learners' ability to use the laptop	
	4.3.2.3 Negative beliefs related to teaching and learning	4.3.2.3.1 One laptop per classroom is not enough to implement ICT in a multi-grade context
		4.3.2.3.2 Difficult to cross over from traditional 'talk and chalk'
4.3.3 Third order barriers relating system challenges, also refered to as macro level challenges	4.3.3.1 Support and assistance from the Department of Basic Education is lacking	4.3.3.1.1 Lack of financial support for ICT resources to be used for implementation
		4.3.3.1.2 Lack of classroom space provided
		4.3.3.1.3 Lack of electrical power supply
		4.3.3.1.4 Lack of technical support and maintenance
		4.3.3.1.5 Lack of ICT implementation support and leadership
		4.3.3.1.6 Lack of appropriate curricular content
		4.3.3.1.7 Lack of training and continuous professional development

4.3.1   FIRST ORDER CHALLENGES

The data reveal that there were first order ICT barriers (school level or micro level) that impede on the ICT implementation in the multi-grade classroom.

4.3.1.1   Lack of suitable infrastructure for ICT implementation

While infrastructural challenges pertaining to multi-grade were dealt with in the previous theme, this section deals with the infrastructural challenges pertaining to ICT implementation within schools. The data reveal that reliable electrical supply posed a challenge to some participating multi-grade schools. This became evident during a focus group interview, when one participant alluded to the problematic power supply in the classroom that was unreliable, *"Power source in classroom" (OEQ,*

MGT 16). Another participat stated in the focus group interview that *"Omdat die skool so ver afgelee is, is Eskom krag buite die kwessie" [Translated into English: Because the school is so isolated, ESKOM power supply is not possible] (FGI, MGT 5).* No power supply and an unreliable power supply in the classroom would obviously hinder the usage of the laptop for teaching and learning in classrooms. The reported lack of basic infrastructure, for example reliable electricity in classrooms, seem to be in line with postulations by Kruss (2009) and the Ministerial Report (2005) that multi-grade schools lack basic infrastructure. The data also support the view of Goktas et al. (2009), Hargreaves and Goodson (2003) and Kirkland and Sutch (2009) that the lack of infrastucture negatively impacts on ICT implementation in the classroom.

The data also highlight an absence of secure classrooms in which ICT could be kept safely at these schools. The absence of a secure classroom space seemed to be a challenge for the multi-grade schools. One participant stated during a focus group interview *"... die beveiliging van die klas" [Translated into English: ... the security of the classroom] (FGI, MGT 6).* This lack of a secure classroom space was also referred to by another participant in responding to the open-ended questionnaire, *"Safe-keeping of the laptop. Classroom set-up not conducive. Classrooms are small and basically falling apart" (OEQ, MGT 16).* From the data, it appears that the schools, especially the classrooms, were not secured to store ICT when they were not in use. This implies that such schools will have to source alternative funding, because their maintenance budgets are too small to afford burglar bars to secure classrooms. This echoes the views of Goktas et al. (2009), Hargreaves and Goodson (2003) and Kirkland and Such (2009), who postulated that ICT implementation is negatively affected by a lack of infrastructure at the meso (school) level.

4.3.1.2 Lack of peer support

The data reveal that some of the participants, especially in one-teacher schools, indicated that on-site peer support at the school level was a challenge, and an aspect that the participants required and highly valued. In responding on an open-ended questionnaire, one participant mentioned the lack of peer support, stating, *"Can't discuss use of laptop with fellow educators" (OEQ, MGT 4).* This lack of support was also mentioned by another particpant on the open-ended questionanire, who stated, *"There is no support for me from other teachers, from the subject advisors" (OEQ, MGT 11).* The lack of peer support was again affirmed by another participant during a focus group interview, stating, *"If you go to your neighbour, how well equipped is your neighbour to help you? How can you assist each other when both of you don't know anything?" (FGI, MGT 3).* This implies that there is no discussion and sharing of ICT matters, as well as the fact that teachers generally lack the necessary ICT knowledge to assist their peers. It seems that teachers are unable or disinclined to form peer groups for planning, discussions and assistance. From the data, it has become evident that the distances between schools, the lack of knowledge, ICT skills and the nature of one-teacher schools, augmented by the isolated location

of the multi-grade schools, make it difficult for teachers to solicit peer support for ICT implementation. Their inability to solicit social or peer support has impeded on ICT implementation. The absence of social support in terms of sharing information and learning from peers which would have encouraged collaboration, and their inability to solicit support outside the school environment, have hindered ICT implementation. The sentiments above seem to support the views held by Surry et al. (2004) and Kirkland and Sutch (2009), who have argued that the absence of peer support at school negatively impinged on the implementation of ICT integration. Furthermore, it supports the views held by Fullan (2006) and Birman, Desimone, Porter and Garet (2000) that support groups are vital for teachers to engage in discussion and sharing.

4.3.1.3   Lack of access to appropriate ICT hardware and software

From the data, it has emerged that the participating teachers battle with a dearth of hardware resources available for ICT implementation. This lack of ICT resources was mentioned several times. In responding to the open-ended questionnaire, several participants highlighted this. This concern was well captured in the comments, *"We don't have screen and data projector to use it for the classroom" (OEQ, MGT 11).* This lack of suitable resources was verified by another participant, who stated in the personal interview, *"En ons het glad nie 'n data projector nie" [Translated into English: And we do not even have a data projector] (PIQ, MGT 19)* and also by another participant during the focus group interview, *"Access to other resources through the laptop like the internet where you suppose to get your information from. We don't have that around here. There is not even telephone lines. We don't have data projectors in the schools" (FGI, MGT 3).* In responding on an open-ended questionnaire, another participant concurred regarding the lack of resources, stating, *"Currently, I have non of these multi-media resources" (OEQ, MGT 16).* Therefore, the lack of resources for ICT integration apparently made it difficult for these educators to use the laptop effectively in the classroom. This also implies that teachers are not exposed to resources suited for ICT implementation, and do not know what the best resources for their own specific classroom situations were. This sentiment shares the views of BECTA (2004), Bingimlas (2006), Ertmer (1999), Goktas et al. (2009), Pelgrum (2001), Rodden (2010) and Schoepp (2005), who have stated that there must be adequate resources available for ICT integration to be successful. The data also supports the argument of Robyler (2006) and Alessi and Trollip (2001), that ICT integration is a complex activity that requires the educator not only to have the necessary resources, but also to have knowledge about which electronic equipment and methods would invoke the most effective learning within the classroom. Therefore, if there is no access or exposure to these ICT resources, ICT integration cannot be implemented.

4.3.1.4   Lack of time

A large number of participants experienced challenges in terms of time. From the responses, it seems that time was one necessity with which the multi-grade teachers were struggling. In a response

to the open-ended questionnaire, one participant said, *"Not enough time in class to use it successfully. No time to waste if it does not work" (OEQ, MGT 10)*. Another participant concurred regarding the lack of time resulting from the heavy workload, stating, *"Especially when you have three grades, it is your whole afternoon every day that you have to prepare, you still have to mark. Now here comes your computer, and that is another strain on you where it is supposed to help you. It takes time" (FGI, MGT 2)*. This lack of time also impeded the utilisation of the laptop for another participant, who stated on the open-ended questionnaire, *"Tyd is 'n probleem, aangesien skoolhoofpligte asook administrasie deur skoolhoof self behartig moet word" [Translated into English: Time is a challenge, since principal duties as well as administration has to be done by the principal himself] (OEQ, MGT 5)*. The lack of time was also alarming to another participant, who stated during a personal interview:

> *"Tydsgewys, tydsbeplanning, tydsbestuur – jy kry min tyd om die leerders behoorlik te onderrig, want die tyd is hopeloos te min as jy twee grade het en jy moet die inhoud dek. Dan is die tyd hopeloos te min. Jy laat nie reg geskied aan die leerder nie, en die leerder ly daaronder, want daar is sommige leerders wat individuele aandag nodig het, wat barriers to learning het, en hoe gaan jy dit dan aanspreek binne die multigrade-opset, want tydsgewys – jy kan net nie by almal uitkom nie, want daar is 'n tydsraamwerk volgens die beleid wat voorgeskryf is waaraan jy moet voldoen" [Translated into English: Time, planning and time management; you have very little time to teach, because the time is hopelessly too little if you have two grades and the content must be covered. Then the time is hopeless too little. You do not do justice to the learner, and the learner suffers and there are also learners who need individual attention, like the learners with barriers to learning. How are you going to address this within the multi-grade context? In terms of time you cannot get to all of it, because there is a timeframe you have to comply with] (PIQ, MGT 2).*

The loss of teaching time during times of bad weather was also a concern for another participant, who mentioned this in a personal interview:

> *"Dan het ons die ander challenge van die rivier. As dit reën, kom die kinders nie skool toe nie, want daar is nie vervoer vir die kinders nie. En as dit baie koud is, kom die kinders ook nie skool toe nie, want hulle moet lang afstande loop" [Translated into English: We have a challenge with the river. When it rains, the learners do not come to school, because there is no transport provided. And when it is very cold, the learners also do not come to school as they have to walk long distances] (PIQ, MGT 19).*

During a focus group interview, another teacher highlighted the loss of teaching time when learners were ill, stating:

"When a child is ill, how long will he stay at home until he comes back to school, because the parent cannot afford to take him there[to the doctor]. The mobile clinic only comes once a month. And everybody must be there, and on that day, how many kids is in the school?"(FGI, MGT 3).

The lack of time resulting from the heavy workload and the character of the multi-grade classroom seem to be amplified by the loss of teaching time during bad weather and on the days on which the mobile clinic visits the area. This constant fear of losing time and then making up the lost time was prohibiting the use of the laptop in the classroom, as it was seen as an experiment that could go wrong – something that they clearly could not afford in their busy schedules. Therefore, the lack of time in these multi-graded schools seem to impact negatively on the implementation of ICT integration. These sentiments are in line with those of Leggett and Persichitte (1998), that the challenges related to ICT integration can be linked to the availability of time allocated to ICT integration. It furthermore supports the views by Baskin and Williams (2006), BECTA (2004), Beggs (2000), Bingimlas (2009), Ely (1999), Ertmer (1999), Schoepp (2005) and Tearle (2003), who argued that teachers need to allocate more time for ICT integration in their classrooms.

4.3.2   SECOND ORDER CHALLENGES

From the data, it seems that second order barriers regarding ICT integration are central to the beliefs about the self. Aspects pertaining to the 'self' are presented in the following sections.

4.3.2.1   Negative belief about the Self

According to Ertmer (1999) and Schoepp (2005), it is difficult to identify barriers related to the 'self'. They have concurred that once educators are aware and understand their 'personal' barriers to ICT integration, they can be assisted in developing strategies to overcome them. From the data, the following aspects pertaining to the self have been identified, namely lack of confidence, fear of the laptop, and lack of motivation.

4.3.2.1.1 Lack of confidence as a result of the lack of training

The data reveal that there was a lack of confidence in using the laptop in general and a lack of confidence in teaching with the laptop. In a response on the open-ended questionnaire, one participant alluded to his lack of confidence, stating, *"I was not confident enough to use the resource due to not sufficient training"(OEQ, MGT 3).* This lack of confidence was affirmed by another participant, who stated during a personal interview, *"The problem with the laptop, I don't know even how to use the thing,' cause I never used a laptop before" (PIQ, MGT 16).* Responding on the open-ended questionaire, another participant concurred regarding the lack of confidence to operate the laptop, stating, *"Ek is 'n multi-grade teacher met baie min rekenaarvaardigheid" [Translated into English: I am a multi-grade teacher with very little computer skills] (OEQ, MGT 15).* Personal interaction with the

participants revealed that the computer literacy training that all the participants were exposed to was in isolation to ICT implementation. The data suggest that the initial training, prior to the INTEL intervention, was insufficient, since the partcipants could not use it in the classroom. It appears that this intial departmental training did not address pedagogical issues (prior to the INTEL intervention) and that after this initial training, the participants consequently still did not know how to use the laptop in the classroom for teaching and learning. These sentiments share the views of Creighton (2003), Gomes (2005), Newhouse (2002) and Schoepp (2005) who emphasised the importance of computer literacy combined with ICT integration skills to ensure that educators are able to implement ICT integration with confidence.

From the data, it seems that the lack of confidence or unpreparedness to teach with the laptop can be linked to insufficient training. During a focus group interview, one participant alluded to her lack of confidence, stating, *"Ek is te onseker, ek moet eers die laptop baasraak dan sal ek die kinders probeer leer" [Translated into English: I am to unsure, I must first be able to use the laptop before I will try to teach the learners] (FGI, MGT 6).* This lack of confidence or unpreparedness was also confirmed by another participant in a personal interview, *"I am not in a way to use it in the classroom" (PIQ, MGT 9)* Another participant stated, *"Insufficient training. What do I do with the laptop in the classroom? I need demonstration of how to use it in my multi-grade classroom" (OEQ, MGT 20).* Although the participants had received training in using computers, they felt that their ICT skills and knowledge were not up to standard for the classroom, because they had not been trained in using laptops in the classroom situation for teaching and learning. This lack of training seems to have affected their confidence levels in terms of using laptops for teaching and learning in the classroom situation. The data infer that training and confidence are interlinked and that this lack of confidence would impede on ICT implementation in the classroom. As a result of their insufficient training, skills and knowledge, the participating teachers lacked confidence to innovatively utilise laptops in the classroom. These sentiments are aligned to the argument by Balanskat et al. (2006), Benveniste and McEwan (2000), BECTA (2004) and Pundak (2007), that teachers' confidence is also affected by their inability to incorporate ICT in their teaching and learning.

4.3.2.1.2 Fear of laptops

The data reveal that some of the participants also had a fear of laptops. During a focus group interview, one participant recalled the following:

> *"Voor die tyd wil jy amper so ver as moontlik van hom af wegbly, omdat ons in 'n*
> *era van bordsports grootgeword het en suke tipe van dinge. So dit was nie deel van*
> *jou verwysingsraamwerk nie" [Translated into English: Before, you wanted to stay*
> *as far away as possible from the laptop, because we grew up in an era of board*
> *games and such. It was not part of one's reference world] (FGI, MGT 5).*

This fear of laptops was affirmed by another participant during the focus group interview:

" ... *nadat hy 'n paar maande net daar gestaan het en ek net vir hom gekyk het en te bang was om hom uit die sak te haal, want wat gaan ek nou maak met hom*" [*Translated into English:... after it stood for a few months and I simply stared at it, I was too afraid to take it out of the bag, because what would I do with it?] (FGI, MGT 6).*

This fear was also expressed by another participant on the open-ended questionannaire:

"I feared using the laptop, because I did not know how to use it. I did not know how to design a lesson on the laptop, how to use internet, and how to look for free lessons. I did not associate the laptop with a multi-grade classroom, because I thought a school should have a lab with a specialized computer teacher to teach the children"(OEQ, MGT 16).

On the open-ended questionnaire, another participant also reflected on her fear of the laptop prior to the training intervention, stating, *"Ja, ek kan nou my laptop met vertroue gebruik en nie bang wees om dit enige tyd en plek oop te maak en te werk nie" [Translated into English: Yes, now I can use my laptop with confidence. I am not longer afraid to open and use it anywhere and anytime] (OEQ, MGT 19).* Another participant also alluded to her fear, stating:

"My attitude was actually not so positive, because I was scared of the unknown. Too used to old methods. Afraid of new – laptop etc. – fear of failing, since multi-grade is so challenging and I am not seeing this method of teaching [with the laptop] as a success, I don't further want to expose myself to failing the learners, because there is no support" (OEQ, MGT 12).

The data suggest that the participants were initially overcome with fears of the laptop, as it was something strange and unknown to them. Although it seems that none of them rejected the laptop, they indicated that because of the insufficient training they had received, as indicated in the previous section (4.3.2.1.1), they did not have the necessary skills and knowledge to confidently utilise the laptop for teaching and learning in the multi-grade classroom. The data therefore seem to imply that a lack of ICT skills and lack of knowledge how to use the laptop could lead to fear, anxiety and a lack of confidence to utilise the technology for ICT integration in the classroom. These sentiments are also shared by BECTA (2004), Beggs (2000), Rodden (2010) and Scrimshaw (2004), who linked ICT skills to confidence levels and further argued that ICT integration is affected by a lack of confidence, which seems to be fear-driven.

4.3.2.1.3 Lack of motivation

The data revealed that demotivation and despair, resulting from teachers' lack of skills, the uncaring attitude of the Department of Basic Education and their overwhelming multi-grade contexts, created barriers to ICT integration. The lack of resources demotivated the participants, as one participant stated in the personal interview:

> *"Want wat baat dit dat jy 'n laptop het wat jy in die klas moet gebruik, maar jy het nie 'n dataprojektor of wide screen om dit regtig te implimenteer nie, om dit gebruik waarvoor dit vir jou gegee is nie?" [Translated into English: What is the use of having a laptop that you have to use in class, but you don't have a data projector or screen to implement it properly for the purposes it was given to you?] (PIQ, MGT 19).*

On the open-ended questionnaire, another participant concurred, stating that her sense of demotivation had been aggravated by the long period they had had to wait for their laptops, *"I gave my laptop in to the Department, but they did not give it back, and it is now six months. So when must I practise or learn?"(OEQ, MGT 11).* This issue also concerned another participant, who stated:

> *"Op hierdie stadium is my grootste struikelblok dat ek nie my laptop kan kry nie. So vir die afgelope twee en 'n half jaar kan ek nie die laptop gebruik nie. Ek het dit steeds nog nie!"[Translated into English: Currently my biggest challenge is that I cannot get my laptop. For the past two and a half years I cannot use the laptop. I still do not have it!] (OEQ, MGT 7).*

Another participant affirmed during an open ended questionnaire *" Laptop was dysfunctional for a long period when I received it"* (OEQ, MGT 3). During a personal interview another participant concurred stating that she was without it for a long time and stated, *"Two months"* (without access to the laptop) (PIQ, MGT 12). Another participant highlighted his despair when he stated in the focus group interview, *"That sample of lessons they gave us was for Grade 12. When I wanted to use that laptop, there was a code, a code... and I could not open it"* (FGI, MGT 1).

From the participants' responses, it seems that they also became demotivated because they expected to have suitable programmes on their laptop which they could use in their classrooms; however, the programme on their laptops were not suitable for their learners. Therefore, they felt helpless, dispairing, and abandoned the idea of trying to implement ICT, because they had no way of obtaining these resources and it seems they have exhausted all avenues with the Department. Another demotivating aspect the participants mentioned, was that there was a restriction code on the laptop, which they could not access, and there was no support to assist them in that regard. The data hence suggest that these factors contributed to the demotivation of the participants and that these demotivating

factors need to be clarified and resolved to ensure ICT integration. The data concur with the views of Korte and Hüsing (2007), Mumtaz (2000) and Ryan and Deci (2000) who stated that intrinsic and extrinsic aspects affect the motivational levels and have an impact on ICT integration. Therefore, when teachers are supported, they may become more inclined to use ICT resources and could become more motivated to implement ICT integration.

4.3.2.2   Negative perceptions about learners' ability to use the laptop

The data reveal that the participants had negative perceptions about their learners' abilities to use the laptop. On the open ended questionnaire, one of the participants stated, *"The learners cannot use it" (OEQ, MGT 18)*. Another participant concurred during a personal interview, stating, *"And also the training of learners is another thing, because it is useless to train [just] the teachers, because at the end the learners must get something from you" (PIQ, MGT 11)*. During a focus group interview, another participant also concurred, stating, *"... not only for the teachers to be equipped and trained in using computers, but especially the children, so it needs to become part of their curriculum, or whatever or their training... computer literacy for the learners" (FGI, MGT 2)*. Another participant highlighted during a focus group interview:

> *"Ek wil net sê ons kinders is baie afgesonder in afgesonderde gebiede, so hulle ervaringsveld is baie eng, so as mens hom kan gebruik om hul meer visueel dinge te kan wys om hulle ervaringsveld soveel te verbreed, sal dit baie lekker wees"* [Translated into English: I just want to add that our learners are very isolated, in isolated areas. Their experiences and reference world are very limited. If we could use the laptop to visually demonstrate to them and expand their reference world, it would be great] (FGI, MGT 6)

This was affirmed by another participant, who stated during a personal interview, *"Those learners can't access, they are not familiar with these things anyway. I have to show them just everything" (PIQ, MGT 12)*. The data highlight the fact that the learners at the participating teachers' schools, did not have access to technology and were not exposed to technology other than their experiences with technology at school. From the data, one can infer that the learners' poverty-stricken home and community environment had a direct affect on the affordability aspect of owning a computer and that that one laptop at school was their only exposure to technology. The data also highlight the link between learners' access to resources and training and their ability to use cutting-edge technology. These negative perceptions about the learners would seem to perpetuate the digital divide between those who have access to technology (city learners) and those who do not have access (learners in multi-grade teaching schools). Ertmer (1999) concurred, arguing that second order barriers seem to be closely related to teachers' vision of what they envisage for their learners through the introduction and use of technology in their teaching and learning experiences, how they envisage the various roles of the

teacher and learner and even the technology (Ertmer, 1999). Therefore, negative perceptions about learners in multi-grade classrooms obstruct the implementation of technology in the classroom.

4.3.2.3 Negative perceptions related to teaching with the laptop

The data highlight two different views on the participants' experiences of trying to teach with the laptop in the classroom, namely that laptops – specifically *one* laptop – does not work in the multi-grade context and that it is difficult to cross over from traditional 'talk and chalk'.

4.3.2.3.1 One laptop per classroom is not enough to implement ICT integration in a multi-grade context

The data draw attention to that the fact that a few of the participating educators felt that having one laptop only in the classroom did not work. It seems from the data that having only one laptop created classroom management issues and hence a negative perception towards using the laptop. On the open-ended questionnaire, a participant alluded to this, stating:

> *"Die laptop is goed en wel, maar in die klas werk dit nie lekker uit nie. Die een groep wat besig is met skriftelike aktiwiteite doen dan nie dit nie. Hulle aandag is daar waar die kinders is wat besig is met die laptop. So wat die laptop in die klas betref, veroorsaak ook chaos want die kinders kan jy nie alleen los wat besig is op die laptop nie en die onderwyser moet beweeg na die ander groepe ook."* *[Translated into English: The laptop is all good and well, but in the classroom it does not work. If one group is busy with written activities, they then do not focus. Their attention is with the learners who are using the laptop. The laptop in the classroom causes chaos, because the learners cannot be left alone with the laptop while the teacher also has to move to the other groups] (OEQ, MGT 14).*

Another participant concurred, stating in a personal interview, *"But at the moment one laptop doesn't work at all for us"* (PIQ, MGT 16). Another participant confirmed this during a personal interview:

"Nee, dis hopeloos onvoldoende. Die laptops is goed vir die persoonlike gebruik van die onderwyser se persoonlike gebruik, om byvoorbeeld soos worksheets, questionnaires, vraelyste, vraestelle en take en so goed op te tik en ja om jou data daarin te voer. Maar om werklikwaar te gebruik in die klas waar ons is vir die multi-grade is dit [one laptop] onvoldoende" *[Translated into English: No, it is hopelessly insufficient. The laptops are fine for personal work and for typing worksheets, questionnaires, question papers and assignments and also for capturing one's data. But to actually use it in the classroom for multi-grade, it [one laptop] is insufficient] (PIQ, MGT 2).*

During a personal interview, another participant concurred, *"And resources, computers, you see you don't get a chance to take the kids to a computer. And I'm only having one laptop. How am I going to cope with one laptop, because I am having more kids in the class"(PIQ, MGT 11)*, while another participant stated in the personal interview, *"I think we need more than one laptop" (PIQ, MGT 16).* During a focus group interview, another participant mentioned:

"How can you use the laptop without a data projector? You can use the laptop for compiling maybe some lessons and question papers, etc., but to use the laptop for the purpose why they gave us the laptop, we don't use it really for that purpose" *(FGI, MGT 2).*

From the data responses, it seems that the new technology, in this case the one laptop, was experienced as overwhelming to the educators, as they cited that they had too many groups to handle and blamed the laptop as a contributor to the chaos. The participants complained that the teacher could not leave the learners unsupervised with the laptop. Therefore, the easiest way out seemed to be to just ignore it and not use it. From the participants' responses, it seems that providing a laptop in isolation did not work for them in the classroom, *inter alia,* because they did not have access to a data projector. Therefore, they felt that it was not effective and emphasised that they needed more resources, such as computers and data projectors. The absence of these resources seem to have affected their classroom management and discipline in the class. The above sentiments are linked to the views held by Tondeur et al. (2008), Mumtaz (2000) and Mouza (2006), who argued that a lack of classroom management skills within the ICT context impedes ICT implementation.

4.3.2.3.2 Difficult to cross over from traditional 'chalk and talk' to teaching with technology

The data reveal that changing from traditional 'chalk and talk' to teaching with technology was a challenge for the participants. This was indicated during a focus group interview by a participant who stated:

"It is difficult to change from traditional way of teaching. It is in a rural area, and we are still using the blackboard and chalk. To change from traditional way to teaching with the laptop, with a data projector ... When I did my teacher training, there was absolute nothing about multi-grade teaching or computers in that course. Especially when you have three grades, it is your whole afternoon, every day that you have to prepare, you still have to mark. Now here comes your computer and that is another strain on you where it is supposed to help you. It (the laptop) is now a constraint" (FGI, MGT 1).

On the open-ended questionnaire, another participant affirmed this as follows, *"Too used to chalk and talk" (OEQ, MGT 10).* Another participant stated, *"It was very difficult for me, you don't have sufficient training in laptop / on computers, now you have to change from using the blackboard, you are used to the blackboard, but one laptop ..." (FGI, MGT 20).* During the focus group interview, another respondent stated:

"Chalk and talk is much easier (yes it is ... all focus group interview participants agree) It is easier with the blackboard. We know how to use it. How can you teach the learners with one laptop, without those accessories towards the laptop. You have to show it on the blackboard, but that wasn't there for us" (FGI, MGT 3).

From the data, it is evident that having a technological resource and even being trained to use it, will not necessarily promote usage, as it seems that sticking to habits and comfort zones also plays a role. These participants experienced the laptop as a constraint in the classroom. The data infer that a mindset change is needed for teaching with technology. The comfort zone, which the known traditional 'chalk and talk' teaching style presents, seems to create a barrier. A change towards teaching with technology would require a paradigm shift, which does not seem to be a process that would occur automatically. These sentiments seem to align with the views of Cuban (2001), Fullan (2006), and Gulbahar and Guven (2008), who argued that resistance to ICT implementation is a result of teacher attitudes and their resistance to change, as this change is not easy. Furthermore, the sentiments of the participants seem to support the views of Mumtaz (2000) and Rogers (2003), who have stated that teachers need to be convinced of the benefits of change before they will accept it.

4.3.3   THIRD ORDER CHALLENGES

As previously mentioned, third order barriers are those barriers that are not controlled by schools or individual teachers. In this study, such barriers refer to the participating teachers, to challenges beyond themselves and their schools' challenges at a macro level, that relate to the Department of Basic Education. It seems that this one-laptop initiative was also riddled with third order barriers, which impeded on ICT implementation. These aspects are presented below.

4.3.3.1   Support and assistance from the Department of Basic Education is lacking

From the data obtained, it seems as if the lack of support and assistance from the Department of Basic Education is a major issue related to the one-laptop initiative. The participants alluded to this lack of support in terms of finances, infrastructure, technical support and maintenance, ICT implementation, and curricular content. These aspects are presented and discussed below.

4.3.3.1.1 Lack of financial support for ICT implementation

The majority of the participants indicated that there was a lack of financial support for ICT implementation at school and that the situation was even more severe in the smaller multi-grade schools that had only one teacher – the one-teacher schools. During a focus group interview, one participant alluded to the lack of financial support, stating, *"The schools do not have the funds to buy the data projectors" (FGI, MGT 2).* This lack of funding for ICT related resources was also higligthed by another participant during a personal interview, *"Ons het glad nie 'n dataprojektor nie, onse begroting is te klein. Ons kan dit nie bekostig nie" [Translated into English: We do not have a data projector, because our budget is too small. We cannot afford it] (PIQ, MGT 19).* This lack of funds for ICT resources was affirmed by another participant, who stated on the open-ended questionnnaire, *"Our budget is so very small. We cannot manage to buy the resources we need" (OEQ, MGT 18).* During a focus group interview, another participant concurred regarding the lack of funds, alluding to the barriers affecting ICT integration, *"The only thing I think that will prevent us [from using ICT] is finances" (FGI, MGT 3).* The financial position of the multi-grade school was dependent on a very small NSF budget allocation, and the schools were therefore not able to allocate a portion of the finances to ICT. This implies that the schools were not able to purchase resources for ICT implementation, therefore, a lack of financial support for ICT hampered the implementation thereof. The funding provided to these schools was insufficient for ICT implementation. These sentiments seem to align with the arguments of BECTA (2009), Butler and Selborn (2002), and Hargreaves and Goodson (2003), who suggested that a lack of finances negatively impacts on ICT integration initiatives and that education departments should plan for providing dedicated funding for projects such as this laptop initiative to multi-grade teachers.

4.3.3.1.2 Lack of electrical power supply to schools

The data reveal that there was a lack of electricity supply to some multi-grade schools, and that this was experienced as a major challenge. During a focus group interview, one participant alluded to the absence of power supply to the school, stating, *"… I can't use my laptop, because my school don't have electricity. No power supplies at our schools here" (FGI, MGT 1).* Another participant affirmed the absence of electricity at the school stating, *"School has no electricity" (OEQ, MGT 19).* Another participant stated on the open-ended questionnaire, *"Not suited for any electrical equipment – no electricity" (OEQ, MGT 17),* while another participant wrote on the open- ended questionnaire, *"No power supply" (OEQ, MGT 1).* According to these responses, the lack of electricity supply to schools in

these rural and isolated areas negatively affected the use of laptops for teaching and learning. Furthermore, the electrification of the schools was not within their ambit. This implies that alternative electricity supply sources must be made available to these schools, from an external force or private partnerships. This lack of basic services, as highlighted by the data, confirms the views of Kruss (2009), the Ministerial Report (2005) and Shibeshi (2006), who stated that multi-grade teaching schools often lack basic services, such as electricity.

4.3.3.1.3 Lack of classroom space

The data highlight the lack of suitable classroom space as a barrier to ICT integration. In a personal interview, one participant stated:

> *"Die klaskamers, onse 'setting', is nie rêrig behoorlik om dit te gebruik nie, omdat*
> *ons is in baie groot klasse [leerdergetalle] en daar is nie genoeg spasie om te*
> *gebruik nie" [Translated into English: The classrooms, our setting, is not conducive*
> *to use it because we have very big learner numbers and there is no enough space to*
> *utilise it] (PIQ, MGT 2).*

This lack of classroom space was confirmed as follows by another participant during the focus group interview, *"You can't use the data projector laptop in our classes, in our classes within our setting with overcrowded classes" (FGI, MGT 3).* On the open-ended questionnaire, one participant alluded to the lack of suitable classroom space, stating, *"Classrooms are small" (OEQ, MGT 15).* Another participant stated on the open-ended questionnaire, *"Small classrooms make movement very difficult" (OEQ, MGT 2).* The data reveal that there was a lack of space to implement ICT in these overcrowded classrooms. It implies that the classrooms were too small and not conducive to facilitate movement to allow a laptop and data projector to be used for teaching and learning. It seems that in some participating multi-grade practising schools that had large learner numbers, the lack of space to effectively utilise the laptop was a major challenge. The overcrowded multi-grade classes impeded on ICT implementation and the use of the laptop with a data projector in the classroom. These sentiments are shared by Gardiner (2008), Jordaan and Joubert (2008) and Little (2006), who stated that multi-grade teaching schools have infrastructural challenges and lack specialised classrooms.

4.3.3.1.4 Lack of technical support and maintenance

From the various responses, it seems that some type of technical support is rendered by the Department. This usually means that the laptop is taken from the teacher and usually returned after a long period of absence. As this seems to be the 'only' support given, there is clearly a lack of technical support to these schools. During a focus group interview, one of the participants alluded to this, stating, *"Also the maintenance on the laptop, we don't know how to maintain it ourselves" (FGI, MGT 2).* Another participant agreed in a personal interview on teachers' inability to deal with technical aspects

and maintenance, stating, *"Another thing that I have experienced with this laptop; it used to freeze. As a result it was taken to Bhisho for repairs, I don't know what was wrong with it" (PIQ, MGT 12).* On the open-ended questionnaire, another participant expressed apprehension about what should be done to maintain the laptop, writing, *"What if I break it? Who is going to fix it? And the virus protections? I cannot afford it" (OEQ, MGT 18).* This perceived lack of support from the Department was also expressed by another participant during a focus group interview, *"When I wanted to use that laptop, there was a code, a code... and I could not open it..." (FGI, MGT 3).* Therefore, from the various responses provided by the participants, it seems that this the lack of teachnical support from the Department negatively impacted on ICT implementation. The schools where the participating multi-grade teachers were stationed, could not support the individual educators in technical and maintenance issues, since no funds had been allocated for this. These sentiments seem to support Ertmer (1999), Ferrero (2003), Khambari et al. (2009), Rodden (2010) and Silvernail and Lane (2004), who argued that the lack of technical support at school level negatively impacts on ICT implementation.

4.3.3.1.5 Lack of ICT implementation support and leadership

The data reveal that there was little or no support from the Department of Basic Education, other than the basic computer literacy training given to the participants. There was no support in terms of ICT implementation prior to the Intel intervention, which became evident when one participant stated on the open-ended questionnaire, *"No support from Department" (OEQ, MGT 4).* This lack of support by the Department was confirmed by another participant, who also stated on the open-ended questionnaire, *"No ongoing assistance. Too little contact" (OEQ, MGT 16).* During the focus group interview, another participant concurred that ICT implementation support from the Department of Basic Education was lacking, mentioning, *"And of course the Department does not provide and does not give training to that regard [ICT implementation] then I won't be abe to use it" (FGI, MGT 3).* This absence of support was also affirmed as follows by another participant during a personal interview, *"If you can be helped with those [Department], because it is useless to get a laptop for the class. That laptop is not for you personally. It is for the class to make the teaching effectively"(PIQ. MGT 11).* It also became clear that that participants required an official employed by the Department of Basic Education to make support and assistance a priority, *"We need actually a champion to run with this vision, someone to take leadership, because this is an enormous task. The Department should make it their priority, especially within the Eastern Cape" (FGI, MGT 1).* The data revealed that there was a lack of support from the Department of Basic Education in terms of ICT implementation. Supporting schools in terms of ICT implementation is vital to ensure sustainable ICT integration, as prescribed in the White Paper on e-Education (Department of Education, 2004). Therefore these sentiments also share the views of Vallance (2008) and Ertmer (1999), who contended that teacher training and support is vital; that teacher support through ongoing professional development programmes – supported by schools and education departments – is imperative. These sentiments are futher linked to Butler and Selborn (2002),

as well as BECTA (2004), who argued that a lack of administrative support, a lack of institutional support by leadership and a lack of training focusing on learning and teaching in the classroom impact negatively on ICT implementation.

4.3.3.1.6 Lack of appropriate curricular content

The data disclose that the participants also suggested that the lack of appropriate software related to the curriculum was a challenge. On the open-ended questionnaire, one participant stated, *"Laptop software not loaded with materials for multigrade classes for Senior Phase" (OEQ, MGT 2).* Another participant mentioned during the focus group interview that the samples of lessons provided on the laptop were inappropriate for primary schools, saying, *"The sample of lessons they gave us was for Grade 12" (FGI, MGT 1).* This lack of appropriate software for the multi-grade classroom was highlighted by another participant, who wrote on the open-ended questionnaire, *"No sample lessons for multigrade on computers" (OEQ, MGT 4).* Another participant agreed during the focus group interview, mentioning:

> *"I am sure there are a lot of lessons all over the world. They could at least have put, they know what grades we are, they could at least sample a few lessons, so that we can show the learners on this thing, so that it can interest the learners and the parents. Maybe they can also get one or other day get a laptop. But now we can't use this, because there is no lessons, because you don't know how to make your own lessons" (FGI, MGT3).*

The data highlight that ICT implementation at the participating multi-grade teachers' schools was impeded by a lack of skills, knowledge, support and appropriate software. The data also reveal that the participants did not know how to design their own lessons. According to the participants, the software loaded on their laptops was of no use to them, because it covered Grade 12 Mathematics, whilst they were teaching at primary school level. The data imply that the participants felt that sample lessons could have been loaded as a guide to assist them with their grades. These sentiments support the argument put forward by Baskin and Williams (2006), BECTA (2004), Beggs (2000), Bingimlas (2009), Schoepp (2005) and Tearle (2003), namely, that the lack of access to appropriate software and hardware resource affects the implementation of ICT integration. Furthermore, these sentiments also align with the view of Little (2006), Nangue (2011), Tinio (2003), Van As (2009) and Wang et al. (2008), who have stated that the success of ICT implementation is dependent on the development of appropriate curricular content.

4.3.3.1.7 Lack of training and continuous professional development for ICT implementation

From the various responses by the participants in this study, it seems that the initial training provided by the Department to the participants was not enough to assist them in ICT implementation in

their classrooms. This inability to operate the laptop due to a lack of training was well recorded during a focus group interview, when one participant stated, *"I don't know when to and how to use the laptop because I did not have enough training. Insufficient training from the Department side"(FGI, MGT 1).* This lack of training was also mentioned by another participant, who responded as follows on the open-ended questionnaire, *"Training on computers – improvement to enable them to equip themselves" (OEQ, MGT 9).* Another participant concurred, responding on the open-ended questionnaire, *"Not enough training. Teachers in rural areas have little knowledge of computers" (OEQ, MGT 2).* This inability to use the laptop seems to be the result of the lack of training. These participants lacked the required skills and knowledge of computers and ICT implementation. Therefore, the data seems to infer that the lack of appropriate ICT implementation training hindered ICT implementation in the participants' schools. These sentiments are aligned to the view held by Baskin and Williams (2006), namely that the absence of professional development presents a barrier to ICT implementation. These views are also aligned with Goktas (2009) views, whereby the participating teachers identified the lack of in-service training as a more important challenge than a lack of appropriate course content, the lack of time and lack of administrative support. Furthermore, the data agree with the postulation by Plante (2005) and Ertmer (1999), that teacher capacity is one of the first order barriers that negatively impact on ICT implementation.

4.4   THEME 3: POSSIBLE SOLUTIONS FOR MULTI-GRADE TEACHING AND ICT IMPLEMENTATION

This section portrays the findings related to the third research question, *"What are the teachers' perceptions of what can be done to meet these challenges"?* The possible solutions as presented by the participants through the various data gathering tools are presented in terms of both multi-grade and ICT, in terms of the three level typology: the first order, second order and third order, presented by Ertmer (1999), Balanskat et al. (2006) and Kirkland and Sutch (2009). At this point it is important to note that multi-grade schools are usually relatively small compared to urban schools. Hence, the first order barriers that the multi-grade schools experience, are not the same as those experienced in urban schools. Table 4.3 represents the possible solutions as presented by the participants, according to the three level typology.

TABLE 4.3: Possible solutions: multi-grade teaching and ICT implementation

TYPOLOGY	CATEGORIES	SUB-CATEGORIES
4.4.1 First order barriers relating to extrinsic challenges or school level challenges, also called meso level challenges	4.4.1.1 Provide enabling programmes for parents	
4.4.2 Second order barriers relating to intrinsic challenges or teacher related challenges, also called micro level challenges	4.4.2.1 Encourage mindset change	
4.4.3 Third order barriers relating system challenges, also referred to as macro level challenges	4.4.3.1 Multi-grade Renaissance: Towards a new model for multi-grade teaching	4.4.3.1.1 Recognise multi-grade teaching as a separate educational reality
		4.4.3.1.2 Design a different resource model
		4.4.3.1.3 Establish a new teacher to learner ratio
	4.4.3.2 Re-think curriculum requirements regarding multi-grade by the Department of Basic Education	4.4.3.2.1 Provide support with curriculum adaptation
		4.4.3.2.2 Provide suitable LTSM
		4.4.3.2.3 Group two grades per phase
	4.4.3.3 Support required from the Department of Basic Education	4.4.3.3.1 Provide on-site support
		4.4.3.3.2 Provide LSEN support
		4.4.3.3.3 Encourage the establishment of communities of learning or peer support
	4.4.3.4 Provide incentives to teach in the multi-grade context and with ICT	4.4.3.4.1 Incentives for teachers
		4.4.3.4.2 Incentives for learners
	4.4.3.5 Encourage further research in multi-grade teaching	
	4.4.3.6 Provide sufficient resources	4.4.3.6.1 Provide physical resources and financial support
		4.4.3.6.2 Provide human resources
		4.4.3.6.3 Provide ICT resources
	4.4.3.7 Provide sufficient training in multi-grade teaching and ICT implementation	4.4.3.7.1 Provide continuous professional development courses for in-service teachers
		4.4.3.7.2 Provide multi-grade teaching as a module in initial teacher training
		4.4.3.7.3 Provide ICT implementation training
		4.4.3.7.4 Provide follow-up sessions after training
	4.4.3.8 Establish partnerships with different stakeholders	
	4.4.3.9 Closure and merger of multi-grade schools	

4.4.1   FIRST ORDER BARRIERS

The data reveal that the participants indicated that it was important to enable and empower parents to assist their children on various fronts. This is presented below.

4.4.1.1   Provide enabling programmes for parents

The data indicate that the participating teachers suggested that enabling programmes or workshops should be developed in order to equip parents to assist their children in their school- and homework. It became evident that the parents generally did not have the literacy and communication skills to properly understand the curriculum and communicate with teachers and school authorities. This became evident during a personal interview, when one participant stated:

> *"Huidiglik ondervind ons groot probleme, maar ek dink die oplossings wat ek aan die hand kan doen is: onse ouers, die parental guidance, om ons kinders te help by die huis; ouers moet opgelei word om ons kinders te kan help" [Translated into English: Currently we experience great challenges, but I think the solutions that I can present are regarding our parents; parental guidance so that they can help the children at home; parents must be empowered to assist our children] (PIQ, MGT 17).*

This was affirmed as follows on the open-ended questionnaire by another participant, *"Parent programmes – establish support groups to assist parents in education matters, such as supporting learners with homework and searching for information" (OEQ, MGT 2)*. The importance of enabling and empowering parents was further highlighted during a personal interview with another participant:

> *"And I've mentioned about the illiteracy of the parents. The only way how that can be addressed, is by introducing ABET classes for the parents themselves. And I think also what the Department also can do, is especially in farm schools, is that we need to revive the ABET classes, in order for these farm workers to get a better understanding, like they need to come and read a little bit more and know something also about Mathematics" (PIQ, MGT 16).*

From the data, it seems that participants would encourage more parental enabling programmes in order to equip parents to support their children with their schoolwork and homework assignments. The South African Schools Act (Republic of South Africa, 1996b) also encourages parental involvement. Through parental programmes, like ABET, the high illiteracy levels among parents could also be addressed. Furthermore, the data highlight that through parent enabling programmes, parental support groups could be formed to assist parents with educational issues. These

views regarding the development of parent communities have been echoed by Joubert (2010), who states that schools should provide opportunities for community development, which includes parents.

4.4.2   SECOND ORDER BARRIERS

The data reveal that it was generally more difficult for the participants to identify, recognise and present solutions for second order barriers, since these are intrinsic and related to the individuals themselves. Second order barriers are related to the self; to aspects pertaining to confidence, personal mindsets and beliefs. These are presented and discussed below.

4.4.2.1   Encourage mindset change from the traditional way of doing

The data suggest that a change in mindset could be a possible solution to ameliorate the challenge of teachers being stuck in traditional mindset and beliefs pertaining to teaching; a mindset of 'talk and chalk'. This was mentioned in responses provided on the open-ended questionnaire, when a participant suggested, *"Change mindset (of everyone from the Department at National office, provincial office, District Office, teachers) about multi-grade and the important job we are doing to teach learners in these poor areas" (OEQ, MGT 12)*. This was clearly seen as important, as another participant also mentioned on the open-ended questionnaire that what was hampering teachers was the fact that they were over-reliant on *"talk and chalk"(OEQ, MGT 10 and MGT 12)*. Responding on the open-ended questionnaire, another participant concurred as follows:

> *"Too used to old methods. Afraid of new – laptop, etc. (fear of failing), since multi-grade is so challenging and I am not seeing this method of teaching as a success, I don't further want to expose myself to failing the learners, because there is no support" (OEQ, MGT 12).*

The change in mindset needed to, for example, embrace the time-saving benefits affected by the usage of a laptop was also highlighted by a participant in the focus group interviews, who stated, *"I think all these things in the past took time and doing that by computer and through internet, emails – that saves us a lot of time and you can work across the sphere with everybody" (FGI, MGT 20)*.

The data reveal that the participants felt that this change in mindset was needed both in respect of multi-grade teaching and the implementation of ICT integration or teaching with technology in the multi-grade classroom. From the data, it seems that, prior to the training, some of the participants had been hesitant to change their teaching style and pedagogy, because they were set in their ways and apprehensive of change. These sentiments seem to share the views of Cuban (2001), Gamache (2002) and Fullan (2006), who contended that it is often difficult for teachers to change their ingrained teaching practices. Baron and Bruillard (2007), Mumtaz (2000) and Rogers (2003) suggested that teachers should be assisted in various ways, for example, by exposing them to positive experiences in

order for them to embrace change, such as teaching with technology. Furthermore, the data seems to imply, that in order for this change to be effected, these teachers would have to *"unlearn"* the 'chalk and talk' ways they had *"learned"* and *"relearn"* to teach with technology. This supports the views espoused by Toffler (1970) and Gamache (2002).

4.4.3   THIRD ORDER BARRIERS

The data reveal that third order barriers were linked to solutions that cannot be accomplished by individual teachers or schools. An external intervention outside the ambit of the individual and the school is required; often involving the greater system. The data also imply that the solutions to third order barriers would require a strong political will to effectively implement the radical change in a mono-grade blinkered milieu. The solutions to the third order barriers also seem to be linked to aspects outside the school and individual teachers's paradigms and would need a top-down approach. The findings are presented in terms of a multi-grade Renaissance, re-thinking curriculum requirements for multi-grade teaching, support, incentives, further research, resources, training, partnerships and the closure and merger of multi-grade schools. These are presented and discussed below.

4.4.3.1   Multi-grade Renaissance: Towards a new model for multi-grade teaching

The participants in this study commented that some of their challenges could be ameliorated by a re-thinking in terms of the teaching model. The data reveal that this new model would require the recognition of multi-grade as an educational reality. This in turn implies that a different model needs to be designed, to specifically cater for the multi-grade context. These suggestions are presented and discussed below.

4.4.3.1.1 Recognising multi-grade as a separate educational reality

The data indicate that there was a need to recognise multi-grade as a separate educational reality through planning, curriculum design and policies. During a focus group interview, one participant alluded to this, stating:

> *"Ten opsigte van die kurrikulum en daardie tipe van goeters, ek sou sê as daar 'n beleid heeltemal totaal en al 'n aparte beleid en goeters is vir multi-grade. Dat mense begin kan besef dit is total anders as monograad en mens kan nie die heeltyd onder dieselfde kam geskeer word nie" [Translated into English: In terms of the curriculum and that sort of thing, I would say that if there were a separate policy and arrangements for multi-grade. So that people could begin to understand that it is totally different to monograde and that we cannot all be treated the same] (FGI, MGT 7).*

This was affirmed by another participant, who responded as follows on the open-ended questionnaire, *"Rethink multi-grade from the start. Plan properly for it. Revisit the curriculum for multi-grade schools" (OEQ, MGT 17).* From the data, it seems that the 'silent' multi-grade voice needs to be heard as a separate entity and not as a step-child of the mono-graded curriculum. The data suggest that multi-grade needs its own identity. The participants in this study suggested that multi-grade teaching should be recognised as a separate and different entity to mono-grade teaching. This would require the National Department of Basic Education to redesign, replan and revisit the curriculum in terms of multi-grade so that it could transfer the national curriculum successfully, without compromising the quality of education. These sentiments are shared by Juvane (2005), Little (2006) and Pridmore (2007), who have advocated for the recognition of multi-grade as a separate entity. Joubert (2010) concurred, stating that the Department of Basic Education should develop a *"national policy for multi-grade"* (Joubert, 2010, p.10).

4.4.3.1.2 Design a different resource model

The data reveal that the participants suggested that a different resource model for multi-grade teaching should be developed as a possible solution. This became evident during a focus group interview, when a participant stated, "*Funding, yes, a funding model that a school can function effectively, not according to learner numbers" (FGI, MGT 2).* This was affirmed by another participant in his response on the open-ended questionnaire, *"Work on new multi-grade resource model" (OEQ, MGT 1).* The data imply that once there is recognition for multi-grade teaching to function as a separate educational entity, as mentioned in section 4.4.3.1.1, then there would be a need for a new resource model for multi-grade teaching, which would be different from the current NSF mono-grade based model. The data highlight that the participants felt that the resourcing of multi-grade schools should not be based on learner enrolment, as with mono-grade schools. There seems to be no literature on a proposed resource model for multi-grade teaching schools within the South African context.

4.4.3.1.3 Establish a new teacher-to-learner ratio

The data suggest that some participants felt that there was a need for a new teacher-to-learner ratio as a solution. Responding on the open-ended questionnaire, one participant alluded to this, suggesting, *"The ratio of educator to learners to be adapted" (OEQ, MGT 3).* Also responding on the open-ended questionnaire, another participant affirmed this, stating, *"A ratio on multi-grade school should not be the same as those not having multi-grade" (OEQ, MGT 8).* From the data, it seems that the participants felt that a solution to their challenges could lie in introducing a new teacher-to-learner ratio, different from the mono-grade classrooms. They expressed the need for changing the ratio from the existing situation. This implies that curriculum designers and planners should not only look at developing a multi-grade policy, as mentioned in section 4.4.3.1.1, and a new funding model, as mentioned in section 4.4.3.1.2, but also include an alternative teacher-to-learner ratio. The data suggest

that these solutions could make a difference to teachers' multi-grade situations, especially since multi-grade teachers have been voiceless in the educational arena, despite the fact that 30% of the learner population receive multi-grade teaching. It seems that the data pertaining to the grouping per phase, as in section 4.4.3.2.3, could provide clarity on this matter, since the learner totals of the schools vary. Joubert (2010) suggested a ratio of 25:1 for a multi-grade class of more than two grades, but there are schools where this ratio would perpetuate the current situation.

4.4.3.2   Re-think curriculum requirements regarding multi-grade teaching by the Department of Basic Education

The data disclose that the current curriculum requirements needed to be addressed in order to gain more successes in the multi-grade classroom. The participants suggested various ways of addressing the curriculum, such as departmental support with curriculum adaptation, multi-grade teaching and learning support materials, and multi-grade class combinations of two groups within the same phase. These suggestions are discussed below.

4.4.3.2.1 Provide support with curriculum adaptation

Most of the participants suggested that they needed support with curriculum adaptation as a potential solution to their challenges with the curriculum. This was suggested by one participant in her response on the open-ended questionnaire, *"Design curriculum CAPS, ANA and moderation according to multi-grade context" (OEQ, MGT 4)*. This was also affirmed by another participant, who suggested during a focus group interview, *"Aligning policies to fit multi-grade. ANA exams to be adapted for multi-grade" (OEQ, MGT 1),* while another participant recommended in the focus group interview, *"The Department or someone must also look at the curriculum also to see that the multi-grade class teaching is also adapted into this curriculum that they set up for monograde teaching" (FGI, MGT 3).* During the focus group interview, another participant concurred, stating, *"En dan soos die kurrikulum ook, dat mens dalk die kurrikulum ook aanpas vir multi-grade" [Translated into English: And then the curriculum, that one could possibly adapt the curriculum to fit multi-grade] (FGI, MGT 7).* The data suggest that the participants experienced challenges in terms of the CAPS curriculum and the Annual National Assesments (ANAs), including the moderation of the ANAs. Therefore, the participants suggested that the curriculum should be adapted for the multi-grade context, as this could assist in ameliorating the experienced challenges. Within multi-grade teaching, there is a need to adapt the current mono-graded curriculum for the multi-grade teaching context. This implies that there should be guidelines as to what and how adaptation could be done, in order to assist these teachers.

The data also seem to highlight that the participants realised that curriculum adaptation was not their sole responsibility, but would need specialised support from the Department of Basic Education. These sentiments seem to agree with the view held by Little (2006), who postulated that

curriculum adapation should be done by curriculum planners and designers. It further supports the view held by Joubert (2010), who stated that the curriculum should be adapted to *"fit"* the multi-grade context (Joubert, 2010, p.11).

4.4.3.2.2 Provide suitable Learner and Teaching Support Materials (LTSM)

The data reveal that many respondents suggested the provision of suitable multi-grade resources for teaching and learning as a possible solution, as stated by a participant during the focus group interview, *"En dan as jy daarvolgens, dan laat mens dan miskien ook handboeke het wat jy dan nou in jou multi-grade-klas kan gebruik" [Translated into English: And therefore, if one could also get textbooks that you could use in your multi-grade classroom] (FGI, MGT 7).* The need for the provision of suitable resources was affirmed by another participant on the open-ended questionnaire, who wrote, *"Supply one school at a time with all the information and equipment to work effectively" (OEQ, MGT 2).* Another participant concurred in her personal interview, recommending the provision of multi-grade resources as follows:

> *"En dan, natuurlik, jou resourcing van die skole. En groter gebruik van rekenaars. Jy kan al baie bereik deur rekenaars tot jou beskikking het, om die kinders rekenaargeorienteer te het, dan gaan jy makliker werk. As jy byvoorbeeld programme op jou rekenaar het en sê, goed, doen vir my daai, dan die een lot kan aangaan" [Translated into English: Then obviously resourcing schools. And the increased use of computers. One can already achieve much if you had computers available for learners to make them computer literate, then your job would become easier. If you had programmes on the computer, then one group could continue and you could instruct the others to do something else] (PIQ, MGT 5).*

From the data responses, it would seem that resource challenges could be ameliorated once sufficient suitable resources are made available to these multi-grade schools, based on their teaching and learning needs. This implies that multi-grade specific LTSM must be developed, published and provided for multi-grade teaching schools. The data suggest that an increase in technology, like computers, provided to multi-grade schools could assist in easing the teachers' workload. These sentiments support the views of Bhardwaj (2008), Commonwealth Secretariat (2004), Juvane (2005), Kazinczi (2009), Little (2006), Thomas and Shaw (1998) and Tsolakidis (2010), who have advocated the provision of more LTSM suited for multi-grade classrooms. It further supports the view held by Joubert (2010), who argued for the inclusion of technology in multi-grade classrooms.

4.4.3.2.3 Group two grades per phase together

The data suggest that the participants felt that the grouping or combination of multi-grade classes could be addressed by grouping only two grade groups within a phase. Currently the situation

differs from schools to school: for example, in one-teacher schools, all the grades, from Grade 1 to Grade 7, are combined in one class. In other situations, the grouping is determined by the teachers available at the school; there is no set formula for the grouping of classes. This became evident during a focus group interview, when one participant stated, *"It would be preferred that we only have two grades of the same phase per class; not for example, grades from different phases in one class…" (FGI, MGT 2).* This suggestion was affirmed by another participant, who suggested on the open-ended questionnaire, *"Have only multi-grade classes per phase" (OEQ, MGT 4).* Another participant also suggested the combination of two grades per phase in responding to the open-ended questionnaire, *"Redesign the multi-grade classes like Grade 1 and 7 does not multi-grade. Then only two grades per multi-grade class, for example, Grades 2-3; Grade 4,5 or multi-grade in phases, except for the ANA grades" (OEQ, MGT 17).* The data suggest that the grouping of a multi-grade class should be done within a phase and that not be more than two grades should be combined per phase. Furthermore, the data also suggest that the entry grade (Grade 1) and the exit Grade (Grade 7) should not be combined to form a multi-grade class. The grouping per phase implies that, in the Foundation Phase, Grades 2 and 3 would be combined, and in the Intermediate Phase, Grades 4 and 5, or Grades 5 and 6, would be combined. Another suggestion was that the grades in which ANA examinations were written, such as Grade 3, Grade 6 and Grade 9, should not be combined to form a multi-grade class. From the responses, it seems that the participants strongly advised against a combination of different phases in one class, as is currently the situation, where one teacher is responsible for all grades. The data therefore imply that by grouping two grades per phase together, the workload of teachers would be reduced and more time could be spent on teaching in the classroom and completing the requirements for a grade, which would then provide more positive results in assessments like ANA. These sentiments oppose the view held by Joubert (2010), who recommended a grouping of a minimum of three grades per teacher in in a multi-grade setting, but are aligned with the author regarding the aspect that the grouping should be different to that of mono-grade teaching.

4.4.3.3 Support required from the Department of Basic Education

The data highlight the fact that support is a key factor in the successful implementation of multi-grade teaching and ICT integration. The data suggest various solutions regarding the type of support these participants envisaged in terms of departmental on-site support, support with LSEN learners, and establishing communities of learning or peer support. These aspects are discussed below.

4.4.3.3.1 Provide on-site support by appointed multi-grade trained official

The data indicate that the participating teachers suggested that on-site support by an official dedicated and responsible for multi-grade was a possible solution. Responding on the open-ended questionnaire, one participant suggested, *"Dedicated multi-grade official to visit multi-grade schools*

and share information, knowledge and skills" (OEQ, MGT 4) and this was affirmed by another participant who stated in a focus group interview:

> *"Support – if the Department employs a dedicated official that can go from multi-grade school to multi-grade school, really sharing information, equipment and skills. They must start to show interest in what are the mgt educators doing at these mgt institutions" (FGI, MGT 3).*

During a personal interview, another participant concurred, suggesting, *"And then I think more support from the Education Department's part. Just come to the classroom, help us, show us some things that we need to do" (PIQ, MGT 16).* Therefore, the data imply that a dedicated official should be appointed to assist schools in implementing multi-grade teaching. The participants highlighted that this official should be involved in on-site school and classroom support to assist multi-grade teachers. Furthermore, they expressed that on-site and classroom support should include regular contact sessions, visits, demonstrations, information sharing, knowledge and skills transfer. These sentiments seem to agree with the views of the Commonwealth Secretariat (2007) and Aikman and Pridmore (2001), who advocated the provision of on-site support, and of Joubert (2010), who argued for a multi-grade specialist district support official trained in multi-grade teaching to provide greater support.

4.4.3.3.2 Provide LSEN (learners with special educational needs) support

The data disclose that the participating teachers suggested that the Department of Basic Education should assist schools with LSEN support. One participant made the following comment on the open-ended questionnaire, stating, *"En dan hulp met LSEN-kinders. LSEN-leerders moet vroeg geidentifiseer word" [Translated into English: And then assistance with LSEN learners. LSEN learners must be identified early] (OEQ, MGT 5).* This was affirmed by another participant, who stated on the open-ended questionnaire, *"Leerders met leerprobleme moet getoets en gesertifiseer word" [Translated into English: Learners with barriers to learning must be tested and certified] (OEQ, MGT 6).* The data highlight the importance of the early identification of LSEN. The data also imply that these learners would also need assistance in terms of the curriculum. Therefore, early identification of these learners would by implication mean that they could be assisted earlier and placed at special schools, where possible. From the data provided, it seems that assistance with the LSEN group could alleviate teachers' workload. Within the South African context, there seems to be no literature to support the provision of LSEN support to multi-grade schools, as suggested by the participants.

4.4.3.3.3 Encourage the establishment of communities of learning or peer support

The data suggest that teachers could be encouraged to group themselves to form communities of learning to provide peer support as a possible solution to the isolation of and lack of support

experienced in multi-grade teaching schools. This issue was referred to by a participant, who suggested in a personal interview, *"And then the other thing that I think, is that all the multi-grade teachers can form their own forum – a forum to deal with the same issues that they have in the classrooms. And then maybe amongst ourselves we can find solutions to the challenges we are finding at the moment" (PIQ, MGT 16).* This was affirmed by another participant in responding on the open-ended questionnaire, *"Teacher support groups – give more attention to groups to assist each other with lessons. Share groups – share electronic lessons in the District through the District co-ordinator" (OEQ, MGT 2).* Another participant concurred, during a focus group interview, stating:

> *"Another thing for this multigrade is support groups. If you have a well-structured support group and a coordinator that co-ordinates these things, then we can share these lessons, like electronically with emails and those things. We can share and we can all do more or less the same kind of work, because most of the time our circumstance and situation is more or less the same. Or you can adapt here and there, if it doesn't fit you, but at least you can have something" (FGI, MGT 3).*

The data highlight the need to establish a forum or community in which teachers can share experiences or techniques and deal with the issues they are faced with on a daily basis. These support groups could facilitate finding solutions to classroom challenges. The data also imply that it should be possible to encourage cooperative learning, sharing of best practices, and knowledge and skills transfer. Hence, it seems that this community of teachers could provide support to each other when needed most. In this way, it could alleviate the frustration, helplessness and isolation experienced by teachers in multi-grade teaching, especially when it is difficult to solicit support. These sentiments share the views held by Birman et al. (2000), Cordingley et al. (2003), Gulbahar and Guven (2008) and Maistry (2008), who have encouraged collaborative participation and the establishment of communities of support.

4.4.3.4   Provide incentives to teach in the multi-grade context and with ICT

From the data responses, it seems that the participants felt that incentives could assist them and they proposed that the incentives be geared towards teachers and learners, as discussed in the sections below.

4.4.3.4.1 Incentives for teachers

The data reveal that the participants suggested that incentivised initiatives would encourage and motivate teachers to work in multi-graded schools. This was mentioned by one participant, who responded as follows on the open-ended questionnaire, *"Incentives [for] like scarce skills [teachers] to be effected in multi-grade schools (OEQ, MGT 4).* Another participant commented as follows in the focus group interview:

"But if there are some incentives to these multi-grade teachers, then he will know he will get something. Because here you are spending too much from your own resources, from your own money, and that to work for the Department"(FGI, MGT 3).

During a focus group, another participant concurred, mentioning:

"You know, another thing, to get experienced people to come and work with you for 2 or 3 months here is for the Department to get incentives to these people. If you look at multi-grade, a university graduate, the chances that that person come to a multi-grade school is nil. But if there are some incentives to these mgt teachers, then he will know he will get something. Because here you are spending too much from your own resources" (FGI, MGT 1).

During a personal interview, another participant suggested that the introduction of technological incentives could also be useful, mentioning, *"What I think can be one of the solutions, is to assist us with a 3G card, where the multi-grade [teachers]can do their own thing in presenting their lessons, their demonstration lessons" (PIQ, MGT 17).* This was affirmed by another educator, who stated on the open-ended questionanire, *"Incentives for these teachers … and 3G internet facilities should be supplied to schools" (OEQ, MGT 20).* The data and personal interactions with the participants highlighted that they experienced multi-grade teaching to be on the same level as a scarce skill; they therefore expected that incentives be allocated to teachers teaching in (remote) multi-grade teaching schools. Incentives were seen as a means of attracting and recruiting specialists and quality teachers. In the age of technology, it seems that incentives related to technology, such as 3G cards, could also assist in breaking the isolation and bridging the digital divide, as prescribed in the White Paper on e-Education (Department of Education, 2004). By implication, the provision of incentives would seem to fall within the ambit of an external force such as the Department of Basic Education. Although the Department of Basic Education does provide incentives for scarce skills, these incentives do not seem to be implemented in the multi-grade context (Republic of South Africa, 1996b). These sentiments agree with one of the formulated recommendations by Joubert (2010), to the effect that incentives should be provided to *"reimburse teachers for their inconvenience and extra expenses"* (Joubert, 2010, p. 11).

4.4.3.4.2 Incentives for learners

The data highlight that the participants suggested the inclusion of incentives also for learners as a possible solution. In this regard, one participant mentioned in the focus group interview:

"If they should like ...the incentives don't be like not only salary wise for educators, like if you give the learners bicycles that have to travel, maybe, for 5 km and more. You know in these areas there are no transport routes here, because there is only a few. If you give these learners bicycles, quality food and warm drinks and those things, just so people will see that they really care about these kids and we will have more learners then at school every day" (FGI, MGT 3).

From the data, it seems that the provision of incentives should not be geared only at educators, as mentioned in the previous section, but should be extended to also include learners, i.e. a learner incentives scheme should be established whereby learners will benefit. Getting specialists to work in these schools seems to be challenging, but an incentives scheme would assist in recruiting specialists to work in these areas. Therefore, the data seem to be in alignment with the suggestions made by Benveniste and McEwan (2000), and Mc Ewan (2008), who contended that incentives for teachers and learners are important variables that could facilitate success in multi-grade teaching schools.

4.4.3.5   Encourage further research on multi-grade teaching

The data reveal that the participants suggested that further research be conducted on multi-grade teaching in order to find solutions to multi-grade challenges. Responding to the open-ended questionnaire, on participant stated, *"More research on multi-grade perhaps from an outside institution to help"(OEQ, MGT 11).* This need was also confirmed by another participant, who suggested on the open-ended questionnaire, *"Research on multi-grade" (OEQ, MGT 20).* The participants highlighted the importance of research on multi-grade teaching to provide solutions to their challenges. Although much research on multi-grade teaching has been done, there is still a need for further detailed research to assist the educators in these multi-grade classrooms, especially within the South African context. The data suggest that further research into multi-grade teaching will generate and unlock new knowledge and solutions to current challenges. Schools could be used as pilot studies, and the lessons learnt, would provide valuable contributions for multi-grade contexts. These views are shared by Juvane (2007) and Little (2006), who encouraged further studies in multi-grade teaching. Furthermore, it supports the views held by Joubert (2010), who called for research and sharing of best practices, supported by information technologies.

4.4.3.6   Provide sufficient resources

In terms of resources, the data explored the provision of physical and human resources as possible solutions. These are discussed in the next section.

4.4.3.6.1 Provide physical resources and financial support

The data reveal that the participants felt that the Department of Basic Education should provide proper school buildings as a solution to the physical resources challenges related to infrastructure experienced at multi-grade schools. During a focus group interview, one participant alluded to this, stating:

> *"Ja, [Yes] if you look at the challenges at my school: the infrastructure. We do not have like in solid buildings. And I am not only talking about the Department. There are so many other companies with their social responsibilities towards people. If they can come in and just build a solid structure where we can put in all these electronic equipment" (FGI, MGT 3).*

This need for proper infrastructure was also mentioned on the open-ended questionnaire by another participant, *"Improve infrastructure. Classrooms to adapt to suit more than one grade" (OEQ, MGT 1).* Another participant agreed, affirming during the personal interview, *"I don't think they can fix those classrooms – just put up new ones" (PIQ, MGT 16).* The data portray the need for safe and secure school buildings. The erection of new buildings lies within the ambit of the owner, who is, in most instances, the Department of Public Works. The data suggest that the solution would not be to repair the buildings, but to erect new ones, because the buildings at many schools were damaged beyond repair; therefore, the schools could not utilise their limited maintenance budgets because the damage was so excessive. The data reveal that infrastructural challenges, in terms of the buildings, space and electricity, pose major challenges in attempts to transfer a national curriculum effectively to learners from different grades, and of different ages and different abilities and capabilities within one classroom. The challenge of a stable power supply in rural areas suggests the need for finding alternative energy sources, as mentioned by one participant, who suggested on the open-ended questionnaire, *"Alternative power supply and 3G internet facilities should be supplied to schools" (OEQ, MGT 20).* Therefore, the data suggest that the Department of Basic Education should build schools with suitable infrastructure, to ameliorate the challenges of overcrowded, small, temporary and dilapidated classrooms. These sentiments are aligned with the views of Gardiner (2008), Jordaan and Joubert (2008) and Little (2006), who argued for the provision of proper infrastructure in multi-grade schools.

The data reveal that the participants also suggested an increase in financial support as a solution. The following was stated by a participant during a focus group interview, *"Ek dink daar moet fondse beskikbaar gestel word" [Translated into English: I think funds should be made available] (FGI, MGT 6).* Another participant agreed, stating during the focus group interview, *"Increase my funding" (FGI, MGT 3).* Another participant concurred, mentioning during the personal interview, *"En hulle kan gerus vir ons 'n groter begroting gee." [Translated into English: They should really give us more funds](PIQ, MGT 19).* The data highlight the financial challenges these small schools experienced

when they wanted to purchase resources. Therefore, they remained under-resourced and could not operate effectively without enough funding. The data therefore suggest that the provision of sufficient finances to multi-grade schools could alleviate many challenges, including ICT resource related barriers. These sentiments affirm the views held by Tsolakidis (2010), who stated that separate funds should be provided when resourcing multi-grade schools. It also agrees with the views of Joubert (2010), who recommended that provincial governments address planning and resourcing issues in multi-grade schools.

4.4.3.6.2 Provide human resources

The data highlight that the participants suggested the appointment of human resources: teacher assistants, support staff, and LSEN specialists, as a solution to ameliorate the workload overload they experienced. On an open-ended questionnaire, a participant referred to this, stating the need for, *"Support staff – cleaners, office admin staff and assistant teachers" (OEQ, MGT 2).* Another participant affirmed in the focus group interview the need for the appointment of support staff, with the option of sharing this support staff between various schools:

> *"Ek sal voorstel dat skole in een area, ons drie skole, dan gee hulle vir ons een sekretaresse, want ons skole het nie soveel werk om elkeen so persoon te regverdig nie. Maar drie skole kan so persoon gebruik. En dan natuurlik assistent-onderwysers wat ons kan help" [Translated into English: I suggest that schools in the same area, we three schools, that they give us one secretary, because each school does not have enough work to justify such a person. But three schools can utilise this person. And then obviously assistant teachers to assist us] (FGI, MGT 6).*

The data suggest that the appointment of support staff at multi-grade teaching schools could alleviate the workload of teachers. The purpose of providing access to education is positive and would contribute towards achieving the Millenium Development goals; dealing with curriculum transfer in such an environment in which one person is responsible for everything: the teacher of each grade and subject, remedial teacher, principal, admin clerk and support personnel, would become incrementally challenging. This implies that an increase in staffing could be experienced as a solution to the challenge. The data also reveal that the participants suggested that support staff be shared amongst schools in the same area, because school sizes did not justify the utilisation of one person per school. The appointment of support staff could alleviate the excessive workload caused by the multiple roles and duties attached to multi-grade teachers. The data imply that there would be more time on task for many multi-grade teachers, enabling them to focus more effectively on teaching and learning in the classroom.

The participants also alluded to the importance of having an LSEN specialist to assist learners with barriers to education. This was highlighted as follows by one participant on the open-ended questionnaire, *"LSEN – have a specialised teacher who can spend one day at a school and share this teacher among five schools to help these learners" (OEQ, MGT 11).* This itinerant teacher could travel and be shared between a few schools in a specific area or radius. This seems to be in line with the suggestions made by Cornish (2010) and Juvane (2007) regarding the recruitment of staff in multi-grade school settings.

Furthermore, the data also reveal that the participants suggested that the employment of classroom assistants could lighten the teachers' heavy workload as mentioned by a participant in the focus group interview, *"They must see how they can employ assistants ... we have to make use of assistants to help the teacher in assisting the kids to do the work" (FGI, MGT 1).* Another participant concurred during the personal interview, mentioning:

> *"Dit sal verskriklik help as die Departement regtig kan net onse hande kan ligter maak. Al beteken dit ons gee klas en die ander juffrou help net om die boekies te merk, of help net om te kyk dat die kinders hulle werkies doen, of wanneer ek in my kantoor iets moet gaan doen, dan sal daar iemand is wat opgelei is wat na die kinders kan omsien" [Translated into English: It would help if the Department could make our load lighter. Even if when we teach, the other teacher could help with the marking of books or help to ensure that the learners are doing their work or when I have go to my office to do something, then there will be a trained person to oversee the learners] (PIQ, MGT 19).*

During a focus group interview, a participant made mention of the fact that school youth could be employed as assistants, commenting, *"And this is where the Department can help with the unemployment of matrics where they can come assist in those schools and help the learners" (FGI, MGT 2).* Another participant concurred during a focus group interview, suggesting:

> *"Say, for example, a Grade 12 learner, who want to go into a teaching, then he can start in a class like this, while you are busy, he can help with the slower learners, he can assist you, he can help you with corrections or all those other things you have to do in the classroom" (FGI, MGT 3).*

The data highlight that the participating multi-grade teachers generally found it difficult to cope with classroom management and administration while also having to deal with many learners from different grades. The participants expressed the need for a classroom assistant, support staff and an LSEN specialist to make their load lighter so that they could concentrate on their core duty, namely teaching in the classroom. This implies that teachers should take responsibility for teaching and learning, while the classroom assistants would assist in classroom administration and management

duties in the classroom, such as marking books and collecting information and projects from the learners.

4.4.3.6.3 Provide ICT resources

The data reveal that many participants suggested that the provision of ICT resources in multi-grade schools could be a possible solution to ensure the success of ICT implementation. During a focus group interview, a participant referred to this, stating, *"Ja (Yes), the laptop thing must be fully equipped with all the support equipment with the laptop" (FGI, MGT 3)*. This was also affirmed by another participant, who made the following comment on the open-ended questionnaire, *"The laptop on its own is not an effective teaching aid. A projector or TV used in conjunction could prove to be useful. For sound/auditory learners, bigger speakers would assist" (OEQ, MGT 16)*. Another participant wrote on the open-ended questionnaire, *"More laptops in school – one for every teacher. Computer rooms for learners" (OEQ, MGT 3)*. Another participant concurred, suggesting the following during a personal interview:

> *"Ek sou sê die dataprojektor is baie belangrik, want dan skakel jy die klein groepe uit, die klein skerm uit. En dan ook die klein laptoppies, die classmates vir die leerders" [Translated into English: I would say a data projector is very important, because then you eliminate the small groups, the small screen. And then also small laptops, the classmates for the learners] (PIQ, MGT 5).*

From the data provided by the participants, it seems that there was a dearth of ICT resources at these multi-grade teaching schools. The participants felt that it was vital that the laptop provided, be accompanied by supporting ICT equipment, such as a data projector, to ensure that it would be used for teaching and learning in the multi-grade classroom. Therefore, the provision of the laptop with other resources such as a data projector, screen, 3G card for internet and email, and appropriate software, was regarded as essential and would assist in ICT implementation. These sentiments are in line with the arguments presented by BECTA (2004), Bingimlas (2006), Ertmer (1999), Goktas et al. (2009), Pelgrum (2001), Rodden (2010) and Schoepp (2005), who have posited that the success of ICT implementation is dependent on sufficient ICT resources and that there is a link between finances and resources.

4.4.3.7   Provide sufficient training in multi-grade teaching and ICT implementation

The data reveal that all the participants ranked training as a top priority and elaborated extensively on the training they desired and envisaged as solutions to the barriers experienced. Such training would prepare and equip existing teachers for ICT implementation and hone their multi-grade skills and could focus on Multi-grade teaching as a module for student teachers; Continuous

Professional Development (CPD) for in-service teachers; ICT implementation training; and follow- up sessions post training as solutions. These are discussed in the sections below.

4.4.3.7.1 Provide continuous professional development for in-service teachers

The participants suggested on-going continuous professional development as a solution to improving their preparedness to teach in multi-grade teaching schools. During a personal interview, one of the participants stated in that regard:

> *"Maybe if they can send us on a course. They [Department of Basic Education] were supposed to send us and then I don't know what happened, why they didn't send us for that particular course on multi-grade teaching. Because I think also that multi-grade teaching is a skill that needs to be taught and that the teacher can learn. And then that in itself will alleviate lots of the other problems that we are experiencing in our own classroom" (PIQ, MGT 16).*

This was affirmed by another participant, who stated on the open-ended questionnaire, *"Teachers need to be trained on multi-grade" (OEQ, MGT 19).* Another participant concurred, observing as follows during the focus group interview:

> *"One thing we should be well trained on is skills for a mgt class. There we need people with experience so we can take our best practices. And get those people to support, come to your school, see your circumstances in your class. Get people from universities. People or students from universities go to best schools, the urban schools. Send them out to these schools, go there and work there for a month and come back and share what you have experienced. So that we can talk on higher level about the problems and get solutions on a higher level. So that the skills that we can develop from this can help people in the mono-grade classes as well" (FGI, MGT 3).*

During a focus group interview, another participant concurred, stating:

> *"Ek dink daar moet fondse beskikbaar gestel word en programme van die Departement se kant af om ons hand te vat en ons op te lei in multi-grade teaching" [Translated into English: I think more funds and programmes should be made available by the Department to assist us by training us in multi-grade teaching] (FGI, MGT 6).*

In the focus group interview, another participant agreed, postulating as follows:

"So I think that really all teachers must be trained in multigrade fashion also, because you don't know when you're going to teach on the farm … you don't know what circumstance you are going to be in, and then you will have to be forced to teach on a farm" (FGI, MGT 1).

The data reveal that the participants recognised that their initial teacher training was insufficient to deal with the challenges in their multi-grade situations. On the open-ended questionnaire one participant affirmed this, stating, *"Sufficient training in multi-grade teaching" (OEQ, MGT 1).* Another participant agreed, mentioning on the open-ended questionnaire, *"Teachers need to be trained on multi-grade" (OEQ, MGT 19).* The data suggest that the participants viewed training in multi-grade specific skills as a vital aspect in addressing their unpreparedness to teach in multi-grade schools. The data highlighted that the participants felt that in order for them to be prepared to teach effectively in their multi-grade classrooms, they needed training in multi-grade teaching. This implies that they required training in multi-grade teaching skills, strategies and pedagogy. The participants regarded this training as vital for teachers who were all trained in mono-grade strategies. The multi-grade teaching context differs from mono-grade teaching and it is therefore important that teachers be properly equipped for the multi-grade teaching reality. It further implies that knowing how to work within this multi-grade reality would have a positive effect on teachers' attitude, motivation, and morale; this could possibly alleviate many other challenges these teachers have in terms of providing access to quality education to learners in isolated areas. The data also highlight that the participants felt that training should be aimed at smaller groups to enable more personalised attention in the training situation, so that they would leave the training venue knowing what to do in their classrooms. These sentiments support the views held by Juvane (2005), Kazinczi (2009), Little (2006), Mulkeen and Higgins (2009) and NWREL (2001), who suggested that training could ameliorate the unpreparedness of multi-grade teachers for the realities of multi-grade contexts. It furthermore supports the views of Joubert (2010), who argued for *"sustainable in-service training"* to assist teachers with coping strategies (Joubert, 2010,p.11).

4.4.3.7.2 Provide multi-grade teaching as a module in initial teacher training

The data suggest that the participants felt that multi-grade teaching and ICT integration should be included as a teaching module in initial teacher training. On the open-ended questionnaire, one participant suggested as follows, *"Universities to assist, like student teachers to have a compulsory multi-grade module" (OEQ, MGT 19).* This was affirmed by another participant, who stated as follows during a focus group interview:

"... en van die proefonderwysers wat kan uitgestuur word na skole met multi-grade klasse. Dit is mense wat dan sommer met die realiteit gedoen gaan kry met multi-grade klasse terwyl hulle 'n baie groot hulp kan wees. Ek het eenkeer vir 'n maand so proefstudent by my gehad en sy het wonderlike werk gedoen en terselfdertyd op hoogte gekom wat in 'n multi-grade skool gebeur en wat van so persoon verwag word" [Translated into English:*... and the student teachers who can be sent to schools with multi-grade classes; they will then be facing the reality of a multi-grade classroom, whilst they could also be of great help. I had one such student teacher for a month, and she did wonderful work, and at the same time gained experience of what happens in a multi-grade school and what is expected of a teacher in a multi-grade class"* (FGI, MGT 6).

During a focus group interview, another participant concurred, postulating:

"There is one university close to us where the fourth year students are in a classroom four days per week, so which means they attend one day a week university. If the university could assist farm schools in getting those so that these students can assist us with the knowledge, also that they be aware what a mgt classroom is. Because they are preparing them for monograde classes. And what if they get a post in the rural areas? You know the Fundza Lushaka learners, they are appointed permanent, no matter where, if there is a post at Stormsrivier they are appointed here, but do that learner have experience of multi-grade teaching? But if the university can send that learner for three months, just for experience's sake, to come help to assist" (FGI, MGT 1).

The data reveal that all the educators suggested that initial teacher training at Higher Education Insitutions (HEIs) should contain a module on multi-grade teaching, to ensure that the newly qualified teachers would be better equipped to deal with the challenges when they are employed at schools practising multi-grade teaching. The data reveal that the partcipants felt that there was a need for HEIs to support multi-grade schools by sending teaching students to experience this reality and share their skills and knowledge. Therefore, the data suggest that this specialised support by university students could bring expertise to multi-grade schools. This way, expert knowledge would filter down to these schools and the challenges experienced by the schools could be addressed at a specialised level. The importance of including multi-grade teaching strategies in an initial teacher training course was also emphasised by Joubert (2010), who has called for HEIs to stop training teachers only in mono-grade strategies and include multi-grade teaching strategies.

4.4.3.7.3 Provide ICT implementation training

The data indicate that the participants suggested the introduction of ICT implementation training in the multi-grade teaching context to ameliorate barriers to ICT implementation. During a focus group interview, a participant referred to this, stating as follows:

> *"I am talking about individual training, where you have a group of ten people or fifteen people and one person is working with those people on a specific thing how to do that. So that when you leave there, then at least you know how to do something. Interactive activities, how to draw up interactive activities, with the learners, so you can keep them busy so you always in contact with" (FGI, MGT 3).*

Another participant affirmed this during a focus group interview, when he stated:

> *"I would say accredited courses for teachers, with incentives. And also with the REQV adaption, that must be a accredited course. A recognised course from a recognised institution, like NMMU [Nelson Mandela Metropolitan University] or MSC [Business College] or any ICT College. How to use Excel and how to use it in the classroom, and how to teach it in the classroom. Training must be enough to empower the teacher to help him- or herself. I think after that we should be able to use our laptop with oomph [vigour]: we will be much more confident and competent if it is an accredited course with 10 to 15 people. How to use Excel and how to use it in the classroom, and how to teach the learner in that lesson, interactive lessons"(FGI, MGT 1).*

This was affirmed by another participant, who wrote as follows on the open-ended questionnaire, *"Training – on multi-grade skills for using the computers in the classroom"* (OEQ, MGT 2). Another participant stated during a personal interview, *"... how to use this laptop in the multi-grade class" (PIQ, MGT 11).* This was also affirmed by another participant, who responded as follows on the open-ended questionnaire, *"More training on how to use the laptop for the classroom"(OEQ, MGT 4).* Another participant concurred, stating on the open-ended questionnaire, *"More training to ensure more confidence"(OEQ, MGT13).* The data suggest that the participants felt that the training should be accredited by a recognised institution. The data also suggest that the training should include incentives for the teachers. From the data it seems that the training content should focus on classroom teaching strategies and skills. ICT training should be inclusive of ICT implementation and how to integrate the technology into the curriculum. From the data, it seems that training in computer literacy was not regarded as sufficient: teachers should be enabled and equipped to use the laptop within the classroom context for teaching and learning.

The data further imply that the training must be classroom orientated. Hence, this envisaged ICT training, as suggested by the participants, should be within the multi-grade context in order for these teachers to implement ICT successfully for teaching and learning in the multi-grade classroom. This implies that ICT skills, ICT integration and pedagogical issues need to be addressed to assist educators in using laptops in the classroom. These sentiments support the views held by Albirini (2006) Balanskat et al. (2006), Beggs (2000), Demetriadis et al. (2003), Ertmer (1999), Ozden (2007), Pelgrum (2001), Schoepp (2005) and Toprakci (2006), who have identified training as vital in ameliorating and eradicating ICT integration barriers. Furthermore, these sentiments support the views held by Bingimlas (2009), Goktas et al. (2009) and Gray (2011), who argued that in-service training is very important for the successful implementation of ICT integration. In addition, these sentiments also seem to be aligned to the argument espoused by Creighton (2003), Gomes (2005), Newhouse (2002) and Rodden (2010), namely that training should include implementation skills within classroom context, i.e. it should include ICT integration and pedagogical issues. The above sentiments agree with the views of Plante (2005), Ertmer (1999) and Vallance (2008), who suggested that teachers should be capacitated through continuous professional development programmes. It further supports the view of Fullan (2006), who stated that the implementation of ICT should be done within context, as well as the views held by BECTA (2004), Rodden (2010) and Scrimshaw (2004), who suggested that the ICT confident educators are more likely to implement ICT integration in the classroom.

4.4.3.7.4 Providing follow-up sessions after training

The participants suggested that there should be follow-ups after training sessions. This was alluded to by a participant, who stated during a personal interview:

> *"Ons dink byvoorbeeld die kursusse, wat aangebied word; ons woon kursusse by, maar daar is geen opvolg na dit nie" [Translated into English: We think for example, about the courses we attend; we attend these courses, but there is no follow up courses afterwards] (PIQ, MGT 17).*

The participants felt that training sessions needed follow-up sessions. The participants identified it as a shortcoming that the training sessions they attended, were not accompanied by follow-up sessions. This implies that participants should be given the time to apply the skills and knowledge from the training in the real-life context. This follow-up sessions would allow them to address issues they may have experienced challenges with during the implementation of the newly acquired skills and knowledge. Therefore, training cannot be approached as a once-off event. Although other educators have not commented about this, Bradshaw (2002) suggested that developmental programmes should include follow-up activities afterwards. These views are also supportive of the argument of Fullan (2006), and Surry et al. (2004), who stated that professional development is a process and not an event.

4.4.3.7.5 Establish partnerships with different stakeholders

The participants suggested the establishment of partnerships between sister departments, and other spheres of government, as well as private companies, as a solution to ameliorate challenges related to the isolation, learning challenges and high absenteeism rates of learners within the rural context. This was mentioned during a personal interview, when one participant stated as follows:

"Sodoende kan ons dink aan die verskillende stakeholders soos Gesondheid; ons kan dink dokters wat ver is om dit nader na die kind te bring" [Translated into English: In this way we can think of various stakeholders like Health – we can bring the doctors closer to the learners] (PIQ, MGT 17).

During a focus group interview, a participant suggested that the Department of Basic Education should form partnerships with media companies as a solution to LTSM resources challenge:

"I would really like the Department to talk to the media, like Naspers, in order to maybe let each school, maybe, for instance, get five different newspapers for each school in a certain area. In the Tsitsikamma area, there are ten schools and five newspapers for each school. Here, we only have the Burger and the Herald and it means it is only two newspapers and it can come from our budget, too ... then we can start our own library, like that. Me as a teacher, I buy and I also have children at home and I use my newspaper for my children. So, if the school receive their own newspaper, then it belongs to the school" (FGI, MGT 1).

From the data, it seems that the disadvantaged communities served by schools where the participating teachers were stationed, also could not afford to support their learners with LTSM like newspapers and magazines from home. The limited school budgets could not bring the outside world to the learners through the media – a partnership could have allowed these learners insight into events and developments outside their reference world. The data also reveal the importance of forming partnerships with societies such as AMESA, as suggested by one participant during a focus group interview:

"You see also we can hear, maybe the Department can contact AMESA, or the Maths, what's this professor's name in PE? in Afrikaans Wiskunde Stigting [Maths Institute]. If they can assist us also, the Department, in getting programme lessons, like you said, and they load it onto the computer. The kids, while you are busy with one group, one group can do that Maths on the computer. Because the Wiskunde Stigting [Maths Institute] do have that. I think AMESA is linked with the university and our nearest university is NMMU [Nelson Mandela Metropolitan University] which is 200 km from us" (FGI, MGT 1).

Therefore, when schools are affiliated to societies like AMESA, expertise is brought to the classroom. New ideas, expertise and methodologies are shared, which breaks the isolation and encourages self-efficacy and improved teacher performance. These sentiments are aligned with the views of Joubert (2010), who stated that, through partnerships, solutions may be found.

4.4.3.7.6 Closure and merger of multi-grade schools

One participant in this study suggested a solution in terms of which two multi-grade teaching schools sharing the same premises could be merged to form one school, in order to ameliorate the heavy overload they experienced. During a personal interview, one participant suggested that teachers' multi-grade challenges could be ameliorated if they were to merge with a school on the same premises, "*… my school is in the same premises with another school, amacolourds. So I think the first solution is if the Department can merge the two schools. That will reduce at least the workload" (PIQ, MGT 9).* Although none of the other participants suggested the closure and merger of their schools as a solution to multi-grade teaching challenges, this suggestion is in line with the view held by the Department of Education (2009b), as reflected in its guidelines on the rationalisation of small and non-viable schools.

4.5   THEME 4: POSITIVE AND NEGATIVE ASPECTS OF THE INTEL® TEACH INTERVENTION PROGRAMME

The primary focus of this theme is based on the fourth secondary research question, *"What did they (the participants) perceive as the positive and negative aspects of the Intel® Teach Training Programme?"* The findings from the data pertaining to this question only related to first and second order barriers. No data related to third order barriers were suggested by the participants. Table 4.4 provides an overview of the positive and negative aspects related to the intervention programme.

TABLE 4.4: Table of positive and negative aspects of intervention

TYPOLOGY	CATEGORIES	SUB-CATEGORIES
4.5.1 First order aspects related to training context	4.5.1.1 Positive aspects related to training context	4.5.1.1.1 Variety of training material resources
		4.5.1.1.2 Knowledgeable, supportive and caring facilitators
		4.5.1.1.3 Conducive and supportive training environment
		4.5.1.1.4 Achieving the Intel outcomes
		4.5.1.1.5 Breaking the isolation through collaboration and sharing
	4.5.1.2 Negative aspects pertaining to training	4.5.1.2.1 Unsuitable time of training sessions
4.5.2 Second order aspects related to the self	4.5.2.1 Positive aspects related to learning	4.5.2.1.1 Perceiving learning experience from a learner's perspective
		4.5.2.1.2 Exepriencing learning as a life-long process
	4.5.2.2 Positive aspects related to the self	4.5.2.2.1 Developing a positive attitude and engendering confidence
	4.5.2.3 Positive aspects related to teaching with technology	4.5.2.3.1 Assisting teachers with teaching and learning transforming traditional practices
		4.5.2.3.2 Enabling teachers to become supporters of peers
	4.5.2.4 Negative aspects related to the self	4.5.2.4.1 Different skills levels of participants caused frustration during the training sessions

4.5.1   FIRST ORDER ASPECTS RELATED TO TRAINING CONTEXT

The data reveal that the participants had both positive and negative experiences in terms of aspects pertaining to first order barriers. These are discussed and presented below.

4.5.1.1   Positive aspects related to training context

The data reveal that all the participants experienced the training programme as positive. In terms of the first order positives, the positive experiences centred around the training material resources; knowledgeable, supportive and caring facilitators; the conducive and supportive training environment; achieving the Intel® Teach outcomes; and the collaborative sharing, which seemed to break down the isolation they experienced. These are presented and discussed below.

4.5.1.1.1 Variety of training material resources

The participants commented that access to a variety of training material resources was experienced as a positive aspect. This was alluded to by a participant in responding on the open-ended questionnaire, *"The training material was enough for everybody. There was a CD and a manual. Instructions were clear and it was user friendly" (OEQ, MGT 8)* and affirmed by another participant in a response on the open-ended questionnaire, "*The training material was enough for each one in the*

workshop. I could use it at home and it was not difficult. The training material guided how the workshop would be, so we could follow even if you missed something the trainer discussed" (OEQ, MGT 3). Another participant mentioned during the focus group interview that another valuable resource used during the training sessions was internet related, commenting, *"Then our access to the internet and to other resources. That helped a lot"(FGI, MGT 3).* During the focus group interview, another participant affirmed the value of such access when he stated, *"Having internet as a source and resource is very helpful for a teacher" (FGI, MGT 2).*

The data suggest that there was sufficient training material for each of the participants, such as training manuals, (in cd format), as well as internet based resources. The participants felt that having the internet as an available resource helped them to source information. From the data, it seems that the training material was not utilised only in the training venue, but that the participants used it as a self-help reference outside the training venue. The participants indicated that the training material provided, was user friendly and assisted them with keeping up with the pace of the workshop. It therefore seems that access to sufficient training resources during training sessions could impact on the way in which participants experience training. These sentiments are aligned with the views of Baskin and Williams (2006), BECTA (2004), Beggs (2000), Bingimlas (2009), Schoepp (2005) and Tearle (2003), who suggested that access to training resources plays a major role in the implementation of ICT integration. Access to sufficient resources, as mentioned by the participants, was also emphasised by Rodden (2010), who suggested that there should be sufficient resources available to facilitate the implementation of ICT integration.

4.5.1.1.2 Knowledgeable, supportive and caring facilitators

The data suggest that the participants regarded the support they received from the trainers during and after the training sessions as positive and helpful. This became evident during a focus group interview, when one participant mentioned:

> *"The support after the training was very good. I could rely on the trainer for helping us in something when we don't are certain about and how we are going to use the training material. Because it is not only during the training that you do understand everything. The support ... we go back and we re-read the material and listen to the CDs that are available in the training material, so in order for us to experience and get more experience, we rely on our trainer and our peer group to work together with us in supporting us and to see how the material can benefit us so than we can get more out of it" (FGI, MGT 1).*

During the focus group interview, another participant stated, *"First of all the trainer, the way it was presented, was in a very relaxing and friendly manner. We did not feel in any way intimidated"* *(FGI, MGT 2)*. Another participant concurred, stating during the focus group interview:

"Nee, vir my was hulle absoluut ongelooflik dat hulle so baie van hierdie laptop geweet het en vir elke probleempie wat ek gehad het, hulle 'n oplossing gehad het" [Translated into English: No, for me they were absolutely incredible, the fact that they knew so much about this laptop and for each little problem I had, they had a solution" (FGI, MGT 6).

This was also affirmed by another participant, who commented as follows during the focus group interview, *"Wat vir my positief was, was dat jy kon gaan vra (vir die fasiliteerder). Weet, as jy vasgehaak het, kon jy gaan vra het" [Translated into English: What was positive for me was that you could ask (the trainer). You know, when you got stuck, you could ask (the trainer)] (FGI, MGT 5).* Yet another participant concurred, responding as follows on the open-ended questionnaire:

"The trainer was helpful. The sessions were fruitful. I was comfortable asking questions. They always left us with contact details for possible interventions. The trainers know their stuff and was well prepared. They were on time and did not waste our time. The training gave us the impression that someone cares about us in our isolated situations and what we do is valued. This made us feel very proud to do the training sessions, because now we could compare with the urban teachers and even be more computer skilled and confident. They are now asking us to help them" (OEQ, MGT3).

The participants also highlighted the approachability and caring attitude of the trainers. Responding on the open-ended questionnaire, one participant wrote:

"The trainers showed interest in our work; they cared about whether we could do the things on our own as a group and by ourselves. It made me feel valued and I also value the training because I improved my skills and knowledge and could apply it in my whole life as a teacher and a fellow colleague and in my community and family life"(OEQ, MGT 16).

The data highlight that various factors served to motivate and inspire the participants. The participants suggested that the fact that they felt that their work was being valued, and the care they experienced from the trainers were the internal triggers for their increased sense of motivation and inspiration. The data suggest that the support the participants received from the trainers were regarded as a highly positive aspect of the training. The participants experienced the trainers as helpful, supportive, friendly, they created a relaxed and conducive environment, which contributed greatly to

the positive experience of the training sessions. The participants indicated that they did not feel intimidated and were comfortable asking questions, knowing the trainers would come up solutions. The data also reveal that the participants were pleased that the trainers knew so much about laptops and had a wealth of knowledge to impart. The trainers also assisted them outside the workshop environment. These sentiments agree with the views of Du Plessis (2010), Du Plessis and Webb (2012a, 2012b), Harris (2002) and O'Connor and Ertmer (2006), who contended that facilitator characteristics could impact positively on training sessions. It furthermore seems to concur with the view on motivation held by Ormrod (2004) and also seems to be aligned with the sentiments held by Du Plessis and Webb (2012) on the care aspect of the $C^2RHOAR^3FS^2R^2$ framework.

4.5.1.1.3 Conducive and supportive training environment

In addition to having knowledgeable, caring and supportive facilitators, as presented in section 4.5.1.1.2, the data suggests that the conducive and supportive training environment was another aspect experienced as positive by the participants. This was alluded to by one participant, who stated on the open-ended questionnaire, *"The groups were small and manageable. You could always get personal attention. Selection of the groups were such that our experiences and challenges were more or less the same and we could work on common problems"(OEQ, MGT 3).* Another participant concurred, stating on the open-ended questionnaire:

> *"Die groep onderwysers waarmee ons[saam] was, het mekaar ondersteun en dit*
> *was lekker om te weet daar is iemand na wie toe jy kan gaan as jy vashaak"*
> *[Translated into English: The group of teachers of which we formed part, supported*
> *one another and it was good to know that there was someone you could turn to when*
> *you got stuck] (OEQ, MGT 19).*

During the focus group interview, another participant concurred, referring to the training environment as "*relaxed and unintimidated, at ease" (FGI, MGT 2),* whilst another participant highlighted on the open-ended questionnaire the importance of respect in a training environment, commenting, *"I enjoyed the respect everybody had for each other's opinion and work" (OEQ, MGT 8).* Invisible aspects such as a relaxed environment, respect, and camaraderie in a suitable venue contributed towards a conducive and enabling environment for learning new skills. The data imply that all these aspects in the training environment as identified by the participants were important aspects that determined trainees' experiences of the training session. This seems to be in line with the views of Du Plessis (2010), Du Plessis and Webb (2012a; 2012b) and Granger, Morbey, Lotherington, Owston, and Wideman (2002), who referred to the importance of the training environment in their discussion on the transferability of newly acquired skills.

4.5.1.1.4 Achieving Intel outcomes

The data highlight that the participants suggested that the intended outcomes of the Intel intervention had been achieved, which was perceived as a positive aspect. This was confirmed by a participant, who stated on the open-ended questionnaire, *"Kursus se uitkomste was duidelik en is bereik" [Translated into English: Course outcomes were clear and were achieved] (OPI, MGT 5).* This was also affirmed by another participant, who responded as follows on the open-ended questionnaire, *"The outcomes were achieved. I learnt more about the computer, critical thinking and using the laptop in the classroom making my own interactive lessons" (OEQ, MGT 9).* Another participant concurred, sharing on the open-ended questionnaire, *"Well, I was empowered. I can use the laptop now. So the outcomes were achieved"(OEQ, MGT 11).* From the data, it seems that the training outcomes were clear and were achieved. This confirmation regarding the outcomes was needed for successful training, which seems to be in line with what Downes, Fluck, Gibbons, Leonard, Matthews and Oliver (2001) and Du Plessis (2010) and Du Plessis and Webb (2012a, 2012b) suggested, i.e. that the outcomes should be clear, realistic and achievable for successful ICT skills transfer.

4.5.1.1.5 Breaking the isolation through collaboration and sharing

The data suggest that the participants highlighted the collaborative sharing of ideas with one another and with the trainers both during and after the training sessions as a positive experience. During a focus group interview, one participant alluded as follows to the collaborative sharing and networking with fellow participants that followed as a result of acquiring new skills during the training sessions:

> *"For me to get contact through my colleagues and through email, that was something else I have never done before and that help me a lot through the communication with our friends. Working together, to share our problems, to share our tasks or assignments, to help each other with that. I think it helped us a lot with that" (FGI, MGT 20).*

Responding on the open-ended questionnaire, another participant concurred as follows:

> *"Dit was lekker om met kollegas oor dieselfde probleme te kan gesels en te weet jy sukkel nie alleen nie. Daar is iemand wat dalk 'n oplossing het. Ons het mekaar goed ondersteun"[Translated into English: It was nice to discuss similar challenges with colleagues and to know you are not struggling alone. There is someone who may have a solution. We supported one another very well] (OEQ, MGT 6.)*

Another participant concurred, stating on the open-ended questionnaire, *"The training helped me to think outside my location. I could go in the internet and look for solutions outside my school and district" (OEQ, MGT 3).*

During the focus group interview, another participant postulated:

"As ek miskien iets oor die kursus self of die omstandighede rondom die kursus, ek dink tog dat uit die kursusse uit en saam met die trainer en die groep wat saamgewerk het, het daar nuwe vennootskappe vir multi-grade gekom. Want in jou omgewing is jy altyd, is jy besig met, of nie al die skole naby jou het dieselfde omstandighede nie, so jy voel half gëisoleerd. En die kursusse het nie net gemaak dat jy rekenaarvaardig geraak het nie, jy het ook ander mense leer ken wat jy kon sê, wat doen jy in hierdie situasie? Wat doen jy in daardie situasie?" [Translated into English: If I may mention something about the training or the circumstances around the training, I think that from these training courses and with the trainer and the groups that worked together, new partnerships for multi-grade developed. Because in your surrounding area, not all the schools have the same circumstances and you feel somewhat isolated. The training did not only empower you to become computer literate, you also met other people whom you could ask: What do you do in this situation? What do you do in that situation?](FGI, MGT 5).

The data reveal that the participants had gained skills and knowledge and developed critical thinking. This implies that they started to think differently than before the training and were not confined to thinking only within their school or themselves, but outside their contexts. The data therefore imply that the empowerment that the training brought, developed their thinking to find solutions beyond their physical space. This speaks to the critical thinking mind required from ICT implementers. From the data, it seems that this ability to think critically, creatively, outside the box, was not an automatic progression, but developed through training and practice; it was not a once-off event, but a process that developed over time. The data suggest that the workshop facilitated the formation of a collaborative community of learning and sharing. These collaborations, formed during the training sessions, broke the isolation experienced by the participants working in remote and rural multi-grade schools; they learned to rely on their fellow participants during and after the training sessions for support and information. The data also suggest that the training sessions provided the platform for establishing a collaborative community of learning, which could eradicate the isolation the teachers experienced in their rural and remote locations, especially the isolation experienced by teachers in one-teacher schools. Abuhmaid (2011), Du Plessis (2010), Du Plessis and Webb (2012a; 2012b), Fiszer (2004) and Vrasidas and Glass (2005) concur, arguing for communication, and sharing practices and experience between teachers to improve their ICT integration.

4.5.1.2   Negative aspects pertaining to training

Although not many negative aspects were highlighted by the participants, it is important to note the negative aspects, since these could assist with future ICT training intervention programmes for multi-grade teachers. The first order negative aspect was related to time and is indicated below.

4.5.1.2.1 Unsuitable time of training sessions

The data reveal that some of the participants expressed their dissatisfaction with the time during which the training sessions were held as a negative aspect of the training. One participant mentioned during a focus group interview, *"And one thing, I don't like working on a Sunday" (FGI, MGT 2).* This was affirmed by another participant responding as follows on the open-ended questionnaire, *"Sunday morning training. Some of us go to church on Sundays" (OEQ, MGT 12).* Another participant concurred, stating on the open-ended questionnaire, *"Timeframe – I disagree with training sessions on a Sunday, because I go to church, and it is against my religious beginsels [beliefs]" (OEQ, MGT18).* Also responding on the open-ended questionnaire, another participant wrote that being away from her family for a weekend was a negative aspect of the *training "... only to be away from my family for the weekend" (OEQ, MGT 14).* From the data, it seems that the fact that the training sessions were held over weekends, especially on Sundays, were experienced as a negative by the participants, due to other commitments, such as attending church, and their religious beliefs. From the data, it seems that scheduling training for Sundays did not suit the teachers. In this regard, Galanouli, Murphy and Gardner (2004) and Mathew, Callaway, Letendre, Kimbell-Lopez, and Stephens (2002), contended that training should suit teachers' time-frames, cautioning against training that is abusive of teachers' non-work time.

4.5.2   SECOND ORDER ASPECTS RELATED TO THE SELF

The data highlight that the participants had positive and negative experiences of the training sessions in terms of the second order aspects related to the self, i.e. aspects related to learning, the self and teaching with technology. These are discussed below.

4.5.2.1   Positive aspects related to learning

From the data responses, the participants had positive experiences related to the learning process. In the section below, a brief discussion of the positive aspects in terms of the learning experience and learning as a life-long experience is presented.

4.5.2.1.1 Perceiving learning experiences from a learner's perspective

The data suggest that the participants expressed that their learning experience was a positive aspect of the training sessions. Although this seems to be similar to experiencing the training context as

positive, an aspect that was referred to in section 4.5.1.1.3, referring to the first order, these positive learning experiences also resonate with the self. It is therefore argued that some aspects could straddle the barrier typology, hence the reference that this positive dimension may also relate to the 'self' section. A participant indicated her positive experience of the learning experience as follows on the open-ended questionnaire, *"I enjoyed the workshop very much" (OEQ, MGT 9)*. Another participant concurred, stating on the open-ended questionnaire, *"Ek het dit ontsettend baie geniet" [Translated into English: I enjoyed it [the training] tremendously] (OEQ, MGT 5)*. During a focus group interview, another participant affirmed this positive learning experience, stating, *"I enjoyed the training" (FGI, MGT 1)* and another participant stated in the focus group interview, *" ... I enjoyed the training so that I can bring that back to my kids" (FGI, MGT 20)*. Another participant commented on the open-ended questionnaire, *"Dit was baie lekker om weer 'n leerder te wees" [Translated into English: It was great to be a learner again] (OEQ, MGT 19)*. The positive learning experience was also affirmed by yet another participant, who mentioned during a focus group interview, *"... Learn from one another. Involvement of all in the class" (OEQ, MGT 18)*.

The data highlight that all the participants had positive learning experiences of the training. The data suggest that the learning environment was experienced as relaxed by the trainees. The data also reveal that the participants expressed that they enjoyed the learning in the training sessions as a fun activity. These positive learning experiences could influence their attitude and behaviour towards the implementation of the knowledge and skills acquired. Therefore, the data confirm that the learning experience in the training sessions was experienced as enjoyable and fun. The data also reveal that the participants experienced learning in the training sessions not as teachers, but as learners. They generally attributed this positive learning experience to learning from one another; the involvement of all the learners in the training sessions; counting on their "teacher" (the knowledgeable and supportive facilitator, as discussed in section 4.5.1.1.2) for assistance; the relaxed atmosphere (the conducive and supportive training environment, as discussed in section 4.5.1.1.3); and the fact that the level of the training was not above their heads. Therefore, this seems to imply that the various aspects related to the actual learning experience during the training sessions were experienced in a positive manner by the participants. The data suggest that the entire training session had been placed under a microscope by the participants and that their experience of the learning environment greatly affected the impact of the training and the implementaion of ICT integration. This agrees with the views held by Collis and Jung (2003), who postulated that ICT integration takes place more readily if teachers experience it as learners. Awan (2011), Du Plessis (2010), Du Plessis and Webb (2012a; 2012b), and Mahn and John-Steiner (2002), concurred that a positive experience of a training programme, such as a relaxed learning environment, affects the implementation of ICT integration. Furthermore, these authors share the views of Burns (2002) and Du Plessis (2010) and Du Plessis and Webb 2012a; 2012b) who stated that real-life contexts of training enhance the enjoyment aspect of training; hence, a positive self-related experience.

4.5.2.1.2 Experiencing learning as a life-long process

The data reveal that the Intel® Teach training was experienced as a learning experience that could be classified as an on-going process, hence self-experiencing learning as a life-long process. This became evident when participants suggested that what was positive about the Intel® Teach training was that it actually made one willing to learn. In this regard, one participant commented as follows on the open-ended questionnaire, *"Willing to learn, it is a life-long learning process. Yes, practice makes perfect. I am never too old to learn" (OEQ, MGT 18).* Another participant added that she experienced the Intel training as an opportunity to learn beyond not only her initial training in the seventies, but to enable her, as a life-long learner, to acquire new skills. She put it like this:

> *"Ja, ek het my onderwysopleiding in die sewentigs, so toe was daar nie eens sprake van hierdie tegnologie nie. Aangesien en ek nou alreeds ouerig is, is my kinders alreeds jare gelede uit die huis uit, was ek nooit blootgestel aan rekenaars of tegnologie nie. So dit was vir my, alhoewel ek bang was daarvoor, was dit vir my 'n wonderlike ervaring. En het ek 'n nuwe mens gevoel en trots gevoel op myself dat ek nou besig was om rekenaargeletterd te word. Ja, dit het my definitief verplaas van voor computers na after computers. So ek het 'n nuwe fase in my lewe betree."* [Translated into English: Yes, I trained as a teacher in the seventies. Then there was no talk of this technology. Since I am already somewhat elderly and my children have left our home many years ago, I was never exposed to computers or technology. So for me, even though I was very scared, it was a wonderful experience. And I felt like a new person and very proud of myself, because I am now computer literate. Yes, it definitely placed me from before computers to after computers. So I have entered a new phase in my life. And I felt like a new person and I was very proud of myself because I was becoming computer literate] (FGI, MGT 6).

The data suggest that the participants realised that they could not rely on their initial teacher training and that learning was not a finite process or a once-off event, but a life-long process. The participants also realised that they were never too old to learn. The data therefore seem to refute the claim by Love (2002), who postulated that younger teachers are usually more technology savvy than more mature teachers with more teaching experience. These sentiments are in alignment with the view held by Ferrero (2003), who argued that age does not affect the way in which teachers engage with ICT. Furthermore, the data seem to be aligned with the White Paper on e-Education by the Department of Basic Education (2004), which encouraged life-long learning. This discovery of new skills and knowledge is in line with what is expected of life-long learners. These sentiments agree with the view of Lawless and Pellegrino (2007), who argued for the on-going professional development of teachers. This, therefore, shows the importance of the self in terms of learning.

4.5.2.2 Positive aspects related to the self – attitude and confidence

The data responses indicate positive learning experiences related to the self. In the section below, a brief discussion is presented of the positive aspects related to developing a positive attitude and engendering confidence, as well as experiencing learning as a life-long process.

4.5.2.2.1 Developing a positive attitude and engendering confidence

The data suggest that the participants felt that their increased skills and knowledge equipped them with the required confidence to utilise their laptops in their classrooms, as a positive aspect of the training. This was confirmed during the focus group interview, when a participant mentioned, *"I see this as a light in my life, because I have never been computer literate and now I can do something on my computer and also help the learners to do something" (FGI, MGT 20).* Responding to the open-ended questionnaire, another participant affirmed this, postulating, *"Ek kan nou die rekenaar met baie meer selfvertroue gebruik en weet ook nou hoe om die laptop in my klas te gebruik" [Translated into English: I can now use the computer with much more confidence and I also know how to use the laptop in my classroom] (OEQ, MGT 15).* Another participant concurred, commenting on the open-ended questionnaire, *"Yes, I can use the laptop with confidence now. I feel empowered. I can use the laptop for teaching and learning in my classroom" (OEQ, MGT 8).* Some of the participants expressed a positive attitude towards ICT implementation in their classroom, as a spin-off from the training. This increased confidence and more positive attitude was mentioned by one participant, responding on the open-ended questionnaire, *"Yes, I overcame my fear of the computer" (OEQ, MGT 9).* Another participant concurred, commenting on the open-ended questionnaire:

> *"Ja, ek het nou genoeg selfvertroue dat ek nie 'n flop sal maak nie, want ek weet presies wat om waar te druk en watter program om te gebruik."[Translated into English: Yes, I have enough confidence now that I will not make a flop, because I know exactly what to press where and which programme to use.] (OEQ, MGT 19).*

In the focus group interview, another participant mentioned as follows, *"We now have the necessary skills and confidence to teach with computers at our school. It helped us to think outside the box"(FGI, MGT 3).* Also during the focus group interview, yet another participant concurred, mentioning:

"Ek het daar gekom met my laptop, nadat hy 'n paar maande net daar gestaan het en ek net vir hom gekyk het en te bang was om hom uit die sak te haal, want wat gaan ek nou maak met hom? En ek moet definitief sê, die training het dit definitief aangespreek, want vandag voel ek heeltemal gemaklik" [Translated into English: I arrived there with my laptop after it had just been standing for months and I just stared at if, too afraid to take it out of the bag, because what was I going to do with it? And I must definitely say that the training addressed this, definitely, because today I am totally comfortable with it] (FGI, MGT 6).

Another participant concurred, also stating during a focus group interview:

"Ek dink dit het definitief 'n positiewe invloed gehad op dit wat mens voor die tyd gedoen het en dit wat jy nou doen. Nou kan jy skielik, jy het nou hierdie instrument gekry en nou kan jy wow! So, ja, ek is baie positief daaromtrent" [Translated into English: I think it (the workshop) definitely had a positive influence on what one could do before and what one can do now. Now you can, you have this instrument and now you can wow! So, yes, I am very positive about this] (FGI, MGT 5).

The data suggest that the learning and mastery of ICT skills and knowledge was a positive experience for the participants. Their ability to master the skills and knowledge presented during the training sessions seems to have encouraged a more positive attitude and increased confidence to operate their laptops for teaching and learning. The data highlight that the participants' confidence and competence levels increased, which in turn saw them implement the training skills and knowledge, enabling ICT implementation, through designing their own lessons. Various views exist on the correlation between positive attitudes, computer experiences, competence and comfort. Schumacher and Morahan-Martin (2001) posited that there is a correlation between computer experiences, positive attitudes, competence and comfort with using computers, as stated by the participants above. Becker and Riel (2000) and Tasir, Abour, Halim and Harum (2012) concurred stating that participants gain enough ICT knowledge through training sessions, which encourage them to implement ICT integration.

From the data it is also evident that the participants initially feared to use their laptops. This fear of laptops was driven by their fear of failure. The data suggest that this fear of laptops was so real that the participants did not even dare open their laptop bags, because they did not know what to do with the laptops. This fear hindered ICT implementation in the multi-grade classroom. They felt that they should stay as far away from the laptops as possible. The data suggest that the training intervention assisted the participants in overcoming this fear. The training sessions assisted in breaking down their fears. From the data, one can infer that this fear dissipated once the participants had grown in confidence, skills and knowledge through the ICT training, which led to the implementation of ICT in

their classrooms. This concurs with the views held by Beggs (2000), Kazinczi (2009) and Rodden (2010).

4.5.2.3 Positive aspects related to teaching with technology

The data highlight that there were positive aspects related to teaching with technology. In this study, these were related to a mindset change related to old practice and the encouragment of skills transfer by supporting their peers.

4.5.2.3.1 Assisting teachers with teaching and learning transforming traditional practices

The data reveal that the participants suggested that the training had assisted in transforming their traditional practice, which was seen as a postive aspect of the training. This was confirmed by a participant responding to the open-ended questionnaire:

> *"Dis soos 'n nuwe wêreld wat vir jou oopgaan. Jy kan nie glo jy kan nou al hierdie goed met die rekenaar in die klaskamer doen nie"[Translated into English: It is like a new world opening up. You cannot believe that you can now do all these things with the computer in your classroom](OEQ, MGT 14).*

Another participant concurred, responding to the open-ended questionnaire, stating:

> *"Now I realise that one can use a laptop, even if it is just one, and teach with technology and apply it in a multi-grade classroom; you don't have to have a lab. I can do my own research, and I am not dependent on a textbook for knowledge, because I can surf the net for information, sample lessons and keep my own lessons and share them with my peers" (OEQ, MGT 9).*

During the focus group interview, another participant concurred, commenting, *"Yes, dit het, ek wil amper sê, dit het wêrelde oopgemaak [in die klaskamer]"* [Translated into English: Yes, it dit, I nearly want to say, it opened up new worlds [in the classroom] (FGI. MGT 5). During a focus group interview, another participant shared the following:

"Ek het nie opleiding in die nuwe kurrikulum gehad nie. Ek het op die ou manier in die nuwe kurrikulum ingespring. Dit het vir my ontsaglik baie beteken. Die meeste van die ou dinge moes ek nou agtergelaat het. Dis 'n manier waarop ek inligting in die nuwe kurrikulum kan kry en die nuwe metodes. En ek is oop vir ontwikkeling. Dit het my laat besef uit dit wat ek geleer, ek betree 'n nuwe fase in die onderwys en ek kan nou dit gebruik. Ek hoef nie meer op die ou metode aan te gaan nie"[Translated into English: I have not received training in the new curriculum. I jumped into the new curriculum in the old way. It (the training) meant a whole lot to me. Most of the old things I left behind, and this was a way in which I gained information into the new curriculum and the new methods. And I am open to development. It made me realise, through that which I have learnt, that I have entered a new phase in education and I can now use this. I do not have to continue with the old methods](FGI, MGT 7).

This was also emphasised during the focus group interview, when another participant stated:

"Definitely, Intel have a lot to do with my teaching style, because first I got the challenge of writing on the blackboard, setting up papers by hand, doing marks by hand and using calculators, now I can use my laptop by using different programmes in order to do my work. Yes, before Intel, I was really, could not really use, I know how to use the computer, but Intel really helps me a lot. It was a catalyst for me, because it has changed my mind about computers and what you can do… " (FGI, MGT 1).

Most of the participants expressed that what they had learned in the training sessions was immediately utilisable, which they regarded as a positive aspect of the training. This was confirmed by one participant, who mentioned during the focus group interview, "*I enjoyed the training, because the skills that I was taught, I could do [implement] it in my classroom*"(FGI, MGT 1). This was affirmed by another participant, who stated on the open-ended questionnaire, "*Elke opdrag was lekker om te doen, want jy kon die nuwe kennis dadelik toepas*" [Translated into English: *Every task was enjoyble, because you could apply the new knowledge immediately*] (OEQ, MGT 19). Responding on the open-ended questionnaire, another participant concurred, writing, "*I could use what I learnt in my classroom. Everything we learnt, had a purpose and was relevant. It made sense not only at the workshop, but when you get home or in the classroom you could use those ideas*" (OEQ, MGT 8). During the focus group interview, another participant agreed regarding the value of using the laptop in her classroom, stating:

"Nee, aan die begin het ek hom glad nie gebruik nie, maar na die training definitief baie. Want toe het ek uiteindelik die waarde van die laptop besef as 'n groot hulpmiddel in die klaskamer"[Translated into English: No, in the beginning I did not use it at all, but after the training, definitely often. Because then I finally realised the value of the laptop as a key resource in the classroom](FGI, MGT 6).

From the data, the participants suggested that the training had assisted them in implementing the skills they had learnt during the training within their multi-grade classroom context. Therefore, their sense of fun and enjoyment, as mentioned previously in section 4.5.2.1, was enhanced by the fact that they could implement and apply their newly azquired skills and knowledge in the workshop and also in their classrooms. The participants also disclosed that what they learnt, was meaningful, relevant and made sense in both the workshop and in their classroom situation, i.e. it was applicable within context. The data highlight that the participants had gone through a major transformation related to their teaching style and classroom practice; they were no longer doing things in the old way. The data suggest that they realised that they did not need a laboratory for ICT implementation, as they thought before, but could now use one computer for their needs. They realised that they needed to change their way of teaching. The participants felt as if the training had opened up a new world to them; that they had been revived, and this assisted them in transforming their teaching practice. Furthermore, they also discovered something about themselves: the fact that they had the ability to be computer literate and use computers in their classrooms.

The data also reveal that they were prepared to discard their old habits and that they were capable of introducing and using the new methods in their classrooms. In this regard, Downes et al. (2001) postulated that workshop sessions should guide and enable teachers to understand what they learnt during ICT training. This agrees with the views presented by Granger et al. (2002), who stated that what is done in training sessions should have an impact in the classroom; in other words, teachers must be able to transfer the skills acquired during the training sessions to the classroom situation. Furthermore, these sentiments are also in alignment with the view held by Rogers (2003), who stated that ICT is diffused at different rates after the realisation of the value it holds. It further support the views of Abuhmaid (2011), Downes et al. (2001) and Rogers (2003) have espoused similar views on ICT adoption and the implementation of technology for teaching and learning.

4.5.2.3.2 Enabling teachers to become supporters of peers

The participants indicated that they felt that they were able to support other educators who had not attended the training and viewed this as a positive aspect of the intervention. During the focus group interview, one participant mentioned in that regard:

"Ja, [Yes]I am able to help someone that is starting with multi-grade class now. I can teach him with confidence and motivate him, show him all the skills that he needs as a starter, knowledge, show him where to look for solutions. I know all the challenges; I can share the challenges with him and I can even help him through the work to see how he can discover the possible solutions himself. Show him how to save time, show him how to organise his work in the computer, how to use the computer in class every day in a different way to keep his learners focused. So, ja, [yes] I will be able to help somebody that is starting his career in a multi-grade class"(FGI, MGT 3).

 Another participant concurred with that sentiment during the focus group interview, stating:

"Most definitely I could help another teacher in getting skills and knowledge in using his computer. During my training, I helped a lot of other people in getting to know the training materials, getting to know the laptop, getting to know how to use certain programmes of the laptop, because it is more for me, then it will be less of a burden for me in helping others rather than in doing others' work or them doing it themselves" (FGI, MGT 1).

 On the open-ended questionnaire, yet another participant mentioned:

"Ek kon aan ander multi-grade onderwysers inligting gee hoe om hulle laptop te gebruik nie net vir administrasie nie, maar ook tegnieke aan te leer om hulpmiddels te ontwikkel. Ek kon hulle wys hoe om internet met hul selfoon te Bluetooth na hulle rekenaars toe en sodoende informasie wat ons nooit sou bereik nie, te kon aflaai. Dan kan ons ook departementele informasie kry en ook kurrikulum-informasie van Thutong. Lesse is ook gratis beskikbaar. Ons maak beurte om 'n tema te ontwikkel en dan deel ons die PowerPoint-lesse" [Translated into English: I could assist other multi-grade teachers to not only use their laptop for administration, but also teach them techniques to develop their own resources. I could show them how to access the internet with their cell phones via Bluetooth to their computers and in this way download information that otherwise would never have reached us. Then we can also obtain departmental information and curriculum information from Thutong. Free lessons are available. We take turns to develop themes and we share our PowerPoint lessons] (OEQ, MGT 5).

 Another participant concurred, stating on an open-ended questionnaire, *"Yes, I can now use the laptop confidently. I even empowered my whole family and the other teachers at school. We all know how to use the laptop" (OEQ, MGT 1).* From the data, it seems that the participants assisted other educators who had not been part of the intervention. The data therefore highlight that skills transfer was

possible when teachers were trained to be confident and comfortable with modern technology like laptops. This confidence exhuded by the participants towards ICT implementation, to the point where they were comfortable enough to transfer their newly acquired skills to empower others, is in line with the views of BECTA (2004), Rodden (2010) and Scrimshaw (2004), who postulated that a confident teacher will most likely implement ICT integration in the classroom.

4.5.2.4 Negative aspects related to the self

A negative aspect of the training in terms of the second order was the different skills levels of the participants. The data suggest that some of the participants did not know how to use their laptops, while some could already help themselves. This was experienced as a negative.

4.5.2.4.1 Different skills levels of participants caused frustration

It is evident from the data that not all the participants were on the same level. This caused some participants to suggest that there should be differentiation. The data reveal that the different levels of computer literacy and competence caused some frustration during the training sessions, which was regarded as a negative aspect of the training. This aspect was alluded to by a participant during the focus group interview, who said, *"Sometimes there was someone that are working a bit slow"(FGI, MGT 3).* Another participant concurred, stating on the open-ended questionnaire, *"Ek kon nie altyd die opdragte uitvoer nie en sou daarvan gehou het as daar eers 'n bietjie leiding gegee is voor ons 'n opdrag moes uitvoer" [Translated into English: I could not always complete the tasks and would have preferred some guidance prior to executing the task] (OEQ, MGT 7).* Yet another participant responded as follows on the open-ended questionnaire:

> *"Aan die begin het ek nie eers geweet waar om die rekenaar aan te skakel nie. Kon miskien meer elementêr begin het, andersins was dit puik"[Translated into English: At the beginning, I did not even know where to switch the computer on. Could have started more basically, but otherwise it was excellent](OEQ, MGT 10).*

On the open-ended questionnaire, another participant stated as follows:

> *"Differentiation – separate the beginners and advanced. I did not know how to use the computer, but some people knew a little more. I feel I held them back. Use venues that is nearer to the school and take smaller groups, like five. We have laptops, so we can use any venue. Intensive training can be done in smaller groups. Train the principals separately, because we feel stupid that the teachers know more about the laptop than ourselves"(OEQ, MGT 18).*

From the data, it seems that the participants were not working at the same pace, which caused some frustration during the training sessions. The data also highlight that this was attributed to the

various levels of computer literacy and competence demonstrated by the participants. From the data, it seems that some of the participants could not complete tasks, while some of them did not even know how to operate a computer. This could have caused the delays and slower pace. Bradshaw (2002), Du Plessis (2010), Du Plessis and Webb (2012a, 2012b) and Galanouli et al. (2004) argued that training sessions should take participants' various levels of ICT skills and knowledge into account so that progress during training sessions is not impeded.

4.6   THEME 5: EVIDENCE OF ICT IMPLEMENTATION IN THE MULTI-GRADE CONTEXT

In this section, data related to the fifth research question, *"Is there evidence that the Intel® Teach Training Programme enabled teachers to implement ICT into their teaching and learning in a multi-grade context?"*, are reported on. This section deals with the evidence of how the laptop was used after the Intel training programme in the multi-grade context, as represented in Table 4.5 below.

TABLE 4.5: Evidence of laptop usage after the training

LAPTOP USES IN MULTI-GRADE CONTEXT
4.6.1.1 Laptop used for general administration
4.6.1.2 Laptop assist with recording school-based assessment and creating worksheet marks
4.6.1.3 Laptop for sourcing information
4.6.1.4 Laptop as classroom assistant
4.6.1.5 Laptop and its capabilities used to enhance teaching and learning
4.6.1.6 Laptop used for sharing and support via emails between teachers
4.6.1.7 Laptop as communication tool to communicate with the Department of Basic Education
4.6.1.8 Laptop assists in reflecting and being reflexive about teaching
4.6.1.9 Laptop used to train other teachers and learners to use the laptop

4.6.1   Evidence of laptop usage after training

The data highlight an increase in laptop usage after the training intervention. These usages are reported and discussed below.

4.6.1.1   Laptop used for general administration

The data suggest that, following the training intervention, the participants utilised their laptops for administrative duties. This was alluded to by one participant during the focus group interview, *"Ons gebruik nou SASAMS om die skool se administrasie, wat dit baie makliker maak om die administrasie te doen. [Translated into English: We use SASAMS to do the school's administration, which makes it much easier.] (FGI, MGT 5).* Another participant affirmed during the focus group interview that she also used the laptop for administrative purposes, stating, *"Baie van my administrasie" [Translated into English: A lot of my administration] (FGI, MGT 6).* On the open-ended

questionnaire, another participant confirmed, *"Administrasie, lesbeplanning, PowerPoint presentation"* *(OEQ, MGT 15).* Another participant concurred, postulating on the open-ended questionnaire, *"Used the laptop for administration purposes"(OEQ, MGT 18).* During the focus group interview, another participant explained that his daily planning and administration depended on the laptop, commenting:

> *"When I get into class, the first thing that I take out every day is my laptop. And I put it on my desk and my laptop will tell me what is my programme for the day. Look at my emails, look at the work that I want to do for the day, look at the work that I have prepared the previous day for that day, look around at school the things I have to do before I start my lesson ... something that I still have to come and do like hard copies that I have to make and some things I have to look up at school... I do all my letters - my handwriting is very poor. So I am using my laptop for all my communication and things. For teaching as well, ja [yes], it is only my signature I do nowadays with pen. I think my main positive thing about it is when it comes to administration. And with the computer and your Excel, you have all those things very neatly in front of you" (FGI, MGT 3).*

The data reveal that the participants utilised the departmental SASAMS Programme for school administration and management duties, as highlighted in Table 4.7 in section 4.6.2. The participants indicated that for their administrative tasks, they used MS Excel for class lists, administration and finances. The data further suggest that the laptops were used to assist in their multiple duties as 'principal-and-teacher' around the administration, management and the organisation of various tasks, including daily planning. This also implies that there was less paperwork. The data also highlight that the participants experienced that doing their administration on their laptops, assisted them with time management, because it was much easier and less time consuming to complete administrative duties on the laptop. These sentiments seem to be aligned with the first three uses referred to in chapter 2 by Bialobrzeska and Cohen (2005) and Stevenson (1997), namely that the initial usage of computers within the South African context (Bialobrzeska & Cohen, 2005) generally focuses on duties around school and classroom administration.

4.6.1.2   Laptop assists in recording school based assessment and creating worksheets marks

The data highlight that the participants utilised their laptops to assist in capturing and storing the marks of school-based assessment tasks. This was confirmed to by a participant during the focus group interview, who stated:

"... especially Excel for doing the marks and helped me with a lot. Doing the calculating the marks, presenting the marks to the seniors could make my life very easy for me. Word helped me there with typing my question papers. And Excel helped me to manage my marks and I could see how learners could also progress in doing their classwork" (FGI, MGT 1).

During the focus group interview, another participant concurred, highlighting how he used the laptop for capturing and retrieving the marks of assessment tasks, adding that the laptop was also useful to create worksheets for the learners, *"I can manage my Excel, my marks, you don't have those lots of paperwork. You make a copy when you need one. If you want to do counting [calculations], you have your spreadsheets" (FGI, MGT3).*

The data reveal that the participants used their laptops to assist in capturing and storing the marks of school-based assessment tasks. The participants stated that they typed their own question papers using MS Word and managed their learners' progress and marks through MS Excel. The participants shared using their laptops grew easier over time. It seems that by using their laptops for school-based assessment tasks, they saved time and it became easier with practice. FitzPatrick (2005) and Johnson and Lamb (2007) concurred, stating that ICT software could be used for assessment.

4.6.1.3   Laptop for sourcing information

The data suggest that the participants used their laptops to source information through the internet. This was alluded to by a participant during the open-ended questionnaire, who wrote, *"Yes, and I don't stress anymore if I don't have information. I just research it on a search engine like Google. Sometimes I download the whole lesson and adapt it for my classroom" (OEQ, MGT 8).* Another participant concurred on the open-ended questionnaire, stating, *"Yes, vind die inliging op Google" [Translated into English: Yes, find information on Google] (OEQ, MGT 10).* During the focus group interview, another participant affirmed this, commenting:

"Vir my was dit ook wonderlik om te kan Google en te kan inligting kry vir take. Ons het dit vroeër vermeld dat daar geen bronne tuis is nie, so jy moet basies al die inligting vir die kind gee. Ek het baie baat daarby gevind om inligting te soek en dan natuurlik in my lesbeplannings en 'n bietjie in die klaskamer die laptop met die leerders te gebruik om 'n PowerPoint presentation saam te stel, om dan nou op so manier inligting oor te dra aan hulle" [Translated into English: It was wonderful to be able to Google and obtain information for assignments. As I mentioned earlier there are no resources at home [for the learners], so you have to provide the learners with all the information. The information assisted me with lesson planning and in the classroom I could use the laptop to compile a PowerPoint presentation, to give them more information in this way] (FGI, MGT 6).

The data reveal that the participants used their laptops to find information for their lessons and projects for the learners on the internet. They found this very helpful, because the learners' impoverished home backgrounds did not offer any resources. The participants therefore found the laptops very useful to source information on the internet for the purpose of planning their lessons. The data highlight that the participants downloaded lessons and adapted the lessons for their classrooms and presented their lessons in PowerPoint. In this regard, FitzPatrick (2005), Johnson and Lamb (2007) and Torero and Von Braun (2005) stated that ICT could be used to access information from the internet.

4.6.1.4   Laptop as classroom assistant

The data suggest that the participants used their laptops as classroom assistants. On the open-ended questionnaire, a participant alluded to this, stating:

"The timeous preparation of tasks, tests, projects and investigations help me to keep one class occupied while you are busy with another. I have now that extra invisible hands in my classroom with my laptop. Yes, it enable me to prepare tasks, question paper, use PowerPoint for presentations, use the data projector, etc." (OPI, MGT 20).

During the focus group interview, another participant explained how she used the laptop as an assistant:

"Ek het 'n leesprogram opgelaai, en dit is ook baie lekker in die klas vir die kinders om dit te sien en te hoor en woordjies te lees. So, daar word ook nou sommer al die sintuie word gebruik terwyl hulle leer lees, wat ook baie effektief is in Engels en Afrikaans"[Translated into English: I loaded a reading programme [on the laptop] and it is also enjoyable for the learners to experience reading while seeing the words and listening to the pronunciation of the words. So now all senses are used while they read, which is very effective for teaching in English and Afrikaans] (FGI, MGT 7).

Another participant concurred during the focus group interview, mentioning, *"There is just one point... within a multi-grade class, you can keep the one group busy if you have something like a slide show on the one hand, or give them an activity on the projector while you're busy with the other group"* (FGI, MGT 2).

The data highlight that the participants utilised their laptops as classroom assistants to keep the learners actively busy with work while they were attending to another group. From the data, it appears as if the participants enabled the learners to operate the laptop so that they could work independently on activities and move from one activity to the next. The participants also prepared lessons in advance when they attended meetings or workshops away from school. The learners received the lessons, whether the teacher was at school or not, because the activities were prepared on the computer and printed in advance. From the data, it seems that the teachers also incorporated computer literacy lessons in order to teach the learners how to use the various keys to run the programme. These sentiments concur with the views of Rao (2003) and Van Wyk (2009), who suggested that teachers could use ICT as classroom assistants. Jonassen, Myers, McKillop and Jonassen (2000), Salomon (2002) and Watson (2001) also suggested that computers could take on the role of teachers, or tutors, when the words on the reading programme must be followed, as mentioned by one of the participants, to achieve the outcomes of the planned lesson.

4.6.1.5 Laptop and its capabilities used to enhance teaching and learning

The data reveal that the participants stated that, after the training sessions, the laptops were used to enhance teaching and learning in their multi-grade classrooms, as they unlocked new possibilities. This was confirmed by a participant during the focus group interview, who mentioned:

"After the training, it was possible for us to help the kids to show them how to get onto internet, how to do their tasks or the assignments, and whatever. And they enjoy it a lot to have access to the internet to do things easier" (FGI, MGT 20).

In responding on the open-ended questionnaire, another participant wrote:

> *"I know how to operate a data projector from my laptop and use my digital camera with my laptop. I can even use my cell phone with my laptop, so I can have internet access in my classroom. It is so easy now. My learners are smiling, because my lessons are interesting" (OEQ, MGT 11).*

Another participant concurred, stating as follows during the focus group interview:

> *"I could use PowerPoint presentations. And that is what I need in class. That is one of the most important things for any educator: to be able to use a PowerPoint presentation confidently, especially when you have to go to get examples for learners, to show them some examples. You can go all over the internet, and that is what I'm doing. You can even do interactive lessons with them, have them as well use your computer to make some changes and show something on the screen where they can see. So that is what I have learnt" (FGI, MGT 3).*

During the focus group interview, another participant concurred, stating, *"... now I am using PowerPoint for the interactive lessons and lesson presentations and using the internet in order to prepare my lessons for myself. It makes me also using these three, PowerPoint, Excel and Word, make myself a confident teacher" (FGI, MGT 1).* The data reveal that one laptop was used to enhance teaching and learning in a multi-grade classroom and that the participants presented interactive lessons through the medium of PowerPoint presentations. After the training sessions, the participants presented more interesting lessons by incorporating various other peripherals, such as digital cameras, their cell phones and internet with the laptop, operating it with a data projector. The data highlight that the learners were using the laptop to gain access, with the teacher, to search engines and websites. This implies that the teaching methods had also been transformed, from teacher-driven to more learner-centred. Therefore, from the data, it seems that the teaching and learning experience had been enhanced, as advocated in the White Paper on e-Education, especially in respect of ICT integration (Department of Education, 2004). Bialobrzeska and Cohen (2005), Hawkridge et al. (1990), Kazinczi (2009), Stevenson (1997) and Tsolakidis (2007) concurred, arguing for the use of technology to advance and enhance teaching and learning in the classrooms, as it offers possibilities to change the way in which one teaches, an aspect that is evident from the data above.

4.6.1.6 Laptop used for sharing and support via email among teachers

From the previous section, it is evident that the participating teachers started not only to use the internet as a source to find tests, assessment tasks and worksheets, but also the retrieved material, to reflect on how what they found, compared with what they were doing and how their material looked. In addition, thanks to the Intel training, it became evident from the data that this had been taken further,

e.g. emails became a useful tool for collaboration and sharing. In responding to the open-ended questionnaire, one participant stated in this regard:

> *"Ek het 'n ander kollega gewys wat ons geleer het sodat ons lesse kan deel, want ons het dieselfde groepie multi-grade-klasse. Sy het haar eie laptop aangekoop en ek was as't ware haar "trainer". Dit het my ook baie gehelp, want ek het ook my kennis meer ontwikkel. Sy is nou op dieselfde punt waar ek is, en ons geniet die bystand wat ons mekaar bied. Sy geniet dit om Lewensvaardighedelessies te beplan en ontwerp en ek geniet die Tale en Wiskunde baie meer. Nou ruil ons lesse oor en weer per epos"* [Translated into English: I showed another colleague what we had learned so that we could share lessons, because we have the same group of multi-grade classes. She purchased her own laptop, and I actually became her trainer. It helped me a lot, because I improved my knowledge. She is now at the same point where I am, and we enjoy the support we can provide for one another. She enjoys designing the Life Skills lessons, while I enjoy designing the language and mathematics lessons more. Now we exchange lessons via email] (OEQ, MGT 7).

Another participant affirmed the practice of collaborative sharing, stating during the focus group interview:

> *"...you can share, all your colleagues, you share your work with your neighbouring schools, especially we with multi-grade teaching and you know that multi-grade teaching is not always on the same level as your monograde ones, your bigger schools. So you ask question papers from them through internet [email] and you check on which level you are. So that you can keep up and you work with your faster learners, you can work on a higher level with them"* (FGI, MGT 3).

During the focus group interview, another participant concurred, mentioning:

> *"... and doing things and we could work together after the training with other groups and my peers and helping and doing the internet and also helping each other by sending emails and let others know how to do and how to access, how to get access to certain programmes during and after the programme"* (FGI, MGT 1).

The data also reveal that the participants confirmed that the laptops were used for soliciting support, when needed. In this regard, one participant stated in responding to the open-ended questionnaire, *"The minimal support from the District Office was no longer the only support I could seek, but I could go to the national website and other websites to learn about something I did not know, and communicate with people I would never have had access to"* (OEQ, MGT 3).

The data reveal that the participants used their laptopS to stay in touch with each other, and formed new collaborative partnerships with other teachers, sharing lessons and information via email. The participants indicated that they found this collaborative sharing enjoyable and that it also improved their knowledge. From the data, it would appear that it improved the levels at which they were working with one another and with their learners. Hodgkinson-Williams (2006) concurred, noting the value of using collaboration in the classroom among learners. Rao (2003) stated that ICT introduces the potential for sharing, and hence collaboration, among teachers. The data also highlight that the participants solicited support by using the internet on their laptops. This assisted them to find the support they needed and also provided new information from which they could learn. The participants highlighted that they could now find support quicker, because they were in contact with a variety of opinions and worked across various spheres, such as national websites. The data suggest that the participants solicited support for themselves, and became a support for one another through collaboration. The data reveal that the participants also served as support for other educators who had not been exposed to the training intervention. Support, sharing and collaboration among teachers are important aspects that should be fostered as part of ICT teacher development, as teachers have indicated that these are important elements within teacher professional development (Du Plessis, 2010; Du Plessis & Webb, 2012b).

4.6.1.7   Laptops as tools to communicate with Department of Basic Education

The data suggest that the participants used their laptops not only to communicate with their colleagues, but also as a communication tool with the Department of Basic Education, thereby bridging the distance and isolation they experienced. This was confirmed by a participant, who stated in the focus group interview:

> *"You have immediately contact with your District Office if you need something from them or if there is something that is coming or that is urgently needed there. You have immediate contact with them, as well. I am in contact, emailing contact, with all my educators at school, with…I have access to all the websites, my… SADTU and I am in contact with all the unions, teacher unions. They send emails, they sent one this morning about the court case, as well. So I am in contact, and that helps you to keep your staff at ease and be informed of the latest things that are happening" (FGI, MGT 3).*

This response highlighted that the laptops offered participants the opportunity to use the internet as a means to bridge the distance and isolation they experienced in their remote locations. The data reveal that the participants used their laptops for communication through emails with teachers at the same school, and also with other teachers as mentioned in section 4.1.6.4, teacher unions and the Departmental Office. The participants also received communication and in this way they stayed in

contact. This supports the view held by Ashmus (2004) and Rao (2003), who state that ICT is useful for communication purposes.

4.6.1.8 Laptop assists in reflecting and being reflexive about teaching

The data suggest that the participants used their laptops to assist them in obtaining tests and material from the internet, as well as in obtaining test and worksheets from their peers via email. With the aid of this material, they began to reflect on their teaching and introduce changes to improve or raise the level of teaching in their classroom. This was confirmed by a participant during the focus group interview, who stated:

> *"I regularly use my laptop, even for retrieving old question papers from the web, especially to see how the question papers are compiled and to see the way I am teaching – if it is up to standard, to prepare the learners in that way. It helps me a lot in that regard. So you can know how to adapt your teaching and you can see the examiners, how they sort of set the papers. To align your teaching methods accordingly" (FGI, MGT 2).*

During the focus group interview, another participant affirmed this, stating, *"So you ask question papers from them (other teachers and examiners) through internet and you check on which level you are. So that you can keep up and you work with your faster learners, you can work on a higher level with them" (FGI, MGT3).* The data highlight that the participants used their laptops as a quality assurance tool to check the quality of their work and establish whether they needed to adapt their levels and align their methods. From the data, it seems that this was gained by retrieving past question papers and examiners' reports through the internet. The data concur with De Ponte, Oliveira, Varandas and Oliveira (2007) and Johnson and Lamb (2007), to the effect that one of the many uses of computers is the potential to access information; and in this case, the teachers accessed information related to tests and worksheets in order to reflect on and make adjustments to their classroom tuition.

4.6.1.9 Laptops used to train other teachers and learners in using the laptops

The data suggest that the participants used their laptops to train teachers and even their learners who had not used a laptop before. This was confirmed by a participant during the focus group interview, who postulated, *"After the training, I was able to assist my colleagues for those that don't know how to use the laptop, just the basic skills, because there are some teachers that don't know how to use a computer, just the basic typing skills and so on" (FGI, MGT 2).* Responding on the open-ended questionnaire, another participant concurred, stating that he was able to assist and train other teachers who had not used computers before, *"Yes. I could train my other colleague at my school. Now we can say all teachers at our school are computer literate. Can a city school say the same that 100% of their*

teachers are computer literate and teach with technology in their classrooms?" (OEQ, MGT 1). Another participant stated that he assisted Foundation Phase educators with using the laptop:

> *"I help the people or the educators, especially those in the Foundation Phase –*
> *some of them are afraid of computers – to help them to get the confidence how to*
> *use it and how to get the learners' attention to them, especially where there are*
> *more than one or two classes in one. So it make you feel worthwhile, you got*
> *something to do by helping them to help the learners" (FGI, MGT 20).*

During a focus group interview, another participant mentioned that she used her laptop to train her learners in basic computer literacy, stating:

> *"Ek het sommer met hulle [learners] laptop-vaardighede gedoen. Hoe om aan te*
> *beweeg, vingeroefeningtjies, om die laptop te kan baasraak, bietjie geleer hoe die*
> *laptop werk" [Translated into English: I taught the learners some laptop literacy*
> *skills, like how to move between screens, some finger exercises to be able to master*
> *the laptop, and a bit on how the laptop works](FGI, MGT 7).*

The data suggest that these teachers shared what they learned from the training sessions with their immediate colleagues and even their learners. It also implies that these educators shared and trained other teachers outside their immediate schools. The data reveal that other teachers also recognised that they were capable ICT users and relied on the participants who participated in the training intervention, for ICT assistance and support. The participants disclosed that they were capable of transferring their skills to other teachers and the learners in their classroom. These sentiments share the views held by Vrasidas and Glass (2005) and Watson (2001), who stated that teachers become leaders when they share what they learn, in this way becoming support for one another.

4.6.2 Quantitative comparison of laptop usage before the training and after the Intel training

Although this interpretative case study operates within the qualitative paradigm, a few quantitative questions were posed to the participants, to assist in examining the fifth research question in order to ascertain whether the quantiative data concurred with the qualitative data. This was done to provide insight into their laptop usage before and after the training. It is important to note that no statistical inferences can be made, as this was a very small research sample of twenty teachers. Yet, it does support the findings in the qualitative data, namely that there was a significant increase in usage of the laptop in various forms, the internet and software after the Intel training.

The data are presented as laptop usage for ICT implementation or usage before and after the training, as indicated by the participants in the qualitative section of the open-ended questionnaire. The

number of the participants decreased with the second open-ended questionnaire, because one of the particpants (MGT 13), had passed away and therefore the number of the participants who received and completed the second open-ended questionnaire was only nineteen, instead of the original twenty. Table 4.6 represents the participants' laptop usage before and after the Intel training.

The quantitative data revealed that 57,9% of the participants had never used the laptop before the Intel® Teach training intervention, but after the training this rose significantly in the often and fairly often range. In fact, the data suggest that there was a great shift to ICT usage post the Intel intervention, as indicated by the results related to often and fairly often (indicated in red). This shift will be alluded to more to further down below. Prior to the intervention, none of the participants had used the laptop for internet and email, or operated the Bluetooth and webcam functions.

Another aspect from the quantitative data, is that one can deduct that the participants did not use the laptop for teaching, learning or administration prior the intervention, since 63.2% indicated that they never used MSWord; 94.7% had never used MS PowerPoint; 94.7% had never used MS Excel; and 84.6% had never used the SASAMS administration programme before the training programme. None of the participants had ever used internet in their classrooms prior to the training.

After the Intel® Teach training intervention, the quantitative data suggest that there was an increase in the use of laptops after the training, supporting the findings from the qualitative data, an aspect that was alluded to in a previous paragraph. The great majority of the teachers now used their laptops (see the red numbers post the intervention in the often and fairly often columns), and although MGT 2 indicated his laptop usage as *'rarely'*, he stated in the focus group interview that he used the laptop for long periods at a time, and more often than before; however, his usage was not daily at that stage, but rather a few times every week. The applications used by the great majority of the respondents after the intervention, were MS Word, MS PowerPoint, MS Excel, and SASAMS.

Participants used applications for administration, lesson planning and preparing classroom activities, assessment and examinations, correspondence, SASAMS (South African Schools Administration and Management System), researching information, internet and email after the intervention. There was also an increase in the usage of the laptop for teaching and learning in the classroom. Most of the participants used Internet and email as correspondence methods, and the Internet to research information. The quantitative data also indicate that the Internet and email were used for communication and to share information and lessons with other multi-grade teachers. SASAMS was often used by the participants as an administrative tool, which also supported the Department of Basic Education's drive to operate SASAMS and LURITS (Learner Unit Record Information and Tracking System) as compulsory administrative and management tools.

TABLE 4.6: Laptop usage: Pre- and post- intervention

	1 Never PRE	Never POST	2 Rarely PRE	Rarely POST	3 Sometimes PRE	Sometimes POST	4 Often PRE	Often POST	5 VeryFairly Often PRE	VeryFairly Often POST
How often do you use your laptop?	57.9%		31.6%	5.3%	10.5%	5.3%		63.2%		26.3%
Which programmes do you use for teaching and learning in your classroom?										
Ms Word (pre n=20; post n=19)	63.2%	21%		5.3%	15.8%	5.3%		31.6%		57.9%
MS Excel (pre n=20; post n=19)	94.7%			5.3%	5.3%	26.3%		68.4%		
MS PowerPoint (pre n=20; post n=19)	94.7%			10.5%	5.3%	15.8%		26.3%		47.4%
SASAMS (pre n=20; post n=19)	84.6%	15.4%		13.3%		26.7%		40%		20%
Internet (pre n=20; post n=19)	100%			5.5%		5.5%		55.7%		33.3%
Email (pre n=20; post n=19)	100%			5.9 %		5.9%		23.5%		64.7%
Which functions do you use for teaching and learning on your LAPTOP ?										
Webcam (pre n=20; post n=15)	100%	40%				30%		30%		
Bluetooth (pre n=20; post n=14)	100%	5.3%		10.5%		5.3%		63.2%		15.8%
USB Port (pre n=20; post n=15)	86.7%	5.6%	13.3%			11.1%		11.1%		72.2%
DVD drive (pre n=20; post n=13)	84.6%	7.1%	15.4%			28.6%		28.6%		35.7%
Data card port (pre n=20; post n=12)	91.7%	10%	8.3%	40%		20%		30%		
What do you use your laptop for ?										
Administration (pre n=20; post n=19)	68.4%	31.6%				10.5%		42.1%		47.4%
Lesson planning and preparing classroom activities (pre n=20; post n=19)	84.2%	15.8%				10.5%		47.4%		42.1%
Teaching and learning in the classroom (pre n=20; post n=19)	89.5%	10.5%	10.5%			42.1%		42.1%		5.3%
Assessment and examinations (pre n=20; post n=19)	81.3%	18.7%				26.7%		40%		33.3%
Correspondence (pre n=20; post n=16)	75%	12.5%			12.5%	13.3%		33.4%		53.3%
SASAMS (pre n=16; post n=14)	84.6%	15.4%		13.3%		26.7%		40%		20%
Researching information (pre n=20; post n=17)	88.2%	11.8%				27.8%		27.8%		44.4%
Internet (pre n=19; post n=14)	85.7%	14.3%				15.8%		47.4%		36.8%
Email (pre n=17; post n=12)	91.7%	8.3%	5.3%			10.5%		36.8%		47.4%
ENCARTA (pre n=18; post n=12)	83.3%	16.7%				18.7%		18.7%		62.6%
Private (pre n=20; post n=11)	54.5%	18.2%		5.6%	27.3%	11.1%		22.2%		61.1%

From the quantitative data, it seems as if the Bluetooth function was used for connecting the Internet with a cell phone to bring the Internet to the classroom, and exchanging information. Internet usage in the classroom also increased significantly after the training. Although ICT implementation or usage was taking place more than before; the main uses for ICT seem to focus on administration, lesson planning and preparing classroom activities, as well as typing assessments and examination papers. The quantitative data reveal that the laptop was often used for correspondence, especially the email function. Researching the Internet was done to a greater extend after the training. SASAMS was also used more often for administrative tasks post the training.

The quantitative and qualitative data also seem to suggest that the preferred programme for lesson presentation seems to be PowerPoint and that the participants collaborated and shared lessons with their colleagues. The laptop was often used as a tutor – learners were empowered to operate the laptop to carry on with work while the teacher was busy with another group. The laptop was also used to present and introduce new lessons. Teachers used interactive lessons, and the learners seemed to enjoy the lessons more according to the qualitative data.

It seems that the quantitative data concurred with the qualitative data in that there was much greater usage of the laptop and or ICT related resources after the Intel training; hence it seems that the Intel training was indeed an enabler that equipped the participating teachers to use the laptop in their multi-grade context.

4.7   DISCUSSION: PULLING IT ALL TOGETHER

The framework provided in chapter 2, Figure 2.3, was used to present the findings and to ascertain whether the framework is indeed helpful to look at the challenges and barriers, suggestions, teachers' experience of ICT training, as well as at what level of use they were within their multi-grade context.

In terms of pertinent subsidiary research question 1, it is evident that the adapted first order and second order typology of Ertmer (1999) is useful as a lens to analyse and present the findings from data. The adapted typology refers to the addition of the third order dimension. The third order level is missing in the original framework of Ertmer (1999). Looking at macro, meso and micro level typology (Balanskat et al., 2006; Kirkland & Sutch, 2009; Kozma, 2003), it became evident that Ertmer's (1999) two order typology can be linked to the macro, meso and micro level framework; hence her typology can be extended to three orders. This then implies that a third order was added. The above was also alluded to in chapter 2, section 2.6. Pertaining to subsidiary research questions 1, 2, 3 and 4; the findings from the data suggest that the adapted first, second and third order typology seems to be a plausible way of looking at the data and analysing, interpreting and presenting the data. In addition, the

findings pertaining to questions 4 and 5 assisted in ascertaining whether the Intel® Teach intervention had been useful in addressing the aspects found from the data, with reference to questions 1, 2 and 3.

At this point, it is important to revisit the framework of Ertmer (1999). She identified the lack of software and hardware, and of resources, time, training, and support as first order barriers. In this study, resources were used as the umbrella term; therefore, the lack of software and hardware resides under the lack of resources and was not discussed as a separate entity. However, it is important to note that in terms of the lack of support, the nature of a multi-grade school is different from that of a monograde school. Therefore, support as it would appear in a normal mono-grade school is not possible. Therefore, such support resides outside the school and not among teachers within the same school. Hence, support in terms of multi-grade teaching schools was placed under third order barriers and not under first order barriers. In terms of the lack of training, it seems that in the smaller multi-grade schools, especially one-teacher schools, training is also experienced as an external challenge and therefore resides under third order barriers, and not first order barriers, as it would in normal mono-graded schools.

4.7.1 What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?

When looking at subsidiary research question 1, the findings suggest that the first, second and third order barrier framework is appropriate since it was possible to present the findings within this three typlogy framework. It seems that the Intel® Teach intervention could assist in addressing several first order challenges with reference to question 1. With reference to the lack of resources, it appears that the Intel training intervention addressed the lack of resources, since it made the laptop useful, not only as a typing tool, but as a multi-dimensional resource empowering schools to have access to the Internet, including email, as a twenty-four hour resource, to multi-grade teachers at school. The challenge of isolation in terms of communication and teaching was resolved and the participating teachers could rely on one another for support, practise collaborative sharing, and be connected through the Internet. The curriculum challenges were addressed, because the teachers could solicit access on national and international websites through the Internet and were therefore well equipped to assist their learners.

In terms of learner related challenges, the data concurred with the literature as presented by Cornish (2010), Jordaan and Joubert(2008), Juvane (2005) and Little (2006). These challenges related to fluctuating learner enrolment, inconsistent attendance, and the distances learners had to walk to school. These challenges were not resolved by the Intel® Teach training intervention, but then the aim of the Intel® Teach intervention was not to address these aspects.

It seems that the challenges regarding time constraints and work overload, which include the multiple roles and responsibilities of school principals at one-teacher schools, teachers (all grades) and non-teaching support staff, still weighed heavily on teachers in these multi-grade contexts. Although the intervention empowered the teachers to utilise their time more effectively and created an environment for looking at different ways to solve challenges and maximise time through collaborative sharing, it did not address the work overload caused by the multiple roles they had to play. The data therefore concur with Brown (2010), Brunswic and Valérien (2004) and Little (2006), who stated that work overload as a result of multiple roles, as well as time management, remains challenges for teachers in multi-grade contexts. However, this study established that the use of the laptop in lesson preparation, using the laptop as a tutor and allowing the learners to use the laptop by working through programme and group lessons prepared in advance, assisted the participating teachers by freeing up time to attend to the slower learners and other duties, such as administrative tasks and attending to visitors.

In addition, it appears that the Intel® Teach intervention assisted in addressing several second order challenges with reference to question 1. The participants indicated that they experienced the attitude of the Department of Basic Education as uncaring, while the Intel® Teach training intervention demonstrated a caring attitude towards the multi-grade teachers through the Intel trainers. The same caring attitude developed through sharing and collaboration among the participating multi-grade teachers. In terms of their second order challenges, the data concur with the literature, because the teachers felt unprepared to teach in multi-grade contexts, since they had not undergone any training in multi-grade teaching strategies and skills, hence their perceptions of multi-grade teaching were negative. Regarding feeling unprepared for their context, it appears that the Intel® Teach intervention provided the teachers with valuable ICT related skills and knowledge, and hence it seems that the teachers felt better prepared for their multi-grade classrooms subsequent to the training. It seems that the training had produced more confident multi-grade teachers who now perceived themselves to be on par with their urban counterpart teachers. Negative perceptions of the learners' ability to use the laptop also seems to have been addressed by the Intel® Teach training intervention, since some of the multi-grade teachers were confident enough to assist their learners with basic literacy skills and even allowed them to work (under supervision) on their (the teachers') laptops.

In terms of the third level barriers, it seems that the Intel® Teach training intervention indeed provided the quality support apparently sadly lacking from the Departmental officials, since the Intel® Teach trainers were available when the participants needed them, and the participating teachers became the supporting pillars for one another during the training process, which lasted for several sessions over a period of weeks; as well as becoming supporting pillars for one another after the Intel® Teach training concluded. These teachers, coming from different multi-grade schools, started to support one another across the different schools. After the Intel® Teach training intervention, the lack of curriculum training for the multi-grade context was also addressed to some extent, as the participating teachers

formed collaborative sharing peer groups, exchanged information and lessons with one another across the various schools; thus becoming supporting pillars for one another. In offering support, they communicated via email, *inter alia* clarifying aspects of uncertainty regarding the curriculum.

4.7.2   What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?

In terms of the second subsidiary research question, it seems that the framework was also appropriate, since the teachers mentioned barriers that could be categorised as second order barriers that were similar to the framework in the literature review in chapter 2 (Balanskat et al., 2006; Bialobrzeska & Cohen, 2005; Bingimlas, 2009; Du Plessis & Webb, 2012b; Ertmer, 1999; Kirkland & Sutch, 2009; Kozma, 2003). From the literature reviewed and the experiences of the participants, it seems that providing a resource such as the laptop, accompanied by a few hours of basic computer literacy as offered by the Department of Basic Education to the teachers prior to the Intel® Teach intervention to teachers in the multi-grade context, did not automatically result in the use of the resource for teaching and learning. Technological determinism, i.e. providing the resource and assuming that it will be used, does not necessarily lead to usage or implementation (Adler, 2008; Surry & Farquhar, 1997).

In addition, it was found that there was a lack of peer support prior to the Intel® Teach training intervention. The Intel® Teach training intervention addressed this, because the peer support could now be offered through the collaborative sharing network the educators established in the training sessions among each other as a result of becoming competent in using the Internet and email communication. Peer support was not established within the school themselves, as the multi-grade schools consisted of two to three teachers each and not all the teachers in the participating multi-grade schools received a laptop. However, peer support with teachers from other multi-grade schools became a reality through access to email communication.

The data suggest that the participants indicated prior to the Intel® Teach intervention that there was a lack of suitable infrastructure for ICT implementation. Unfortunately, the Intel® Teach intervention did not focus on this aspect, but nevertheless provided the participants with ICT skills.

Regarding the challenge of lack of access to appropriate hardware and software, the Intel® Teach training assisted in this regard, as the teachers had access to the Internet during the training as a resource and source of information. The teachers were shown how to access the Internet using their cellphones and the Bluetooth function, which assisted them in acccessing the Internet at their schools. They were also exposed to presentations using a data projector in the training. Intel® Teach training provided them with a manual and CD and a website that they could use and access whenever they needed.

The challenge relating to lack of time was also addressed by the Intel® Teach training. It seems that the Intel® Teach training assisted the teachers regarding preparation time, as this was no longer confined to the school only, as they could now also prepare their lessons at home and could exchange lessons with their peers in other schools by means of emails. Hence, they saved time and could manage their time more effectively.

In terms of the second order barriers, the data concur with literature and furthermore suggest that the Intel® Teach training intervention eradicated the participating teachers' negative beliefs about themselves, their negative perceptions of their learners, and their beliefs related to teaching and learning. This was as a result of the fact that the Intel® Teach training intervention served to equip the participants with skills and knowledge, boosting their confidence and motivation to the extent that they did not fear the laptop and its resources anymore. The quantitative data in Table 4.6 also suggest a significant increase in the usage of the laptops and related resources, such as software and hardware. Although the teachers seemed to harbour negative perceptions regarding their learners' ability to use the laptop prior to the intervention, the data suggest that some participants did subsequently provide opportunities for learners to use the laptop within the classroom, for example, as classroom assistants when they designed lessons and allowed the learners to work independently. In addition, others used it as an assessment tool to check their own level of teaching, i.e. whether they were on par with what was required. This saw both teachers and learners using the laptop in a variety of ways in the multi-grade context. The Intel® Teach intervention also encouraged the teachers to view ICT implementation as a possiblility outside the "ICT lab" situation. The data suggest that they grew to realise that ICT implementation was possible with using only one laptop and that they could use it for teaching in their multi-grade classrooms, as they used it for general administration, recording of school-based assessments and creating worksheets, marks, sourcing information, sharing and support via email among teachers, communication, reflecting on their teaching, and training other teachers and learners.

Regarding third order barriers, the data suggest that the multi-grade teachers indicated that support was lacking on all levels. The participants highlighted that support was urgently required within the multi-grade context on several levels, not in respect of a single aspect only in terms of training, but that they experienced multi-faced barriers within the multi-grade context. Hence, support and assistance from the Department of Basic Education should entail more than just the Intel® Teach intervention to ameliorate these barriers. The active involvement of the school's main stakeholders, such as the Department of Basic Education, ESKOM, owners and cellphone companies, was required. The Intel® Teach training was not able to assist with infrastructural aspects, as these are the responsibility of the Department of Basic Education.

In terms of technical support and maintenance, the Intel® Teach intervention addressed this partly, because the participating teachers were exposed to the importance of anti-virus programmes as

part of the training. This they could now access by downloading these programmes freely off the Internet in order to keep their laptops virus-free. The Intel® Teach intervention therefore encouraged them to take responsibility for and ownership of their laptops. When looking at ICT integration support and leadership barriers, the data reveal that the teachers had now become change agents at their respective schools, supported one another across school boundaries and provided leadership in terms of ICT implementation. From the data, it seems that the Intel® Teach training assisted with the lack of training and continuous professional development as issues of concern, as it provided the teachers with ICT related skills that enabled them to develop and support one another. The Internet also provided them with a resource to find information regarding any aspect with which they needed assistance. While the Department of Basic Education did not provide them with support and did not show the necessary leadership, the Intel® Teach training assisted them in supporting one another and becoming leaders themselves pertaining to ICT usage.

4.7.3   What are the teachers' perceptions of what can be done to meet these challenges?

When looking at the third subsidiary research question, the data suggest that there were more third order barriers in relation to the first and second order barriers. In terms of the first order barriers, the teachers felt that there were parental challenges at school level that had to be addressed; for example, the majority of parents were not literate and therefore could not assist their children with their schoolwork. This Intel® Teach intervention was not able to address this barrier, as this was not the focus of the intervention.

Regarding first order barriers, it is interesting to note that the suggestions made regarding to the challenges or barriers, with reference to the first two subsidiary research questions, were suggested under the umbrella of third order barriers. This can be attributed to the fact that, because of the unique nature of small schools, solutions cannot be found within the schools or the individual teachers, as would be the case with normal mono-graded schools that consist of a large staff compliment. The solutions that the partcipants proposed, could only be found externally, or within the system.

In terms of second order barriers, the data concur with Ertmer (1999) relating to the self, as the mind is part of the self and the mindset is seen as an important factor that can limit ICT implementation (Ertmer, 1999). The Intel® Teach training played a significant role here, as it had a positive outcome on the self and teachers' ICT usage.

When looking at the third order barriers, the data and the literature seem to concur. The participants' suggestions of a multi-grade Renaissance through the development of a new model for multi-grade teaching seem to be in line with international trends, as mentioned in the Escuela Nova model (Colbert de Arboleda, 2010), a basic education innovation model developed in Colombia, designed to address critical education problems simultaneously, through integration in terms of the

curriculum, in-service training with follow-up, and community and administrative strategies in a systemic and cost-effective way. In a similar manner, the RIVER (Rishy Valley Institute for Educational Resources) model in India, also known as the school-in-a-box (Yerravali, 2010) also highlights the importance of looking at multi-grade teaching differently. The participants were of the opinion that the multi-grade reality should be recognised as a separate educational reality, in a similar way as the above-stated models did and therefore required a different resource model, including a teacher-learner ratio conducive to learning. A re-thinking of the curriculum requirements was needed and therefore it was suggested that support, suitable LTSM and the re-thinking of the number of grades constituting a phase within the multi-grade were required. Support from the Department of Basic Education was also viewed as a vital element in ensuring that multi-grade teachers and their learners would function optimally. Furthermore, the participants suggested that further research related to multi-grade schools was required to promote a better understanding of the school context. In addition, support and resources were viewed as important for smooth functioning. Regarding all of the above, the Intel® Teach training was not able to assist directly, as the focus of the training was not on addressing these aspects. However, in terms of their suggestions that there should be ICT training and follow-up sessions, the Intel® Teach training did fulfill these needs, as it was on-going and the training enabled the participants to use ICT resources within their classroom context, but it did not assist with their specifically required multi-grade curricular needs. With respect to establishing partnerships, new partnerships were established amongst the teachers and between the teachers and the Intel® Teach trainers; therefore, it seems fair to state that the Intel® Teach training assisted with this aspect.

4.7.4 What did they perceive as the positive and negative aspects of the Intel® Teach training programme?

The data suggest that the Intel® Teach training intervention was generally perceived as positive, but that there were also some negative aspects. The data suggest that the positive aspects of the training included that the trainers were knowledgeable, supportive and caring, concurring with the facilitator related aspects listed by Du Plessis and Webb (2012b). The Intel trainers were qualified teachers; this in effect means that they cared about the participants through their personal attributes of being approachable and patient. They listened to the participants, provided clear explanations, were passionate about the material they presented, and motivated the participants. The Intel trainers were also competent teachers in their own right, possessing a wealth of ICT skills and knowledge that they imparted to the participants; therefore, they could relate to the teachers, highligting and concurring with the aspects proposed by Du Plessis and Webb (2012b) and their $C^2RHOAR^3FS^2R^2$ heuristic.

The data also suggest that the conducive and supportive training context was viewed as important. The data suggest that the Intel teach training intervention was successful in providing hands-on training and practice, which the teachers could implement both during the training sessions and

afterwards in their multi-grade contexts. Furthermore, the data highlight that the Intel® Teach training intervention was not a once-off event, but was on-going; the courses were designed as building blocks, hence it was an on-going intervention and provided the platform for life-long learning. The data also suggest that the Intel® Teach training also allowed the teachers to reflect, read and re-plan their workshop contributions, thereby adding to the positive experiences of the teachers. The above-mentioned aspects seem to validate a number of aspects of the $C^2RHOAR^3FS^2R^2$ heuristic (Du Plessis & Webb, 2012b)

The participants felt that the fact that the workshops were held on Sundays was a negative aspect of the Intel® Teach training intervention. The training could not be presented after school, because the distances the participants would have to travel to the training venues were too great and because of their other commitments during the week after school. Hence the training took place over weekends, public holidays and school holidays. From another perspective, this indicated that this group of participants were committed and dedicated to improve themselves to become confident ICT implementors in their respective multi-grade schools and within the educational community and communities they served.

In terms of the second order positive aspects with reference to the self, the training context engendered a positive learning experience; learning being an on-going and lifelong process, the findings concur with the suggestions of Du Plessis and Webb (2012a). The training context was relaxed and made participants feel more positive and confident. In addition, based on the training, some participants started to change their traditional ways of 'doing' within their classrooms, as they started to use the laptop for administration and teaching and learning. The participants also felt confident that they could support one another; however, they found that the skills levels of their peers during training were on different levels, hence the suggestion by Du Plessis and Webb (2012a) that the grouping of participants during training is an aspect that trainers or facilitators should consider.

4.7.5 Is there evidence that the Intel® Teach system enabled teachers to implement ICT into their teaching and learning in a multi-grade context?

When looking at the final subsidiary research question, the data suggest that the Intel® Teach training intervention successfully contributed towards the ICT professional developement of this group of teachers in their multi-grade contexts and that the intended outcomes were beneficial for teacher and learner usage in their multi-grade contexts. Both the qualitative and quantitative data suggest that after the training, the participants began to use their laptops for general administration; as classroom assistants; as tools to enhance teaching and learning and to assist with school-based assessment tasks; to source information; to collaborate and communicate with their co-training peers; to solicit support; and to train their peers who did not attended the Intel® Teach training. Using the levels of use of ICT as presented by Bialobrzeska and Cohen (2005) for the South African context, it seems that these levels

relate to what was established from the data. The data suggest that, based on their levels (Bialobrzeska & Cohen, 2005), the multi-grade teachers used the laptops and ICT resources for USEs 1 and 2 (school and classroom administration, including recording assessment); USE 3 (preparing worksheets and tests); USE 4 (searching for web-related resources to be used for teaching and learning); and USE 5 (basic computer literacy). In some instances, teachers used the laptops as a classroom assistants, which seems to suggest USE 6. The teachers also used their laptops and emailing as communication tools, which served to break their isolation. However, this aspect is not indicated on the levels of USE of Bialobrzeska and Cohen (2005), and hence it is suggested that support and communication should become either a separate level in their USE framework or a vertical level, as it would suggest that communication and support among teachers could occur at any time at any level. The quantitative data also portray a substantial increase in ICT usage after the intervention, in comparision with usage prior to training.

The data seem to concur with the literature, such as the ACOT intervention (Dwyer, Ringstaff & Sandholtz, 1991) and the Toledo (2005) framework, that teachers tend to introduce ICT to their learners only once they themselves have become confident ICT users. The laptops were primarily used to replace traditional ways of using computers and using the laptop in a constructivist manner was not indicated. This could probably be attributed to the fact that there was only one laptop per class, which would limit usage in ways different from the traditional manner.

4.8   REFLECTING ON THE MAIN QUESTION

The main research question was, *"Can the use of the Intel® Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context?"* This seem to imply a 'yes' or 'no' answer. However, Andrews (2003) stated that the main research question (if phrased in a manner that seems to demand a 'yes' or 'no' response, as in this case), goes beyond providing a 'yes' or 'no' response. In the previous sections, an overview and a discussion were provided regarding each of the sub-questions that emanated from the main research question. In this section, an overview is provided in order to ascertain what the sub-questions revealed in order to provide answers to the main research question.

Reflecting on the findings, one is tempted to respond positively to the main research question, but the answer should be validated by the findings from the data. It is therefore critical to consider the research sub-questions based on the data findings. In order to answer the main question, it is imperative to zoom in on what the findings validate in terms of addressing multi-grade challenges and ICT implementation barriers, as well as the participants' suggestions on how to ameliorate these challenges and barriers, how they experienced the Intel® Teach training programme, and their laptop usage after exposure to the Intel® Teach training programme.

4.8.1 Reflecting on multi-grade challenges

Based on the findings, in respect of the multi-grade meso level challenges, it seems that the Intel® Teach training had addressed the challenge of a lack of resources, because the teachers now used their laptops to access the Internet to download the information they needed. The challenges they had with the curriculum and the learner related challenges had not been addressed by the training. However, the challenge they perceived to have in terms of isolation was addressed, since they formed communities of learning and served as support for one another. Intel® Teach training was Internet based; thanks to participants' usage of emails and the Internet, it seems as if the issue of isolation ceased to be a challenge. The Intel® Teach training courses guided them to utilise their laptops more effectively and productively. Sharing lessons and tips with one another also served to mitigate some of the teachers' challenges. It seems as if the issues around time constraints were also addressed, because the participants could do more with their laptops, such as performing administrative and management tasks, in less time than before the training.

From the findings, it seems that the participants' micro level challenges in terms of their unpreparedness for multi-grade teaching, which demotivated them, had been addressed by the Intel® Teach intervention, because they were now more confident to present electronic lessons to their learners. The negative perceptions they harboured about their learners had also been addressed by the training, because they now allowed the learners to use the laptop under supervision. The Intel® Teach training also addressed the participants' challenges regarding the lack of Departmental support from officials, because they were supporting one another. Their lack of curriculum training on multi-grade teaching was not fully addressed, but the training enabled them to think creatively by sharing their lessons with one another. However, the lack of support on various fronts had not been addressed by the Intel® Teach training; nevertheless, it assisted with providing support among themselves.

4.8.2 Reflecting on ICT barriers

In terms of the ICT meso level barriers, the Intel® Teach training addressed the lack of peer support, as mentioned in section 4.7.6. It had also addressed the participants' lack of time; since their training, they began to utilise the laptop in the classroom, or to utilise it much more often. The teachers now also utilised the Internet in the classroom and at home, discovering that it saved time. They now had more time to attend to other matters, because the laptop served as tutor or classroom assistant. The Intel® Teach training also addressed the lack of access to suitable hardware and software to a certain extent, because the participants were exposed to operating and using the Internet, their laptop, data projector, CDs and incorporating their cellphones with the laptop. Unfortunately, the training did not address the lack of suitable infrastructure for ICT.

In terms of the ICT micro level barriers, the Intel® Teach training was successful in addressing the participating teachers' negative beliefs about themselves, because they had grown more

confident and motivated and no longer feared to use the laptop in their multi-grade contexts. Their negative perceptions of the learners' ICT ability had also been addressed, as mentioned above in section 4.7.6. Their negative beliefs about teaching and learning had also been addressed, because they had begun to appreciate the value of teaching with technology; that ICT implementation could take place with one laptop; that ICT is not a separate entity, but part of teaching practices. The transition from traditional 'chalk and talk' to a learner-centred technology learning was possible even in their multi-grade rural context. Hence Intel® Teach training had facilitated the change in mindset towards technology as a separate entity. After the training, the teachers experienced using technology in the multi-grade context not as an additional activity, but as an enhancement of and part of the curriculum they were teaching.

The findings reveal that in terms of macro level challenges, the Intel® Teach training had addressed the lack of support from the Department of Basic Education, because the teachers could now find the support they needed from each other, or via the Internet. Intel® Teach training had also addressed the lack of technical support and maintenance, because the teachers could download antivirus programmes from the Internet to safeguard their laptops against viruses. The challenge regarding the lack of ICT implementation support and leadership was also addressed by Intel® Teach, because the teachers were now leaders in terms of ICT implementation and served as support for one another. The lack of appropriate curricular content had also been addressed, because the participants were sufficiently confident to use search engines to obtain curricular information. Intel® Teach had also addressed the lack of training and professional development, because the courses were structured like building blocks, allowing the teachers sufficient time for practice and implementation.

4.8.3   Reflecting on proposed solutions

With regard to the participants' proposed solutions to the challenges and barriers, Intel® Teach had not addressed the solutions on the meso level. However, Intel® Teach had addressed solutions on the micro level regarding the barriers relating to a mindset change, because the teachers were teaching with the laptop and no longer relied solely on the traditional 'chalk and talk' method of teaching.

From the findings, it seems that some of the solutions regarding the macro challenges and barriers had been addressed through the Intel® Teach training intervention. Intel® Teach training had addressed the macro level solutions regarding support, because the teachers now served as a support basis for each other and as a community of learning for peer support. In terms of the provision of resources, Intel® Teach had provided the teachers with the necessary skills and knowledge to use their laptops, the Internet, emails and each other as valuable resources on which they could rely. Intel® Teach had addressed their training needs regarding ICT implementation, since they were now fully computer literate and used their laptops in various ways in their multi-grade contexts. The researcher

also observed that, after the Intel® Teach training, these participants submitted various documents electronically to the Department of Education and comunicated *via* emails with the Department.

4.8.4   Reflecting on Intel® Teach training experiences

Based on the above, it seems that the Intel® Teach training intervention was perceived as a positive experience on the meso level, because it had exposed the participants to a variety of training material resources, through which the trainers had become more knowledgeable, supportive and caring. The Intel® Teach training environment was conducive and supportive; the outcomes set for the training had been achieved; and the participants' exposure to the Intel® Teach training had also broken the isolation they felt, through increased collaboration and sharing.

The Intel® Teach training intervention also brought about positive experiences related to learning on the micro level, because the participants experienced learning from learners' perspective; the participants also experienced learning not as a once-off event, but as a life-long process. As a result of the Intel® Teach training, they developed more positive attitudes regarding themselves, while their capabilities, skills and confidence levels increased. It seems that the Intel® Teach training had also addressed their generally negative attitude towards technology, because it assisted them in transforming from their traditional practice of 'chalk and talk'. The Intel® Teach training had also assisted these teachers in becoming supporters of their peers.

4.8.5   Reflecting on laptop usage

The evidence regarding the laptop utilisation indicates that, as a result of the Intel® Teach training programme, the participants began to use their laptops in a similar fashion to the first six uses mentioned by Bialobrzeska and Cohen (2005), namely for general administration, recording school-based assessments, and creating worksheet marks. After the Intel® Teach training course, they began to reflect and became reflective about their teaching. The laptop was used for sourcing information, to enhance teaching and learning, sharing and supporting one another *via* email; it also assisted the participating teachers to communicate with each other and the Department of Basic Education. In terms of the fourth use of Bialobrzeska and Cohen (2005), it seems that after the Intel® Teach training, sharing information with others teachers and the Department of Basic Education, became an important aspect of teachers' laptop usage. Furthermore, the Intel® Teach training intervention had encouraged them to use the laptop to train other teachers and learners and also utilise it as a classroom assistant. Therefore, it seems that the Intel® Teach training had indeed encouraged and equipped these multi-grade teachers to use the laptop for teaching and learning in their multi-grade context.

When reflecting on the main research question (Can the use of the Intel® Teach ICT Programme assist novice ICT multi-grade teachers in promoting ICT implementation in their teaching

in multi-grade classrooms?), based on the data findings, it seems that, yes, Intel® Teach ICT Programmes do assist novice ICT multi-grade teachers to implement ICT in their multi-grade contexts.

4.8.6   Reflecting on professional ICT teacher development

Based on the findings from the data and the researcher's informal experience and observations during the Intel® Teach training intervention, it seems that the training contained elements of the $C^2RHOAR^3FS^2R^2$ heuristic for professional ICT teacher development, as proposed by Du Plessis and Webb (2012 b). Intel Teach training addressed the three main aspects, namely the facilitator aspects; training context aspects; and school related aspects, as suggested by Du Plessis and Webb (2012 b).

In terms of the first aspect – the facilitator aspect – it seems that the findings concur that the Intel® Teach trainers showed attributes of competency (knowledgeable) and care, and that they related to the multi-grade teachers, since they were qualified teachers themselves. They were approachable (participants could rely on them during and after the training sessions); patient (assisting individual participants when requested); listened to the participants; provided clear explanations that the participants could follow; always motivated the participants; and clearly had a passion for the work they were doing.

In terms of the second aspect – the training context related aspect – the data findings and researcher observations align the Intel® Teach training with that of the $C^2RHOAR^3FS^2R^2$ heuristic of Du Plessis and Webb (2012b). The Intel® Teach training courses followed a hands-on approach. It was on-going, and assessment was done throughout the training. There were ample opportunities for reflection, reading and re-planning. The training context allowed the individual teachers to follow at their own pace and assisted them in containing and overcoming their anxiety and fears in a relaxed atmosphere. Furthermore, the participant teachers were grouped to extract the best from each individual; there were various levels of interaction; the participants had sufficient practice, and met the expectations of the trainers. In addition, the coursework was provided in a manual, and on CD and access to the Schoolnet and Intel websites was given in addition to other hand-outs. The participants were allowed to express themselves in their home language, and interpretation services were made available for the benefit of the participants of other language groups. Hence the Intel® Teach training intervention contributed towards developing the <u>S</u>elf, an aspect that is not clearly identified in the $C^2RHOAR^3FS^2R^2$ heuristic; thus adding another aspect to the heuristic, which relates to confidence, change in mindset and motivation of the <u>S</u>elf.

In terms of the third aspect – the school related aspect – the Intel® Teach training intervention allowed for sharing, on-going support, recognition and ample resources. Although the $C^2RHOAR^3FS^2R^2$ heuristic mentions important issues like class visitations, school-based staff

development sessions, share classroom experiences, access to own computer, on-going training, collective planning, visioning and rewarding, this aspect becomes another focus point for multi-grade teachers, namely, the important <u>S</u>ustainable <u>S</u>upport aspect.

It seems fair to conclude that the Intel® Teach training intervention, predominantly used for ICT training of mono-grade teachers, is a useful training approach that could also be used for ICT training of multi-grade teachers.

4.9   SUMMARY

This chapter presented the research data and related the findings to the literature pertaining to the five research questions. The findings pertaining to questions 1 to 4 were presented by using the theoretical perspective of Balanskat et al. (2006), Kirkland & Sutch (2009) and Kozma (2003), and were categorised as first (meso or school level), second (micro or individual level) and third (macro or system level) order barriers or challenges, each with sub-categories. In addition, interpretations from the categories were provided, and the research findings were linked to existing literature. In section 4.7, a short discussion was presented to pull all the threads together and to present implications drawn from the findings and interpretation from the data.

CHAPTER 5

CONTRIBUTION, CONCLUSION AND RECOMMENDATIONS

5.1   INTRODUCTION

In the previous chapter, chapter 4, the findings based on the data were presented by using the three level typology of Balanskat et al. (2009), Bialobrzeska & Cohen (2005), Bingimlas (2009) Du Plessis & Webb (2012b), Ertmer (1999), Kirkland and Sutch (2006) and Kozma (2003), to address the main research question and subsidiary questions (Figures 2.3 and 2.4). The main research question that guided this study was:

Can the use of the Intel® Teach ICT Programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context? The subsidiary questions that were explored in order to answer the research question above were:

- *What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

- *What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms*

- *What are the teachers' perceptions of what can be done to meet these challenges?*

- *What did they perceive as the positive and negative aspects of the Intel® Teach Training Programme?*

- *Is there evidence that the Intel® Teach Training Programme enable teachers to implement ICT into their teaching and learning in a multi-grade context?*

This chapter, chaper 5, concludes the study, presenting the conclusions drawn and formulated in terms of the data generated and discussed in chapter 4, and the literature review presented in chapter 2. Furthermore this chapter presents a review of the research rationale and design; the main findings of the study; the theoretical significance and contribution; proposed adapted heuristic, practical significance; implications and recommendations regarding the findings; a reflection on the aims and research questions; a reflection on the relevance of the study; a reflection and recommendations for researchers wanting to conduct a similar study; limitations of the research; suggestions for further research; and a conclusion.

5.2   RATIONALE AND DESIGN

This study aimed to assist multi-grade teachers in utilising their laptops in their multi-grade classrooms. The literature reviewed, advised that this complex phenomenon would be best explored through a qualitative study, since the qualitative paradigm allows for personal interaction and, provides deeper insight into and understanding of the phenomenon within context (Creswell, 2003; Denzin and Lincoln, 2005). This research therefore utilised a qualitative research approach, since it allows more flexibility, is descriptive in nature, allows for exploration, is contextual, and offers a holistic perspective (Creswell, 2003; Marshall & Rossman, 2006).

The paradigmatic stance of this study found preference within the interpretative view, since it aims to search for a better understanding of the participants' experiences and their inner perspectives (Cohen et al., 2007; Creswell, 2003; Denzin & Lincoln, 2005; Johnson & Onwuegbuzie, 2004). Therefore, the research design for this research project was an intrinsic explorative case study within the interpretive paradigm, utilising qualitative data (Creswell, 2003; Fiedler, 2004; Flyvberg, 2011; Gerring, 2007; Picciano, 2004; Pring, 2004; Thomas, 2003; Yin, 2009). The case study approach was used, because it does not prescribe the use of a specific data gathering tool (Merriam, 2009).

Within the interpretive paradigm, qualitative data collection tools were used to gather data, because qualitative data would provide the researcher with the opportunity to explore the inner perspectives and perceptions of the research participants. In this study, the teachers' perceptions were explored *via* two open-ended questionnaires, of which the second questionnaire included some quantitative questions related to the fifth subsidiary research question; individual interviews with nine of the participants; and two focus group interviews with three participants per group, before and after the training sessions. Through the interviews, the researcher gained true information directly from the participants, interviewed the participants personally, and could therefore probe and prompt, where necessary. The interviews were recorded in order to keep the information as factual as possible, and the recordings were transcribed. The data were coded manually according to themes, categories and sub-categories. The findings were presented in terms of the three level typology to address the main research question and subsidiary research questions.

The study proposed to explore and understand the reasons for the non-implementation of ICT integration within a multi-grade classroom. The challenges facing the multi-grade teaching context, the barriers impeding ICT implementation in the multi-grade classroom, and the solutions proposed by the participants were investigated. Furthermore, through the utilisation of an existing intervention, ways were sought to assist teachers in utilising the one-laptop in the multi-grade classroom. Therefore, this study also discovered that the intervention held both positive and negative experiences for the participants. The study also explored whether there was evidence of increased laptop usage after the training intervention.

This interpretive case study was conducted in three phases; the first phase investigated the challenges and possible solutions as perceived by the participants through personal interviews with nine participants; implementing an open-ended questionnaire among all the participants; and holding focus group interviews with two groups of participants. The second phase of the study incorporated an existing intervention, the Intel® Teach Programme, normally used to train teachers in a mono-grade context. The researcher wanted to ascertain whether this same intervention could be used for the multi-grade context. The third phase investigated the positives and negatives emanating from the intervention and how the participants had implemented ICT in their classrooms after the intervention. The data were gathered using an open-ended questionnaire involving all the participants, and focus group interviews held with two groups of participants.

5.3   MAIN FINDINGS

The main findings of the study were explored in terms of the three-level typology (Balanskat et al., 2006; Bialobrzeska & Cohen, 2005; Bingimlas, 2009; Du Plessis & Webb, 2012b; Ertmer, 1999; Kirkland & Sutch, 2009; Kozma, 2003). Regarding the subsidiary research questions, the themes were multi-grade teaching challenges, ICT implementation barriers in the multi-grade context, possible solutions to the challenges, positives and negatives of the training intervention, and evidence of the use of the laptop after the Intel® Teach intervention. A summary of the main findings is discussed in the next section according to the themes. Figure 5.1 provides an overview of all the findings.

5.3.1   THEME 1: Multi-grade teaching challenges

The assumption that delivering a mono-grade curriculum within the multi-grade context would be challenging was confirmed by the literature reviewed and the responses provided by the participants; the experiences by the participants in this study in this regard, were identified and categorised. In terms of the first order (meso or school level) challenges, the data reveals that the main challenges were related to a lack of resources; the mono-graded curriculum posed challenges in the multi-grade context; that the fluctuating learner attendance and learner absenteeism impacted on multi-grade schools; that the isolation impacted on communication and teaching; and the time contstraints due to the heavy workload as a result of the multiple roles fulfilled by multi-grade teachers.

The data reveals that the second order (micro or individual teacher level) challenges in the multi-grade classroom included the perceived uncaring attitude displayed by of the Department of Basic Education, which discomforted teachers; the teachers' unpreparedness for multi-grade classrooms, which demotivated the teachers; and the negative perceptions these teachers had about their learners and their learners' ability to embrace ICT.

FIGURE 5.1: Summary of the findings

ICT IMPLEMENTATION FRAMEWORK

FIRST ORDER (Extrinsic to teachers: School Level or Training Context)	SECOND ORDER (Intrinsic to teachers: Self Level)	THIRD ORDER (System Level: External to school and teachers)
Meso Level	**Micro Level**	**Macro Level**

Multi-grade teaching challenges

• Lack of resources • Curriculum challenges • Learner related challenges • Isolation impacts on communication and teaching • Time constraints and workload overload as a result of multiple roles	• Perceived uncaring attitude of the DoBE hurts teachers • Unpreparedness for multi-grade teaching demotivates teachers • Negative perceptions about the multi-grade learners	• Lack of Departmental support from officials • Lack of Curriculum training for multi-grade contexts • Lack of support on various fronts

ICT challenges in the multi-grade context

• Lack of suitable infrastructure for ICT implementation • Lack of peer support • Lack of access to appropriate hardware and software • Lack of time	• Negative beliefs about the self ⇒ Lack of confidence ⇒ Fear of the laptop ⇒ Lack of motivation • Negative perceptions about the learners' ability to use the laptop • Negative beliefs related to teaching and learning ⇒ One laptop is not enough to implement ICT in a multi-grade context ⇒ Difficult to cross over from traditional talk and chalk	• Support and assistance from the Department of Basic Education is lacking ⇒ Lack of financial support for ICT resources to be used for implementation ⇒ Lack of classroom space provided ⇒ Lack of electrical power supply ⇒ Lack of technical support and maintenance ⇒ Lack of ICT implementation support and leadership ⇒ Lack of appropriate curricular content ⇒ Lack of training and continuous professional development

Suggestions to deal with the challenges in the multi-grade context

• Provide enabling programmes for parents	• Encourage mind-set change	• Multi-grade Renaissance: towards a new model for multi-grade teaching ⇒ Recognise multi-grade teaching as a separate educational reality ⇒ Design a different resource model ⇒ Establish a new teacher to learner ratio • Re-think curriculum requirements regarding multi-grade by the department of Basic Education ⇒ Provide support with curriculum adaptation ⇒ Provide suitable LTSM ⇒ Group two grades per phase • Support required from the Department of Basic Education ⇒ Provide on-site support ⇒ Provide LSEN support ⇒ Encourage the establishment of communities of learning or peer support • Provide incentives to teach in the multi-grade context and with ICTs ⇒ Incentives for teachers ⇒ Incentives for learners • Encourage further research in multi-grade teaching • Provide sufficient resources ⇒ Provide physical resources and financial support ⇒ Provide human resources ⇒ Provide ICT resources • Provide sufficient training in multi-grade teaching and ICT implementation ⇒ Provide continuous professional development courses for in-service teachers ⇒ Provide multi-grade teaching as a module in initial teacher training ⇒ Provide ICT implementation training ⇒ Provide follow up sessions after training • Establish partnerships with different stake holders • Closure and merger of multi-grade schools

EVIDENCE OF USAGE

	LITERATURE (Bialobrzeska & Cohen, 2005)	FINDINGS AFTER INTEL TRAINING
Use 1	School administration use ICTs	Laptop used for general administration
Use 2	Teachers ICT usage for administrative purposes	Laptop assist with recording school based assessment and creating worksheets marks
Use 3	Teachers ICT usage to prepare worksheets and tests	Laptop assist with recording school based assessment and creating worksheets marks Laptop assists to reflect and being reflexive about teaching
Use 4	Teachers access web resources for teaching and learning [Share information too with others & Department of Basic Education]]	Laptop for sourcing information Laptop and its capabilities used to enhance teaching and learning Laptop used for sharing and support via email among teachers Laptop as communication tool to communicate with the Department of Basic Education
Use 5	Computer Literacy for Learners: Learners are taught basic ICT skills and knowledge	Laptop used to train other teachers and learners to use the laptop
Use 6	Learners apply basic IT skills to work across the curriculum in their IT lessons, and informally outside formal teaching time: ♦ Traditional based learning (Behaviourist) OR ♦ Construction of artefacts (Constructivist & Constructionism)	Laptop as classroom assistant
Use 7	Learners use ICTs from time to time when required in their subjects in a loose manner	
Use 8	Learners use computers in an integrated manner in their subjects	

Positive aspects related to training context

• Positive aspects related to training context ⇒ Variety of training material resources ⇒ Knowledgeable, supportive and caring facilitators ⇒ Conducive and supportive training environment ⇒ Achieving the Intel outcomes ⇒ Breaking the isolation through collaboration and sharing • Negative aspects pertaining to training ⇒ Unsuitable time of training sessions	• Positive aspects related to learning ⇒ Perceiving learning experience from a learner's perspective ⇒ Experiencing learning as a life-long process • Positive aspects related to the self ⇒ Developing a positive attitude and engendering confidence • Positive aspects related to teaching with technology ⇒ Assistig teachers to transform traditional practice ⇒ Enabling teachers to become supporters of peers • Negative aspects related to the self ⇒ Various skill levels of participants caused frustration during the training sessions	**IMPLICATIONS FOR TEACHER PROFESSIONAL DEVELOPMENT AND THE C²RHOAR³FS²R² HEURISTIC IN SECTION 5.4, FIGURE 5.2**

AS A RESULT OF INTEL

INTEL: POSSIBLE VEHICLE TO ACHIEVE ENVISIONED OUTCOMES & TO ADDRESS BARRIERS/CHALLENGES

INTENDED ENVISIONED OUTCOMES OF PROCESS

Learner usage

Teacher usage

The third order (macro or system level) challenges identified from the data responses related to the lack of departmental support from officials, the lack of curiculum training for multi-grade contexts, and the lack of support on various fronts.

5.3.2   THEME 2: ICT Implementation barriers in a multi-grade classroom

The data concur with the literature reviewed on the barriers to ICT implementation. In terms of the first order (meso or school level), the main barriers were identified as lack of suitable infrastructure for ICT implementation, lack of peer support, lack of access to appropriate hardware and software, and lack of time.

The data reveal that the second order (micro or individual teacher level) ICT barriers were the negative beliefs and low confidence levels the participants harboured about themselves in terms of using the laptop and the internet, due to insufficient ICT training; their fear of the laptop; as well as their lack of motivation to use the laptop, because of their lack of ICT skills and being without their laptops for long periods of time. Therefore, these intrinsic and extrinsic factors relating to the 'self' or individual teacher impacted negatively on ICT implementation in the multi-grade context. Other barriers to ICT implementation that were identified, included the negative perceptions these teachers had of learners' ability to use the laptop and the negative beliefs related to teaching and learning. Some felt that the one laptop was not enough to implement ICT in a multi-grade context, while others highlighted the difficulty of crossing over from the traditional 'talk and chalk' approach.

The third order (macro or system level) barriers were related to the lack of ICT implementation support and assistance from the Department of Basic Education, centred around the lack of financial support for the ICT implementation, the lack of classroom space provided, lack of electrical power supply, lack of technical support and maintenance, lack of ICT implementation support and visionary leadership, lack of appropriate curricular content, and lack of training and continuous professsional development.

5.3.3   THEME 3: Possible solutions to the challenges

The possible solutions from the data were also presented in terms of both multi-grade and ICT integration. In terms of the solutions to first order (meso or school level) challenges, one solution was to provide enabling programmes for parents.

In terms of the second order (micro or individual teacher level), the data revealed that the solutions presented, aimed to encourage a mindset change.

The data reveal that the solutions presented by the participants were focused on the third order level (macro or system level). These include as solutions, in terms of a multi-grade Renaissance,

towards a new model for multi-grade teaching, which include recognising multi-grade teaching as a separate educational reality, designing a different resource model, and establishing a new teacher-to-learner ratio for multi-grade teaching schools. The data also highlight as a solution the rethinking of curriculum requirements regarding multi-grade by the Department of Basic Education and the provision of interventions by the Department in the form of curriculum adaptation, the introduction of suitable LTSM and the design of multi-grade groupings so that only two grades per phase are combined. Another solution suggested, entailed the provision of broad-range support by the Department of Basic Education; with the emphasis on the provision of on-site support and LSEN support and encouraging the establishment of communities of learning for peer support. The participants also suggested the introduction of incentives for teaching in the multi-grade context, for both teachers and learners. Furthermore, another solution presented, was encouraging further research in multi-grade teaching. Another solution suggested by the participants was the provision of sufficient resources, including physical resources and financial support, human resources and ICT resources. The provision of sufficient training in multi-grade teaching and ICT implementation through providing continuous professional development for in-service teachers, providing multi-grade teaching as a module in initial teacher training and providing ICT implementation training and having follow-up sessions after training sessions were also suggested. The data also reveal solutions that involved the establishment of partnerships with different stakeholders, as well as the closure and merger of multi-grade schools as a possible solution.

5.3.4   THEME 4: Positives and negatives of the Intervention

The participants' positive and negative experiences were presented in terms of both multi-grade and ICT integration. On the first order (meso or school level), the data reveals that the positive aspects were related to the variety of training material resources, knowledgeable, supportive and caring facilitators, a conducive and supportive training environment, achieving the Intel® Teach outcomes, and breaking the isolation through collaboration and sharing. The negative aspect of the training highlighted by the participants was related to the unsuitable time of the training sessions.

In terms of the second order (micro or individual teacher level), the data suggest that the positive aspects related to the learning were in terms of the positive learning experiences from a learner's perspective and experiencing learning as a life-long experience. There were also positive aspects related to the self, which included developing a positive attitude and engendering confidence, as well as enabling teachers to become supporters of peers. A negative aspect of the training was the various skill levels of the participants which caused frustration during the training session.

5.3.5 THEME 5: Evidence of the use of the laptop after the Intervention

The data suggest that there was evidence of a substantial increase in the use of the laptops after the Intel® Teach training intervention. The laptops were used for general administration; to assist with recording school-based assessments and creating worksheets; for sourcing information; as a classroom assistant; to enhance teaching and learning; for sharing and support via emails between teachers; as communication tool to communicate with the Department of Basic Education; to assist teachers to reflect and to be reflective about teaching; to train other teachers and learners to use the laptop. There was also quantitative evidence of an increase in laptop usage after the Intel® Teach training intervetion (Table 4.6 in chapter 4 in section 4.6.2, regarding the quantiative comparison between laptop usage before and after the Intel® Teach training). The uses concurred with the 'USE framework' presented by Bialobrzeska and Cohen (2005) and revealed an aspect not included in the USE framework by the authors: using the laptop for emailing and communication, to break the isolation. Therefore, it is suggested that support and electronic Internet based communication be either integrated as a separate level in the USE framework, or a vertical level, as a vertical level would suggest that communication and support among teachers could occur at any time at any level. In general, the quantitative data portrayed a positive picture of laptop usage after the Intel® Teach training intervention.

5.4 THEORETICAL SIGNIFICANCE AND CONTRIBUTION: PROPOSED ADAPTED HEURISTIC

In the previous chapter, chapter 4, in section 4.8, the main research question was reflected upon, namely *"Can the use of the Intel® Teach ICT programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context?"* From the data and discussion, it is fair to suggest that certain challenges experienced within the multi-grade context, as well as pertaining to ICT (questions 1 and 2), were addressed through the participation of the teachers in the Intel® Teach intervention. It also appears that the Intel® Teach intervention fulfilled the participating teachers' suggestions regarding what they perceived as possible solutions (question 3). The data provided for questions 4 and 5 and the discussion above, in which the findings of questions 4 and 5 were used to indicate which aspects in questions 1, 2 and 3 had been addressed, seem to indicate that the intervention served to address a vast array of the challenges that they had experienced. In addition, it seems that the teacher professional development heuristic of Du Plessis and Webb (2012a) is a useful framework when planning, implementation and sustaining teacher professional development due to the fact that the features of their heuristic were corroborated by the data and findings from this study.

However, it seems that there are two main aspects that could be added to their heuristic in order to make it more comprehensive; these two aspects are represented by the two red circles as

depicted in Figure 5.2, namely SELF and SUSTAINABLE SUPPORT. Within the multi-grade context these two aspects related to the SELF and SUSTAINABLE SUPPORT (from stakeholders such as the Department of Basic Education, NGOs, the community, and sister departments) are very important. This does not imply that the SELF and SUSTAINABLE SUPPORT are missing from the authors' heuristic, as they referred to support and to containing anxiety, a relaxed atmosphere and hands-on practice, which seems to imply the SELF and confidence. However, it is the opinion of the researcher that this has to be made more explicit, hence this recommendation.

The data suggest that in terms of the SELF (second order barrier), there are aspects that contribute towards the successful implementation of ICT. These include a change in mindset and practice, confidence and motivation to use ICT. The SELF is developed in both the training context and in school related aspects. In the training context, the SELF is motivated, the focus is on change in mindset and practice, thereby developing confidence. In terms of the school related aspects in terms of multi-grade teaching, especially in one-teacher schools, there is no sustainable support within the school; there is no exchange of ideas at school level. Therefore, sustainable support for the SELF is outside the school; forming communities of support for one another outside the school boundaries. In the school related aspects, the focus is on sustainable support from peers, sharing and exchange of best practices, and the SELF is developed.

Furthermore, it seems that aspects related to SUSTAINABLE SUPPORT from stakeholders, such as the Department of Basic Education, NGOs, the community and sister departments, are needed, especially in the roll-out of resources. These aspects relate to what should be done in terms of preparation, a management plan, implementation and training, support during the implementation process, as well as on-going support after the training and the evaluation or assessment of the roll-out and classroom implementation in order to ascertain whether the intended outcomes have been achieved. The SUSTAINABLE SUPPORT within the multi-grade context is not only external, or outside multi-grade, but inside the school. Hence providing SUSTAINABLE SUPPORT to the SELF, addresses not only the first and third order barriers, but also indirectly addresses the second order barrier, SELF.

The red arrows pointing from the SELF and SUSTAINABLE SUPPORT in Figure 4.1 indicate how these aspects are actually already imbedded within the Du Plessis and Webb (2012a) heuristic for ICT related professional teacher development (the red arrows indicate these links). As stated before, it is suggested that the SELF and SUSTAINABLE SUPPORT be made more explicit in order that participants and trainers may become more aware of the aspects that relate to them.

FIGURE 5.2: Adapted Heuristic based on Du Plessis and Webb (2012a)

Use 1   School administration use ICTs [Principal/Teacher use it]

Use 2   Teachers ICT usage for administrative purposes [Laptop assist with recording school based assessment and creating worksheets marks]

Use 3   Teachers ICT usage to prepare worksheets and tests

Use 4   Teachers access web resources for teaching and learning
Share information & communicate via email with peers & Department of Basic Education

Use 5   Computer Literacy for Learners: Learners are taught basic ICT skills and knowledge
Laptop used to train other teachers and learners to use the laptop—computer literacy & beyond

Use 6   Learners apply basic IT skills to work across the curriculum in their IT lessons, and informally outside formal teaching time: [Laptop as classroom assistant]
    ♦ Traditional based learning (Behaviourist) OR
    ♦ Construction of artefacts (Constructivist & Constructionism)

Use 7   Learners use ICTs from time to time when required in their subjects in a loose manner

Use 8   Learners use computers in an integrated manner in their subjects

The data also suggest that older teachers can adapt and utilise cutting edge technology when they are trained, motivated, supported, have intrinsic motivation and the will, i.e. self-determination, to do so. The data furthermore reveal that the first and third order barriers are different for multi-grade than for mono-grade teachers. It therefore seems fair to say that the Intel® Teach training intervention had assisted the teachers participating in this study in implementing ICT within their multi-grade contexts.

In terms of Rogers' (2003) theoretical perspective, it seems that the Intel® Teach training intervention was a successful vehicle for ICT implementation within the multi-grade context since it provided the participants with the knowledge and skills pertaining to ICT. The persuasion dimension also played a role, because although it is perceived as a *'simple'* process, the complexity of the training due to the 'newness', did not deter the participants. On the contrary, the trialability which refers to being able to practice what they have learned during the training, as well as the observability of how to implement ICT due to the facilitators modeling the *'how to'*, assisted with the adoption process (Rogers, 2003). The modelling and support seems to support aspects of the theory of self-efficacy of Bandura (1997), i.e. the modelling and training context provided a platform where the participants started to believe that they were capable of using ICT at the level required by Intel® Teach. The data suggest that the participants rose to the occasion as a result of the training context and facilitators who supported and encouraged them. In addition, the hands-on modelling of what was required, also assisted to inform self-efficacy. From the data, it also became apparent that the participants saw the relative advantage of the innovation (Intel® Teach), as it filled a vacuum in their context; namely, providing a communication medium supporting tool through which the participants could support and assist one another in terms of ICT and the curriculum. Hence, participants found the Intel® Teach compatible with their needs, as it filled a void (Rogers, 2003). The Intel® Teach intervention thus persuaded the participants to make a decision whether to adopt, reject or reinvent the Intel® Teach as innovation (Rogers, 2003) and, based on the data, they not only adopted it, but they also reinvented the original purpose of how they started to use ICT (the one teacher laptop) within their multi-grade contexts.

In terms of the usage of the one teacher laptop in the multi-grade context, the data reveal that it could be linked to the Levels of Use of Bialobrzeska and Cohen (2005). The data suggest that, based on their levels Bialobrzeska & Cohen, 2005), the multi-grade teachers used the laptops and ICT resources for USEs 1 and 2 (school and classroom administration, including recording assessment); USE 3 (preparing worksheets and tests); USE 4 (searching for web-related resources to be used for teaching and learning); and USE 5 (basic computer literacy). In some instances, teachers used the laptops as a classroom assistants, which seems to suggest USE 6. The data reveal that the teachers also used their laptops as communication and support tools through emailing, which served to break their isolation in the multi-grade context. However, this aspect is not indicated on the levels of USE of Bialobrzeska and Cohen (2005). Hence it is suggested that communication and support should become

either a separate level in their USE framework or a vertical level, as it would suggest that communication and support among teachers could occur at any time at any level. All aspects indicated in red adjacent to or below the use levels, suggest that the Levels of Use of Bialobrzeska and Cohen (2005) can be extended by including these aspects.

5.5   PRACTICAL SIGNIFICANCE: IMPLICATIONS AND RECOMMENDATIONS REGARDING THE FINDINGS

The practical significance of the study is based on the participants' perceptions of ways of addressing their needs within the multi-grade context and the interrogation as a result of the data by using the three-level typology framework as a categorisation tool. The study drew attention to the challenges experienced by the teachers in multi-grade contexts and the barriers they face when attempting to implement ICT in multi-grade teaching. From the data, this could be done by introducing literacy programmes and more intensive ABET programmes to enable parents to assist learners at home with their homework and other scholastic needs.

Furthermore, it seems that a mindset change could be encouraged among teachers by scheduling participatory sessions during which the participants involved in the training could do practical demonstrations, share their experiences and best practices, including their struggles to overcome the challenges they experienced, as well as the positives and negatives they experienced.

In terms of providing support for ICT implementation, the Department of Basic Education could invest in training appropriate to the needs of multi-grade teaching, as well as to the needs pertaining to ICT implementation. With reference to ICT assistance, it is proposed that the Department of Basic Education should use Intel® Teach as a vehicle to enable teachers to become ICT literate on various fronts in order that they could start with ICT implementation. Furthermore, teachers should be exposed to practical on-site training within the multi-grade context in order to make the training hands-on within the multi-grade school context. This could posssiby lead to positive experiences related to ICT usage, as well as enhanced implementation in their classrooms. As a further means of support, the Department of Basic Education should look at training and appointing departmental officials who are confident and capable of supporting teachers in multi-grade settings, assisting them with curriculum adaptation and strategies for ICT implementation, providing platforms for demonstrations and collaborative sharing. In terms of providing incentives, it seems that the Department of Basic Education should look at providing incentives to teachers teaching in multi-grade schools and investigate the possibility of establishing partnerships to include learner incentives.

It seems from the data that the prevailing silence regarding the multi-grade classroom as an educational reality needs to be broken. Multi-grade teaching needs to be recognised in every aspect. This would be possible through the recognition of multi-grade teaching in policies and tasking

curriculum planners to look at strengthening quality teaching in the multi-grade context. This means that the Department of Basic Education should involve all stakeholders, such as Higher Educational Institutions, teacher organisations and researchers, to find integrated and collective strategies. Furthermore, this implies that the school model for multi-grade teaching needs to be developed in such a manner that it would enable multi-grade teachers to have a well-functioning school.

5.6   REFLECTION ON AIMS AND RESEARCH QUESTIONS

The overall research aim of this study was to enable teachers to use laptops in the multi-grade classroom by determining their needs in order to use an existing teacher assistance programme, such as Intel® Teach, for one-laptop implementation within the multi-grade classroom. Therefore, the main research question was: *"Can the use of the Intel® Teach ICT Programme assist multi-grade teachers in promoting ICT implementation in their teaching in the multi-grade context"?* Five subsidiary research questions were answered in order to address the research question above. In the following sub-sections, a short reflection is provided pertaining to all five subsidiary research questions in order to ascertain whether they have been addressed.

5.6.1   Reflection on subsidiary research question 1: *What are the perceived challenges that a sample of teachers experience when teaching in a multi-grade context?*

This question was addressed through the literature reviewed and the data responses, as presented during the personal interviews, on the open-ended questionnaires and during the focus group interviews, regarding the challenges experienced by a sample of teachers teaching in a multi-grade context. These challenges were identified in terms of the three-level typology, namely first order (meso level or school level); second order (micro level or individual teacher level); and third order (macro level or external level) (Balanskat et al., 2006; Ertmer, 1999; Kirkland & Sutch, 2009; Kozma, 2003). The study therefore addressed this research question.

5.6.2   Reflection on subsidiary research question 2: *What are the perceived challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms?*

The study highlighted that there were barriers preventing ICT implementation in the multi-grade classroom. These barriers or challenges in the implementation of ICT in the multi-grade context were also identified by the participants in the study. These bariers were also identified according to the three-level typology, as mentioned in section 5.6.1, and therefore this question was also addressed by the study.

5.6.3   Reflection on subsidiary research question 3: *What are their perceptions of what can be done to meet these challenges?*

This question revealed that the participants had formulated solutions to address these challenges, which solutions were also presented in the three-level typology, as mentioned in the sections above on the previous two questions. Interesting to note was that these proposed solutions and their perceptions of what could be done to address the challenges, were perceived as mostly external and were not really first or second order solutions. This could be attributed to the fact that as the teachers were from small rural schools, the nature and functioning of these schools were different to normal mono-graded schools and they largely depended on outside assistance; hence these teachers felt that their solutions did not lie at school level, nor at individual level. The solutions seem to concur with the literature reviewed, and, collectively, the responses from the participants as well as the literature reviewed, provided valuable contributions for assisting other schools similar to these; therefore, this research question was also addressed.

5.6.4   Reflection on subsidiary research question 4: *What do they perceive as the positive and negative aspects of the Intel® Teach training programme?*

This question was addressed, as the participants' responses indicated that they had perceived the Intel® Teach training intervention as positive, although they also had negative experiences. In addressing this question, it was also important to look at the ICT framework as presented by Du Plessis and Webb (2012b). From this framework, it seems that the issues mentioned by the participants agreed with the Du Plessis and Webb (2012b) framework. However, it is important to note that the ICT framework of Du Plessis and Webb (2012b) was based on a mono-grade school functionality. The participants in this study were teaching in multi-grade contexts and therefore the aspects of the self and sustainable stakeholder support were important to them. Hence, these two aspects were added to the heuristic, as seen in the pre-adapted figure, Figure 2.3, and in the adapted figure, Figure 4.1, which could assist future ICT implementation in both mono-grade and multi-grade schools. Therefore, this research question was successfully addressed.

5.6.5   Reflection on Subsidiary research question 5: *Is there evidence that the Intel® Teach system enable teachers to implement ICT into their teaching and learning in a multi-grade context?*

Although this interpretive case study operated within the qualitative paradigm, the researcher had to employ both qualitative and quantitative questions in the open-ended questionnaire in an attempt to answer this question. The responses from the participants revealed an increase in the usage of laptops in teaching and learning in their multi-grade contexts. Furthermore, the data agrees with the USE framework, as presented by Bialobrzeska and Cohen (2005), and highlights the usage of laptops and emails as communication tools, to break the isolation teachers experience in multi-grade contexts,

aspects not indicated on the levels of USE of Bialobrzeska and Cohen (2005). Therefore, this research question was addressed.

5.7 REFLECTION ON RELEVANCE OF STUDY

In chapter 1, it was envisaged that the Intel® Teach training intervention programme could be used as a vehicle and an active plan to assist teachers in multi-grade contexts in implementing ICT in their teaching and learning. In terms of this study, the ICT implementation framework provided a means of supporting other teachers in multi-grade contexts who were not part of the intervention. Furthermore, the challenges, barriers and solutions provided by the participants could assist in providing greater support to these multi-grade teachers by the DBE, as presented in the section on practical significance.

5.8 REFLECTION AND RECOMMENDATIONS FOR RESEARCHERS WANTING TO CONDUCT A SIMILAR STUDY

Upon reflecting on this study, the following recommendations were formulated for other researchers wanting to conduct a similar study:

- Ensure that the participants are informed about the aims and objectives of the study before collecting the data. Furthermore, ensure that the participants are aware that their responses will be regarded as confidential and that their names will not be divulged.

- Conduct a pilot run with the questionnaire in order to develop questions that will provide data rich responses. Questionnaires should not be cumbersome and cover all the aspects in one. Questionnaire sessions should be conducted at the training venues, especially when participants have to travel great distances; therefore, allocate sufficient time for this activity.

- Ensure that the interviews do not interrupt the daily operations or classroom activities of the participants. When conducting interviews, take cognisance of noise levels and any disturbances that may occur. Therefore, when conducting interviews, choose times most convenient to the participants and venues where only minimal disturbances and (or) distractions are likely, without interfering in the work environment of the participants. Focus interviews provide data rich information in a much shorter space of time than personal interviews. Have the interview questions written down, with possible probing questions, and do probing to gain deeper insight and data rich information related to the topic. Record and replay the interview responses to the participants, because this may stimulate them to provide more information. Allow the participants to

rethink their responses and leave contact details for them to add at a later stage.

5.9 LIMITATIONS

The small number of participants involved in this case study could be regarded as a limitation of the study. Therefore, the researcher acknowledges that the research findings are context specific, i.e. a sample of multi-grade teachers in the Uitenhage District. More inclusive findings could have been obtained if all the teachers in the multi-grade pilot roll-out had been included. Furthermore, the inclusion of all one hundred teachers in the provincial roll-out could have yielded more comprehensive findings for the Province. However, this was an interpretive case study within the qualitative framework, because of the time constraints associated with the collection of data over such a wider area (Lusikisiki and Sterkspruit and Sundays River Valley areas) with a larger number of participants, the research was conducted only among twenty teachers at multi-grade schools in the Kouga and Koukamma areas in the Uitenhage District. The distances travelled to one training facility would have been too great if all the teachers in the Uitenhage pilot roll-out had been included and it would have presented a logistical nightmare.

Another limitation was that the data gathering tools were conducted in a language that was not the home language of the participants. However, the participants were free to respond to the questions in their language of choice. Every effort was made to ensure the valid, truthful and reliable presentation and reporting of the findings.

As this was a case study, one cannot generalise; however, the reader has the opportunity to engage with the findings in order to ascertain whether they seem plausible and could possibly be similar within other similar contexts (Guba & Lincoln, 2005; Stake, 1995).

5.10 SUGGESTIONS FOR FURTHER RESEARCH

When looking at the data and literature reviewed, it seems that possible suggestions for further research could be:

- A similar study could be conducted with the laptop recipients in Lusikisiki and Sterkspruit to establish the similarities.

- A quantitative study involving all teachers in multi-grade settings in the Eastern Cape could be conducted to look at the challenges on a wider scale.

- A study could be undertaken on the positive motivation that ICT implementation training initiatives have in schools and on learning.

- A quantitative study could be conducted to look at whether ICT implementation in multi-grade teaching schools affect the ANA results of learners in grades 3, 6 and 9.

- A similar study could be conducted among the learners of the laptop recipients to examine how exposure to ICT has affected their school experience and learning.

5.11   CONCLUSION

This study brought about a renewed appreciation of and admiration for educators in multi-grade contexts who have to contend with a myriad of challenges, but still find the courage to transfer quality teaching and learning to the poorest of the poor. This study looked at the challenges and solutions in terms of multi-grade teaching and ICT implementation within the multi-grade context. It also provided an intervention as a solution, and considered the positives and negatives such an intervention could have. Furthermore, the study investigated if there was any evidence of increased laptop usage after the intervention. Multi-grade teaching as an educational reality needs to be addressed through recognition, and this should be encouraged through research.

The fruits of the intervention are experienced daily in the researcher's interactions with these educators and the other educators who were positively affected through the collaborative sharing of skills and knowledge. From observations it seems that the participants in this study are now at the forefront of ICT implementation; and their submissions to the District Office are done electronically. Communication with these educators occur for example via email, and in the latest submission of the LTSM requisitioning documents, these educators were the only ones who were able to utilise the requisitioning tools without any assistance. They converted and submitted their requisition documents in pdf file format well before the due dates and mono-grade teaching schools. Providing resources to schools is important, but it should be accompanied by sufficient training, on-site support and continuous professional development.

REFERENCES

101 Activities for the one-computer classroom. Retrieved January 22, 2011 from http://www2.drury.edu/dswadley/101/

Abuhmaid, A. (2011). ICT Training Courses for Teacher Professional Development in Jordan: *Turkish Online Journal of Educational Technology – TOJET, 10* (4), 195-210.

Adler, E., & Clark, R. (2011). *An Invitation to Social Research: How It's Done.* USA: Wadsworth: Cengage Learning.

Adler, N. (2009). Memories of mass repression: narrating life stories in the aftermath of atrocity. New Jersey: Transaction Publishers.

Adler, P. (2008). Technological determinism. In S. Clegg, & J. Bailey (Eds.), *International encyclopedia of organization studies,* 1537-1540. Thousand Oaks, CA: Sage.

Aikman, S., & Pridmore, P. (2001). Multigrade schooling in 'remote' areas of Vietnam. *International Journal of Educational Development*, *21* (6), 521-536.

Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education,* 27, 373-398.

Alderman, M. (1999). Motivation for achievement: Possibilities for teaching and learning. N.J: L. Erlbaum Associates.

Alessi, S., & Trollip, S. (2001). *Multimedia for learning: Methods and Development.* Boston: Allyn and Bacon.

Aligaen, J. (2009). *One computer in multi-grade classroom. Case of Buan Elementary School.* Bangkok: UNESCO Asia and Pacific Regional Bureau for Education Retrieved May 11, 2010 from http://www.unescobkk.org

Altrichter, H., Feldman, A., Posch, P., & Somekh, B. (2008). *Teachers investigate their work: An introduction to action research across the professions* (2nd ed.). New York. Routledge.

Altun, S., Kalayci, E., & Avci, U. (2011). Integrating ICT at system level: A Case Study. *Turkish Online Journal of Educational Technology- TOJET, 10* (4)*,* 230-240.

Andrews, R. J. (2003). 1953-Title Research questions / Richard Andrews.Imprint London ; New York : Continuum.

Ary, D., Jacobs, L. C., Razavieh, A., & Sorenson, C. (2006). *Introduction to research in education* (7th ed.). Orlando, FL: Harcourt Brace & Company.

Ashmus, D. (2004). *But I don't have a Computer Lab! Using one computer in the classroom*. Retrieved September 25, 2011 from http://wwwseirtec.org

Awan, R. (2011). International Journal of Information and Education Technology, Vol. 1(4), October 2011.

Babbie, E. (2001). *The practice of learning social research*, 9th ed, Wadsworth Thomson Learning, Belmont, CA USA.

Babbie, E. (2005). *The basics of social research*, 3rd ed. Thomson, Wadsworth.

Babbie, E. (2010). *The Practice of Social Research* (12th Edition ed.). Wadsworth, USA: Cengage Learning.

Bai, H., & Ertmer, P. (2004). Teacher Educators' Beliefs and Technology Uses in Relation to Preservice Teachers' Beliefs and Technology Attitudes. Association for Educational Communications and Technology, Washington, DC,: Association for Educational Communications and Technology, 27th Chicago, II. October 19-23 2004 (ED485020).

Balanskat, A., Blamire, R., & Kefala, S. (2006). The ICT Impact Report: A review of studies of ICT impact on schools in Europe. European Schoolnet. http://insight.eun.org/ww/en/pub/insight/misc/specialreports/impact_study.htm

Bandura, A. (1997). *Self-efficacy: The Exercise of Control.* New York: Freeman.

Baron, G-L., & Bruillard, E. (2007). ICT, educational technology and educational instruments. Will what has worked work again elsewhere in the future? *Educational Technology Research and Development, 12(2),* 71-81. Retrieved February 25, 2013 from http://www.springerlink.com

Barrett, A., Sajid, A., Clegg, J., Hinostroza, E., Lowe, J., Nikel, J., Novelli, M., George, O., Pillay, M., Tikly, L., & Yu, G. (2007) *Initiatives to improve quality teaching and learning: "*Paper commissioned for the EFA Global Monitoring Report 2008, Education for All by 2015: will we make it?"

Basit, T. N. (2003). Manual or electronic? The role of coding in qualitative data analysis. *Educational Research, 45*(2), 143-154.

Basit, T. N. (2010) Conducting research in educational contexts. London: Continuum.

Baskin, C., & Williams, M. (2006). ICT integration in schools: Where are we now and what comes next? *Australian Journal of Educational Technology*, *22*(4), 455-473.

Becker, H., & Riel, M. (2000). Teacher Professional Engagement and Constructivist-Compatible Computer Use. *Teaching, Learning, and Computing: 1998 National Survey*, Report No 7.

BECTA, (2003). *ICT Research*. BECTA. retrieved February 2, 2012 from http://www.mmiweb.org.uk

BECTA (2004). *A review of the research literature on barriers to the uptake of ICT by teachers.* Retrieved July 24, 2011 from http://www.BECTA.org.uk

BECTA, (2009). *Harnessing Technology. Business practices which support risk-taking and innovation in schools and colleges*. BECTA. retrieved February 2, 2012 from http://www.mmiweb.org.uk

Beggs, T. (2000). *Influences and barriers to adoption in instructional technology.* Paper presented at the proceedings of the mid-South Instructional Technology Conference, Murfeesboro, TN.

Benveniste, L., & Mc Ewan, P. (2000). Constraints to implementing educational innovations: The case of multigrade school. *International Review of Education, 46* (1/2), 31-48.

Bennel, P. (2004). *Teacher motivation and incentives in Sub-Saharan Africa and Asia.* (Brighton, Knowledge and Skills for Development) Retrieved January 27, 2013 from http://www.eldis.org/vfile/upload/1/document/0708/doc15160.pdf

Berg, B. (1998). Qualitative Research Methods for the Social Sciences. Boston: Allyn and Bacon.

Berry, A., Loughran, J., Smith, K., & Lindsay, S. (2009). Capturing and enhancing science teachers' professional knowledge. *Research in Science Education*, *39*(4), 575-594.

Berry, C. (2001 a). Achievement effects of multigrade and monograde primary schools in the Turks and Caicos Islands. *International Journal of Educational Development 21 (2001)* 537-552.

Berry, C. (2001 b). *Multigrade Teaching: A Discussion Document.* Retrieved May 12, 2010 from http://www.ioe.ac.uk/multigrade

Bhardwaj, N. (2008). *Multigrade Teaching.* New Delhi, India: APH Publishing.

Biablobrzeska, M., & Cohen, S. (2005). *Managing ICT's in South African Schools: A Guide for School Principals.* Braamfontein: South African Institute for Distance Education (SAIDE).

Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, *5*(3), 235-245.

Birman, B., Desimone, L., Porter, A., & Garet, M. (2000). Designing professional development that works. *Educational Leadership, 57*(8), 28-33.

Bisschoff, T., & Koebe, C. (2005). School Choice: Challenge to Sharpeville public school principles. *South African Journal of Education*, *25*, 156-163.

Blaikie, N. (2003). Analyzing quantitative data : from description to explanation. London : SAGE.

Blaikie, N. (2010). *Designing Social Research* (2nd ed), Cambridge: Polity.

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

Blumenfeld, P.C., Soloway, E., Marx, R.W., Krajcik, J.S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, *26*(3), 369-398.

Boakye, K.F., & Banini, D.A. (2008). Teacher ICT Readiness in Ghana. In Kathryn. T, Tchombe. T.M.S, & Karsenti. T (ed) *ICT and Changing Mindsets in Education*. Bamenda, Cameroon: Langaa RPCIG.

Bodner, G. (1986). Constructivism: a theory of knowledge. *Journal of chemical education, 63* (10), 873-878.

Bogdan, R., & Biklen, S. (2003). Qualitative *Research for Education: An Introduction to Theories and Methods*. Boston: Pearson.

Boote, D., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Researcher, 34* (6), 3-15.

Bradshaw, L. (2002). Technology for Teaching and Learning: Strategies for Staff Development and Follow up Support. *Journal of Technology and Teacher Education, 10* (1), 131-150.

Brown, B. (2010). Teachers' accounts of the usefulness of multi grade teaching in promoting sustainable human development related outcomes in rural South Africa. *Journal of Southern African Studies*, *36*(1), 189-207.

Brown, B. (2009). Preparation of teachers for multigrade teaching: Global lessons for South Africa. *Southern African Review of Education, 15*(2), 61-84.

Brunswic, E., & Valérien, J. (2004). *Multigrade schools: improving access in rural Africa?* Paris: UNESCO *:*International Institute for Educational Planning.

Bryman, A. (2001). *Social Research Methods,* Oxford: Oxford University Press.

Bryman, A. (2004). *Social Research Methods*. 2nd Edition. New York: Oxford..*Sampling.* Retrieved January 26, 2011 from http://www.andrews.edu/-calkins/math/webtexts/stat02.htm

Burkhart, L. (1999). *Strategies and Application for the one computer classroom.* Retrieved August 30, 2010 from http://www.lburkhart.com

Burns, M. (2002). From compliance to commitment: Technology as a catalyst for communities of learning. PhiDelta Kappan.

Burns, N. & Grove, S. K. (2003). *Understanding nursing research*. (3rd Ed). Philadelphia, PA: W. B. Saunders.

Burton, N., Brundrett, M., & Jones, M. (2008). *Doing Your Education Research Project.* 1st ed., London: Sage.

Butcher, N., & Associates. (2008). *Intel® Teach for Pre-Service Teacher Education in South Africa : A Formative Research Report* (*summary report*). Retrieved on February 4, 2012 from http://download.intel.com

Butler, D., & Sellborn, M. (2002). *Barriers to adopting technology for teaching and learning.* Educause Quarterly, *9*(4), 105–127.

Calkins, K.G. (2005). *An Introduction to Statistics – Lesson 2: The How and Why of Statistical Sampling*. Retrieved October 12, 2011 from http://www.andres.edu/~calkins/math/webtexts/stat02.htm

Cameron, J. (2005). 'Focussing on the Focus Group', in Iain Hay (ed.), *Qualitative Research Methods in Human Geography*, 2nd ed., Oxford University Press, Melbourne.

Carver, S.M., Lehrer, R., Connell, T., & Erickson, J. (1992). Learning by Hypermedia Design: Issues of Assessment and Implementation. *Educational Psychologist*, *27*(3), 385-404.

Cash, T. (2000). *Multi-grade Teaching*. Retrieved February 28, 2010 from http://www.ioe.ac.uk/multigrade

Chaka, T. (2010). *Mail and Guardian.* Retrieved August 20, 2010 from http://www.mg.co.za/article/2010-08-20-a-reality-wed-rather-ignore

Chetty, R. (2010). *Politics and policies of Multigrade education in South Africa.* Paper presented at The Southern African Multigrade Education Conference 2010, held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Cohen, L., & Manion, L. (2000). *Research Methods in Education.* New York: Routledge.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education.* London: Routledge.

Colbert de Arboleda, V. (2010) *Escuela Nueva International.* Paper presented at The Southern African Multigrade Education Conference 2010, held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Collis, B., & Jung, I. S. (2003). Uses of information and communication technologies in teacher education. In B. Robinson & C. Latchem (Eds.), *Teacher education through open and distance learning*, London: Routledge Falmer, 171-192.

Commonwealth Secretariat. (2004). *Resource materials for multigrade teaching*. London: Commonwealth Secretariat.

Commonwealth Secretariat. (2007). Commonwealth Education Partnerships. Cambridge. Nexus.

Cope, M. (2002). Feminist epistemoly in geography. *In feminist geography in practice: Research and methods, eds*. Pamela Moss, 43-56. Oxford: Blackwell.

Cordingley, P., Bell, M., Rundell, B., & Evan, D. (2003). The impact of collaborative CPD on classroom teaching and learning. In: *Research Evidence in Education Library*. Version 1.1*. London: EPPI-Centre, Social Science Research Unit, Institute of Education.

Cornish, L. (2010). *Multigrade Education in Australia.* Paper presented at The Southern African Multigrade Education Conference, 2010, held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Cowie, B., & Jones, A. (2005). *Digital horizons: laptop for teachers evaluation study update on secondary teacher's experiences*. Retrieved on July 31, 2010 from http://www.minedu.govt.nz

CREATE (Consortium for Research on Education, Access, Transitions and Equity). (2008) *Increasing Access through Multigrade Teaching and Learning.* Policy Brief Number 5. Retrieved on March 15, 2010 from http://www.create-rpc.org

Creighton, T. (2003). *The Principal as Technology Leader.* Corwin Press: California.

Creswell, J. (2003). Research Design: Qualitative, Quantitative and Mixed Methods Approaches. London, Thousand Oaks: Sage.

Creswell, J. (2009). *The Selection of a Research Design.* Retrieved June 4, 2010 from http://www.scribd.com/doc/21355766/The-Selection-of-a-Research-Design-Creswell-2009

Creswell, J. W. (2006). Understanding mixed methods research. In Creswell, J.W. & Plano-Clark, V. (Eds.), *Designing and Conducting Mixed Methods Research*, 1-19. Thousand Oaks: Sage.

Creswell, J., & Plano Clark, V. (2007). *Designing and Conducting mixed Methods Research.* London, Thousand Oaks: Sage.

Creswell, J., Plano Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A.Tashakkori & C.Teddlie (Eds.). *Handbook of mixed methods in social and behavioral research,* 209-240. Thousand Oaks, CA: Sage.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom.* Cambridge, MA: Harvard University Press.

Cuerrier, C. (2004). *Mentoring and Professional Development.* Ontario: Canadian Career Development Foundation.

Cunningham, M., Kerr, K., McEune, R., Smith, P. & Harris, S. (2003). Laptops for teachers: An Evalutaion of the First Year of the initiative. *ICT in School Research and Evaluation Serier* No. 19. BECTA / National Foundation for Educational Research.

Curry, L.A. (2009). *Qualitative and Mixed Methods Provide Unique Contributions to Outcomes Research*. Retrieved January 18, 2013 from http://circ.ahajournals.org/content/119/10/1442#

De Ponte, J., Oliveira, P., Varandas, J.M., Oliveria, H., & Fonseca, H. (2007). Using ICT to support reflection in pre-service mathematics teacher education. *Interactive Educational Multimedia*, *14* pp. 79-89. Retrieved July 28, 2011 from http://www.ub.edu/multimedia/iem

De Vaus, D. (2001). Research Design in Social Research. London: Sage.

De Vos, A., Strydom, H., Fouché, C., & Delport, C. (2005). *Research at grass roots*. 2nd edition. Pretoria: Van Schaik.

Demetriadis, S., Barbas, A., Molohides, A., Palaigeorgiou, G., Psillos, D., Vlahavas, I., Tsoukalas, I., & Pombortsis, A. (2003). Cultures in negotiation: teacher's acceptance / resistance attitudes considering the infusion of technology into schools. *Computers and Education*, *41*, 19-37.

Denscombe, M. (2003). The Good Research Guide: For Small-Scale Social Research Projects. Buckingham: Open University Press.

Denscombe, M. (2007). *The good research guide: for small-scale social research projects* (3rd Edition ed.). New York: Open University Press.

Denzin, K. (2006). *Sociological Methods: A Sourcebook*. (5th Edition). New Jersey: Transaction.

Denzin, K., & Lincoln, Y. (2000). *Handbook of Qualitative Research*. London: Sage Publication Inc.

Denzin, K., & Lincoln, Y. (2005). Introduction: The Discipline and Practice of Qualitative Research. In N.K. Denzin and Y.S. Lincoln (eds.), *The SAGE Hand book of Qualitative Research (3rd ed.)* Thousand Oaks, London: Sage.

Department of Education. (1999). *Personnel Administration Measures*. Government Gazette. *404* (19767). Pretoria: Department of Education.

Department of Education. (2004). White Paper on e-Education. *Transforming Learning and Teaching through Information Communication Technologies*. Pretoria: Government Gazette.

Department of Education (2007). Rural Education Newsletter.

Department of Education. (2009a). *Quality Learning and Teaching Campaign*. South Africa: Department of Education.

Department of Education. (2009b). *Guidelines for the Rationalisation of small and non-viable schools*. South Africa: Department of Education.

Department of Education. (2010). 10th day SNAP survey. *EMIS.* Uitenhage, Eastern Cape, South Africa: Department of Education.

Department of Education. (2011). *Report on the Annual National Assessment for Grades 1-6 and Grade 9.* South Africa: Department of Education.

Dierking, L. (2007). Fostering Tomorrow's Learning Society. *Advance Technologies in Education. 13-24.*Paper presented at Designing the Science Laboratory for the School of Tomorrow Conference, Athens, Greece, 26-27 January 2007.

Dodge, B. (1997). *Some Thoughts About WebQuests*. Retrieved November 10, 2011 from http://webquest.sdsu.edu/about_webquests.html

Donnelly, D., McGarr, O., & O'Reilly, J. (2011). A framework for teachers' integration of ICT into their classroom practice. *Computers & Education, 57*(2), 1469-1483. Retrieved January 31, 2012 from http://www.bing.exp.sis.pitt.edu:8080

Dougiamas, M. (1998). *A journey into Constructivism*. Retrieved February 02, 2008 from http://dougiamas.com/writing/constructivism.html

Downes, T., Fluck, A., Gibbons, P., Leonard, R., Matthews, C., Oliver, R. (2001). Making betterconnections: models of teacher professional development for the integration of information and communication technology into classroom practice. Canberra, Australia: Commonwealth Department of Education Science & Training.

Du Plessis, A. (2004). Learners Perceptions of Creating a Collaborative Hypermedia Product: An Exploratory Study at Mount Pleasant Primary School. Unpublished MEd Thesis, Rhodes University: South Africa.

Du Plessis, A. (2010). The Introduction of Cyberhunts as a teaching and learning strategy to guide teachers towards the integration of computer technology in schools. Unpublished PhD. Department of Education, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.

Du Plessis, A., & Webb, P. (2012a). Teachers' perceptions about their own and their schools' Readiness for computer implementation: a South African case study. *The Turkish Online Journal of Educational Technology, 11*(3).

Du Plessis, A., & Webb, P. (2012b). A teacher proposed heuristic for ICT professional teacher development and implementation in the South African context. *The Turkish Online Journal of Educational Technology*, *11*(4).

Duarte, A. (2006). *A short report on Multigrade Teaching and ICT in Portuguese Education.* Retrieved June 9, 2010 from http://www.intel.com

Dunne, M., Pryor, J., & Yates, P. (2005). *Becoming a researcher: A research companion for the social sciences.* Open University Press: Berkshire.

Durrheim, K. (1999). Research Design. In M. Terre Blanche and K. Durrheim (eds), *Research in practice,* 1-16. Cape Town: University of Cape Town.

Dwyer, D., Ringstaff, C., & Sandholtz, J. (1991). Changes in teachers' beliefs and practices in technology-rich classrooms. *Educational Leadership,* 45-52.

Earle, R. (2002). The Integration of Instructional Technology into Public Education: Promises and Challenges. *Educational Technology, 42*(3), 5-13.

Eickelmann, B. (2011). Supportive and hindering factors to a sustainable implementation of ICT in schools. *Journal for Educational Research Online Journal für Bildungsforschung Online, 3*(1), 75-103.

Eisenberg, M., & Berkowitz, B. (2004). *What is the Big6™?* Retrieved November 10, 2011 from http://www.big6.com

Ely, D. (1999). Conditions that facilitate the implementation of educational technology innovations. *Educational Technology, 39*(6), 23-37.

Ertmer, P. (1999). Addressing First-and Second Order Barriers to Change. Strategies for Technology Integration. *Educational Technology Research and Development, 47*(4), *47-61.*

Ertmer, P. (2004). Increasing Preservice Teachers' Self-Efficacy Beliefs for Technology Integration. *Journal of Research on Technology in Education.* Spring, *36*(3), 231-244.

Ertmer, P. Ottenbreit-Leftwich, A. & York, C. (2007). Exemplary technology-using teachers: Perceptions of factors influencing success. *Journal of Computing in Teacher Education*, 23, 55-61. Available from EBSCOhost.

Esterberg, K. (2002). *Qualitative methods in Social Research.* Boston: Mc Graw-Hill.

Evans, L. (2002). What is teacher development? *Oxford Review of Education, 28*(1), 123-137.

Evoh, C. (2009) Emerging Trajectories and Sustainability of ICT;s in Educational Reforms in Africa: Exploring the Prospects of the Teacher Laptop Policy in South Africa. *Journal of Education for international Development, 4*(2).

Ferrero, S. (2003). *Two Generations of Teachers: Differences in Attitudes towards ICT.* Retrieved June 16, 2010, from elearningeuropa.infor directory: http://www.elearningeuropa.info

Fiedler, R. (2004). Retrieved June 9, 2010 from http://www.beckyfiedler.com/edf6481/litreview/casestudies.pdf

Fishman, B., & Zhang, B. (2003). Planning for Technology: The Link Between Intentions and use. *Educational Technology, 42*(4), 14-18.

Fiszer, E. P. (2004). How Teachers Learn Best: an ongoing professional development model. Maryland: ScarecrowEducation.

FitzPatrick, S. (2005). *ICT (Information Communication Technologies.* Retrieved on October 26, 2012 from http://www.ncca.ie/en/Curriculum_and_Assessment/ICT/

Flick, U. (2002). *An introduction to qualitative research* (2nd Ed). London: Sage.

Flick, U. (2006). *An Introduction to Qualitative Research*. Thousand Oaks: Sage.

Flyvberg, B. (2011). "Case Study" in Norman K. Denzin and Yvonna S. Lincoln, eds., *The Sage Handbook of Qualitative Research*, 4th Edition (Thousand Oaks, CA, Sage, 2011), *17*, 301-316.

Fong, C. (2006). *Integrating ICT into teaching and learning*. Concepts, implementation an challenges: A Bruneian Perspective. Paper presented at the National Conference on ICT in Education 24-26 March 2006, Brunei Darussalam.

Frankel, I., & Wallen, N. (2003). *How to design and evaluate research in education.* Boston: Mc Graw Hill Higher Education.

Fullan, M. (2005). Eight Forces for Leaders of Change. *National Staff Development Council. 26*(4), 54-64.

Fullan, M. (2006). Leading professional learning. *School Administrator, 63*(10), 10-14.

Galanouli, D., Murphy, C., & Gardner, J. (2004). Teachers' Perceptions of the Effectiveness of ICT-competence Training. *Computers & Education*, *43*(1-2), 63-79.

Gamache, P. (2002). University students as creators of personal knowledge: an alternative epistemological view. *Teaching in Higher Education, 7*(3), 277-294.

Gardiner, M. (2008). Education in Rural Areas. *Issues in Education Policy*, *4*, 1-34.

Gay, L.R., & Airasian, P. (2000). Educational Research: Competencies for Analysis and Application. New Jersey: Prentice Hall.

Gergen, K. (1995). Social construction and the educational process. In L. Steffe & J. Gale (Eds.). *Constructivism in education,* 17-39. New Jersey: Lawrence Erlbaum Associates, Inc.

Gerring. (2007). *Case Study Research Principles and Practices*. New York: Cambridge University Press.

Gerson, K. & Horowitz, R. (2002). Observation and Interviewing: Options and Choices in Qualitative Research. In May T (ed). *Qualitative Research in Action*, 199-224. London: Sage.

Gibson, I. (2002). Leadership, technology and Education: achieving a balance in new school leader thinking and behaviour in preparation for twenty-first century global learning environments. *Journal for Information Technology for Teacher Education, 11*(3), 315-334.

Gibson, W. & Brown, A. (2009). *Working with Qualitative Data.* Los Angeles: Sage.

Gilham, B. (2000). *Case Study Research Methods*. London: Continuum.

GLOBAL CAMPAIGN FOR EDUCATION & 1GOAL. (2010, April 13). join1goal.org/home. (Queen Rania, Sepp Blatter) Retrieved July 31, 2010 from http://www.1goal.org

Goktas, Y., Yildirim, S., & Yildirim, Z. (2009). Main Barriers and Possible Enablers of ICT's Integration into Pre-service Teacher Education Programs. *Educational Technology & Society*, *12* (1), 193-204.

Gomes, C. (2005). Integration of ICT in science teaching: A study performed in Azores, Portugal. *Recent Research Development in Learning Technologies.*

Granger, C. A., Morbey, M. L., Lotherington, H., Owston, R. D., & Wideman, H. H. (2002). Factors Contributing to Teachers' Successful Implementation of IT. *Journal of Computer Assisted Learning, 18*(4), 480-488.

Grant, R., & Sugarman, J. (2004). Ethics in Human Subjects Research: Do Incentives Matter? *Journal of Medicine and Philosophy 29*(6): 717-738.

Gray, S. (2005). An Inquiry into Continuing Professional Development for Teachers. Retrieved March 21, 2011 from http://*www.esmeefairbairn.org.uk/docs/Education-Rep.pdf*

Gray, T. (2011) Barriers to integrating ICT into the UK primary school curriculum: a case study approach. EdD thesis, University of Nottingham.

Guba, E., & Lincoln, Y. (2005). Paradigmatic Controversies, Contradictions, and Emerging Confluences. In N.K. Denzin and Y.S. Lincoln (eds), *The SAGE Handbook of Qualitative Research 3rd Ed,* 1919-2161. Thousand Oaks, London: Sage.

Gulbahar, Y., & Guven, I. (2008). A Survey on ICT Usage and the Perceptions of Social Studies Teachers in Turkey. *Educational Technology & Society*, *11* (3), 37-51.

Guskey, T. (2002). Professional development and teacher change. *Teachers & Teaching, 8*(3/4), 381-391.

Hargreaves, A., & Goodson, I. (2003). Series Editors' Preface. In B. Lingard, D. Hayes, M. Mills and P. Christie, *Leading Learning: Making hope practical in schools,* pp vii-x. Maidenhead: Open University press.

Harris, A. (2002). *School Improvement: What's in it for Schools*? London: Routledge Falmer.

Hawkridge, D., Jaworski, J., & McMahon, H. (1990). *Computers in Third-World Schools*. London: The MacMillan Press Ltd.

Healy, J., & Perry, C. (2000). Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm. *Qualitative market Research: An International Journal, 3*(3), 118-126.

Hendron, J. (2009). *Modifying Pedagogy with 21st Century Skills*. Retrieved April14, 2010 from http://www.johnhendron.net

Henn, M. W. (2006). *A Short introduction to Social Research.* London, Thousand Oaks: Sage.

Henn, M., Weinstein, M., & Foard, N. (2006). *A Short Introduction to Social Research.* London, Thousand Oaks: Sage.

Herrington, J., & Kervin, L. (2007). Authentic Learning Supported by Technology: Ten suggestions and cases of integration in classrooms, *Educational Media International*, *44*(3), 219-236. Retrieved May 25, 2010 from http://www.dx.doi.org/10.1080/09523980701491666

Herrington, J., & Oliver, R., (1997). Multimedia, magic and the way students respond to a situated learning environment. *Australian Journal of Educational Technology* 1997, *13*(2), 127-143. Retrieved February 27, 2010 from http://www.ascilite.org.au/ajet/ajet13/herrington.html

Herrington, J., & Oliver, R., (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development*, *48*(3), 23-48.

Higgins, S., & Moseley, D. (2001). Teachers' thinking about information and communication technology and learning: beliefs and outcomes. *Teachers Development*, *5*(2), 191-210.

Hinson, J., Laprairie, K., & Heroman, D. (2006) A failed Effort to Overcome Tech Barriers in a K-12 Setting: What went wrong and why? *International Journal of Technologu in Teaching and Learning,* 2(2), 148-158.

Hoban, G.F. (2002). Teacher Learning for Educational Change: A Systems Thinking Approach. Philadelphia: Open University Press.

Hodgkinson-Williams, C. (2005). *Dust on the Keyboards: Policy Gaps in the Integration of ICT into the South African Curriculum*. Proceedings of the 8th IFIP World Conference on Computers in Education 4-7 July. Stellenbosch: University of Stellenbosch.

Hodgkinson-Williams, C. (2006). Revisiting the concept of ICTs as 'tools': Exploring the epistemological and ontological underpinnings of a conceptual framework. *Paper for ITFORUM 13-17 March 2006*. Retrieved November 10, 2011 from http://it.coe.uga.edu/itforum/paper88/Hodgkinson-Williams-2006.pdf

Hokanson, B., & Hooper, S. (2000). Computers as cognitive media: examining the potential of computers in education. *Computers in Human Behavior*, *16,* 537-552.

Holstein, J. &. Gubrium, J. (2003). *Inside interviewing: new lenses, new concerns*. Thousand Oaks: Sage.

Howie, S., Muller, A., & Paterson, A. (2005). Information and Communication Technologies in South African Secondary Schools. Cape Town: SITES, HSRC Press.

Humphrey, C., &. Lee, B. (2004). The real life guide to accounting research: a behind-the-scenes view of using qualitative research methods. Oxford, UK: ELSEVIER.

Intel® Corporation. (2009). Retrieved October 31, 2010 from http://www.intel.com/cd/corporate/education/emea/eng/za/395993.htm

Jarrard, B. (2008). *Mentoring for Creativity and innovation.* Retrieved April 25, 2010 from http://www.mindwerx.com/blogs/bill-jarrard/2008/05/26/mentoring-creativity-and-innovation

Johnson, B., & Christensen, L. (2004). Educational Research: Quantitative, Qualitative and Mixed Approaches. 3rd Edition. Boston: Pearson.

Johnson, L., & Lamb, A. (2007). The one-computer classroom. *Teacher tap: Professional development resources for educators and librarians.* Retrieved August 12, 2010 from http://www.eduscapes.com

Johnson, R., & Onwuegbuzie, A. (2004). Mixed Methods Research: a Research Paradigm Whose time Has Come. *Educational Researcher, 33*(7), pp 14-26.

Jonassen, D. (2000). *Computers as Mindtools for Schools: Engaging Critical Thinking.* Upper Saddle River, New Jersey: Merrill, Prentice Hall.

Jonassen, D. (2003). The Vain Quest for a Unified Theory. *Educational Technology, 43*(4), 5-8.

Jonassen, D., Carr, C., & Yueh, H. (1998). Computers as Mindtools for engaging learners in critical thinking. *Tech Trends*, 43 (2), 24-32.

Jonassen, D., Myers, J.M., & McKillop, A.M. (1996). From Constructivism to Constructionism: Learning with Hypermedia/Multimedia rather than from it. In B.G. Wilson (Ed.), *Constructivist Learning Environments: Case Studies in Instructional Design*, 96-106. New Jersey: Educational Technology Publications.

Jonassen, D., Peck, K., & Wilson, B. (1999). *Learning with Technology: a constructivist Perspective.* New Jersey: Pearson, Merrill Prentice Hall.

Jonassen, D., & Reeves, T. (1996). Learning with technology: Using computers as cognitive tools. In D.H. Jonassen (ed), *Handbook of research on educational communications and technology,* 693-719). New York: Macmillan.

Jordaan, V., & Joubert, J. (2008). Training of teachers in poor rural areas through a multigrade intervention to achieve millennium development goals: Our experience of using ODL as a tool for building capacity and what lessons can be learned? Wellington. Cape Peninsula University of Technology.

Joubert, J. (2010). Multigrade schools in South Africa: Overview of a baseline study conducted in 2009 by the Centre for Multigrade Education, Cape Peninsula University of Technology. Retreived March 22, 2012 from http://www.pmg.org.za/files/docx/100728multigrade.doc

Juvane, V. (2007). *Multi-grade teaching can improve quality of primary education.* Commonwealth Education. Retrieved May11, 2010 from http://www.thecommonwealth.org.news/160291/090307teaching.htm

Juvane, V. (2005). Redefining the Role of Multi-Grade Teaching. *ADEA Working group on the Teaching Profession.* Addis Ababa, Ethopia. ADEA.

Kazinczi, I. (2009). *Mentoring for innovation – using virtual collaborative tools to develop ICT competence of multigrade teachers*. Paper presented at LOGOSO Open Conference on strengthening the integration of ICT research effort, 19-20. Budapest, Hungary.

Kelle, U., & Erzberger, C. (2004). Qualitative and Quantitative Methods: Not in Opposition. In U.Flick, E. Von Kardorff and I. Steinke, *A Companion to Qualitative Research.* 172-177. London, Thousand Oaks: Sage.

Kervin, L., Vialle, W., Herrington, J. & Okely, T. (2006). *Research for educators.* Thomson. Social Science Press, South Melbourne, Victoria

Khambari, N., Moses, P., & Su Luan, W. (2009). Laptop ownership and use among educators: Reflections from school teachers in Malaysia. *International Journal of Instruction*, *2* (2),47-72

Khan, A.W. (2008). UNESCO's Abdul Waheed Khan: ICT to shape the future of education and learning. Retrieved June 4, 2009, from UNESCO.ORG: http://portal.unesco.org/ci/en/ev.php-URL_ID=27501&URL_DO=DO_TOPIC&URL_SECTION=201.html

Kirkland, K., & Sutch, D. (2009). Overcoming the barriers to educational innovation: A literature Review. Bristol: Futurelab. http://archive.futurelab.org.uk/resources/documents/lit_reviews/Barriers_to_Innovation_review.pdf

Klenke, K. (2008). *Qualitative research in the study of leadership* . UK: Emerald Group Publishing Limited.

Korte, W., & Hüsing, T. (2007). Benchmarking Access and Use of ICT in European Schools 2006: Results from Head Teacher and a Classroom Teacher Surveys in 27 European Countries. eLearning Papers Vol. 2(1). Retrieved January 25, 2010, from http://www.elearningeuropa.info/files/media/media11563.pdf

Kozma, R. (2003). 'Technology and classroom practices: An international study', *Journal of Research on Technology in Education*, *36*: 1-23.

Kozma, R. & Anderson, R. (2002). Qualitative case studies of innovative pedagogical practices using ICT. *Journal of Computer Assisted Learning, 18*(4), 387-394.

Kruss, G. (2009). *Opportunities & challenges for teacher education curriculum in South Africa*. Cape Town. HSRC press. Retrieved March 28, 2010 from http://www.hsrc.ac.za

Kula, A. (2010) *Barriers to ICT integration, Strategies Developed Against Them and Cases in Turkey*. Retrieved Jan 24, 2012 from http://www.academia.edu/294212/Barriers_For_ICT_Integration_Strategies_Developed_Against_Them_and_and_Cases_in_Turkey

Kvale, S. (1996). Interviews: an introduction to qualitative research interviewing. Thousand Oaks: Sage.

Lambert, L. (2002). Leading the Conversation. In L. Lambert, D. Walker, D.P. Zimmerman, D.P. Cooper, J.E. Lambert, M.E. Gardner and M Szabo (Eds). *The Constructive leader,* 63-88. New York: Sage.

Lankeshear, C., & Knobel, M. (2004). *A Handbook for Teacher Research: From Design to Implementation.* Glasglow: Open University Press.

Law, N., Pelgrum, W., & Plomp, T. (2008). Pedagogy and ICT Use in Schools around the World – Findings from the IEA SITES 2006 Study. Hong Kong: Springer.

Lawless, K., & Pellegrino, J. (2007). Professional Development in Integrating Technology Into Teaching and Learning: Knows, Unknows, and Ways to Pursue Better Questions and Answers. *Review of Educational Research*, *77*(4), 575-614.

Leedy, P. D. (1997). Practical research: planning and design. 6th ed. Merrill. Upper Saddle River. N.J.

Leedy, P., & Ormrod, J. (2005). *Practical Research. Planning and Design*. Uppers Saddle River: Pearson.

Leggit, W. & Persichitte, K. (1998). Blood, sweat, and TEARS: 50 years of technology implementation obstacles. *TechTrends, 4*(3), 33-36.

Lehrer, R. (1993). Authors of knowledge: Patterns of hypermedia design. In S.P. LaJoie and S. J. Derry (Eds.), *Computers as cognitive tools*, 197-227. Hillsdale, NJ: Erlbaum.

Lehrer, R., Erickson, J., & Connell, T. (1994). Learning by designing hypermedia documents. In W.M. Reed, J.K. Burton and M. Liu (Eds.), *Multimedia and Megachange: New Roles for Educational Computing*, 227-254. New York, NY: Haworth Press.

Lichtman, M. (2010). *Understanding and Evaluating Qualitative Educational Research*. California: Sage.

Light, D. (2009). The Role of ICT in Enhancing Education in Developing Countries: Findings from an Evaluation of the INTEL Teach Essentials course in India, Turkey and Chile. *Journal of Education for international Development, 4*(2).

Light, D., & Mendez, J. (2010). Intel® Teach Essentials course: a strategy to implement the Chilean reforms in the classroom. *Congreso Iberoamericano de Informatica Educativea Jaime Sanchez, Editor Santiago*. Chile.

Lingam, G. (2007). Pegagocal practices: the case of multi-class teaching in Fiji primary school. *Educational Researh and Review, 2,* 186-192. Retrieved August 22, 2011 from http://www.academicjournals.org/ERR

Lingard, B., Hayes, D., Mills, M., & Christie, P. (2003). *Making hope practical in schools.* Maidenhead: Open university Press.

Little, A. (2001). Multigrade teaching: towards an international research and policy agenda. *International Journal of Educational Development, 21,* 481-497. Retrieved August18, 2010 from http://www.elsevier.com/locate/ijedudev

Little, A. (2004). *Learning and Teaching in Multigrade Settings*. Paper prepared for the UNESCO 2005 EFA Monitoring Report. Retrieved April 22, 2010 from http://www.siteresouces.worldbank.org/INTINDIA/4371432-1194542398355/2154321/LearningandTeachinginMulti-Gradeclassroom.pf

Little, A. (2006). Education for All and Multigrade Teaching: Challenges and Opportunities. Dordrecht, Netherlands: Springer.

Little, A., Pridmore, P., Bajracharya, H., & Vithanapathirana ,M. (2006). *Learning and Teaching in Multigrade Settings: A final report to DFID*. Retrieved April 18,2010 from http://www.ioe.ac.uk/multigrade

Lockard, J., & Abrams, P. (2001). *Computers for Twenty-First educators* (5th ed.). New York: Addison Wesley Longman.

Loeto, B. (2010). *Lessons on Multi Grade Education in Botswana.* Paper presented at The Southern African Multigrade Education Conference 2010, , held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Love, C. (2002). Teacher attitudes in computer education. *Computimes.* 11 March.

Loveless, A. (2003). *Role of ICT*. London: UK. New York. Continuum.

Lujan-Pincomb, C. (2011). The one computer classroom: from reward to treasure. Retrieved September 26, 2011 from http://www.ddlnmsu.edu

Mahn, H., & John-Steiner, V. (2002). The Gift of Confidence: A Vygotskian View of Emotions. In G. Wells and G. Claxton (Eds.), *Learning For Life In The 21st Century: Socio-cultural Perspectives On The Future Of Education*. Retrieved March 23, 2013 from http://people.ucsc.edu/~gwells/Files/Courses_Folder/documents/HolbrookJohn-Steiner.pdf

Maistry, S. (2008). Towards Collaboration Rather Than Cooperation for Effective Professional Development of Teachers in South Africa: Insights from Social Practice Theory, *Southern African Review of Education, 14*(1-2).

Mariano, L. & Kirby, S. (2009). *Achievement of Students in Multigrade Classrooms.* Rand Education, USA.

Marshall, C., & Rossman, G. (2006). *Designing Qualitative Research* (4 th ed.). Thousand Oaks, CA: Sage.

Mathew, K., Callaway, R., Letendre, C., Kimbell-Lopez, K., & Stephens, E. (2002). Adoption of Information Communication Technology by Teacher Educators: one-on-one coaching. *Journal of Information Technology for Teacher Education, 11*(1), 45-62.

Mathot, G. (1998). A Survey of Multigrade Schools in the Eastern Cape: University of Fort Hare In-service Programmes. East London: University of Fort Hare.

Maxwell, J. (2005). *Qualitative Research Design: An Interactive Approach.* Applied Social Research Methods Series, Volume 41. Thousand Oaks: Sage.

McCloy R.A., & Wise L.L. (2002). Invited reaction: The effects of personality,affectivity, and work commitment on motivation to improve work through learning. *Human. Resource. Development. Q*, *13*(4), 377-382.

McDonough, J., & McDonough, S. (1997). *Research Methods for English Language Teachers*. London: Sage.

McEwan, P. (2008). Evaluating multigrade school reform in Latin America. *Compararive Education. 44*, (4), 465-483.

McFarlane, A. (2000). Communicating meaning: Reading and wirting in a multi-media world, in N. Gamble and E. Easingwood (eds) *ICT and Literacy.* London: Continuum, 19-24.

McGhee, R., & Kozma, R. (2001). *New Teacher and Student Roles in the Technology-Supported Classroom*. Paper presented at the Annual Meeting of the American Educational Research Association, April 2001, Seattle, WA. Retrieved February 02, 2008 from http://www.cehd.umn.edu/carei/reports/docs/newrolestechnology.pdf

McMillan, J., & Schumacher, S. (2006). *Research in Education: Evidence-Based Inquiry.* Boston: Allyn Bacon, Pearson.

McNamee, M., & Bridges, D. (2002). *The Ethics of Educational Research*. Oxford, UK: Blackwell.

McWilliam E., Danby, S. & Knight, J. (2004) *Performing research*. Flaxton: Postpressed.

Merriam, S. (2009). *Qualitative Research: A Guide to Design and Implementation*. Thousand Oaks: Sage.

Mertens, D. (2005). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative and mixed methods*. Thousand Oaks: Sage.

Miller, B. (1991) *Teaching and Learning in the Multigrade Classroom: Student Performance and Instructional Routines*. Retrieved May, 28, 2010 from http://www.ericdigests.org/pre-9221/teaching.htm

Mills, G. (2003). *Action research: A guide for the teacher researcher*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Mills, A., Mills, J., Bratton. J and Forshaw, C. (2007). *Organisational Behaviour in a Global Context*. Canada: University of Toronto Press.

Ministerial Committee. (2005). *Report on rural education: A new vision for rural schooling*. Pretoria: Department of Education.

Mishra, P., & Koehler, M.J. (2008) *Introducing Technological Pedagogical Content Knowledge*. Paper presented at the Annual Meeting of the American Educational Research Association New York City, March 24–28, 2008.

Modisane, T., & Masango, D. (2005). *SA on track for Millennium goals.* Retrieved March, 22, 2010 from http://www.southafrica.info/about/social/mdg-050805.htm

Mouton, J. (2001). *How to succeed in your Master's and Doctoral Studies*: A South African Guide and Resource Book. Pretoria: Van Schaik.

Mouza, C. (2006). *Learning with Laptops: The impact of one-to-one Computing on Student Attitudes and Classroom Perceptions*. University of Delaware.

Mulkeen, A., & Higgins, C. (2009). *Multigrade Teaching in Sub-Saharan Africa*: Lessons from Uganda, Senegal and The Gambia. Washington, D.C., U.S.A: The World Bank. (World Bank working paper, *173*.

Mulryan-Kyne, C. (2007). The preparation of teachers for multigrade teaching. *Teaching and Teacher Education*, *23*(4)*,* 501-514.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319-342.

Nangue, C. (2011). *Guidelines for the successful integration of ICT in schools in Cameroon.* Unpublished M.Tech Department of Education, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.

Nardy, M. (2006). *Doing Survey Research – a guide to quantative methods.* Boston, USA: Stratford Publishing Services.

Nelson Mandela Foundation. (2005). *Emerging Voices.* HSRC Press: Cape Town.

Neuman, W. (2000). *Social research methods.* 4th ed. Boston, MA: Allyn & Bacon.

Newhouse, P. (2002). *Literature review: The impact of ICT in learning and teaching.* Perth, Western Australia: Department of Education.

NWREL. (2001). *Multigrade classroom instructional resources overview.* Retrieved March 26, 2010 from http://www.nwrel.org/ruraled/multigrade.html.

O'Connor, D.L., & Ertmer, P. (2006). Today' Coaches Prepare Tomorrow's Mentors: Sustaining the Results of Professional Development. *Academy of Educational Leadership Journal*, *10*(2), 97-112. Retrieved March 23, 2013 from http://www.edci.purdue.edu/ertmer/docs/MWERA_TodaysCoaches.pdf

O'Donoghue, T. and Punch, K. (2003).*Qualitative Educational Research in Action: Doing and Reflecting*, London, Routledge Falmer (2003)

One computer classroom. Retrieved January 22, 2011 from http://www.webtech.kennesaw.edu/jcheek3/onecomputer.htm

One computer classroom lessons. Retrieved January 22, 2011 from http://www.internet4classrooms.com›Links for K-12

Ormrod, J. (2004). *Human learning* (4th ed). Upper Saddle River, NJ: Prentice Hall.

Oppenheim, A. (2005). *Questionnaire design, interviewing and attitude measurement*. New York: Continuum.

Ozden, M. (2007). Problems with science and technology education in Turkey. *Eurasia Journal of Mathematics, Science and Technology Education, 3*(2), 157-161.

Papaiounnaou, P., & Charalambous, K. (2011). Principals' Attitudes towards ICT and their perceptions about the factors that facilitate or inhibit ICT Integration in primary schools of Cyprus. *Journal of Information Technology Education, 10*, 350-369.

Papert, S. (1991). Situating Constructionism. In I. Harel and S. Papert (eds.) (1991). *Constructionism: Research Reports and Essays 1985-1990 by the Epistemology and Learning Research Group,* 1-12. New Jersey: Ablex.

Patton, M. (2002). *Qualitative Research and Evaluation Methods.* Thousand Oaks, London: Sage.

Pelgrum, W.J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education, 37*(2), 163-178.

Perkins, D. N. (1986). *Knowledge as Design*. Hillsdale, NJ: Erlbaum.

Phan, H. (2008). Exploring epistomological beliefs and learning approaches in context: A Sociocultural Perspective. *Electronic Journal of Research in Educational Psychology,6* (3), 793-822.

Picciano, A. (2004). *Educational Research Primer.* London: Continuum.

Plante, J. (2005). *Connectivity and ICT Integration in First Nations Schools: Results from the Information and Communications Teachnologies in Schools Survey 2003/04*. Canada: Minister of Industry.

Polkinghorne, D. E. (2005). Language and meaning: Data collection in qualitative research. *Journal of Counseling Psychology, 52*, 137-145.

Prensky, M. (2008). *The Role of Technology in teaching and the classroom.* Retrieved June 18, 2011 from http://111.marcprensky.com/writing/Prensky-Essential_21stCenturySkills.pdf

Prestridge, S. (2010). ICT professional development for teachers in online forums: analysing the role of discussion. *Teaching and Teacher Education*, *26* (2), Elsevier, Cardiff UK. 252-258.

Pridmore, P. (2007). Adapting the Primary School Curriculum for Multi-grade Classes in Developing Countries: A Five-step Plan and an Agenda for Change. London: Institute of Education, University of London.

Pridmore, P., & Vu, S. T. (2006) Adapting the curriculum for teaching health in multigrade classes in Vietnam, in. Little, A. W. (Ed.) *Education for All and multigrade teaching: challenges and opportunitie*,(169-191). Dordrecht: Springer.

Pring, R. (2004). *Philosophy of Educational Research.* London: Continuum.

Pulkkinen, J. (2007). Cultural globalization and integration of ICT in education. In K. Kumpulainen (Ed.), *Educational technology: Opportunities and challenges,* 13-23. Oulu, Finland: University of Oulu.

Punch, K. (2009). *Introduction to Research Methods in Education*. London: Sage.

Pundak, D. (2007). Empowering teachers to Adopt Active Learning Methods for school of tomorrow. *Advance Technologies in Education*, 41-57. Greece: Ellinogermaniki Agogi.

Raffo, C., Dyson, A., Gunter, H., Hall, D., Jones, L., & Kalambouka, A. (2007). *Education and poverty: A critical review of theory, policy and practice.* Manchester: Joseph Rowntree Foundation & University of Manchester.

Rao, K. (2003). One-computer classrooms: Technology Integration with limited Resources. *Pacific resources for education and learning: Pacifica Educator,* 21.

Republic of South Africa. (1994). *The Public Service Act (Act 103 o 1994).* Pretoria: Government Printer.

Republic of South Africa. (1996a). *The Constitution of the Republic of South Africa* (*Act 108 of 1996).* Pretoria: Government Printer.

Republic of South Africa. (1996b). *The South African Schools Act of 1996 (Act 84 of 1996).* Pretoria: Government Printer.

Republic of South Africa. (1998a). The Basic Conditions of Employment of Educators Act (Act 76 of 1998). Pretoria: Government Printer.

Republic of South Africa. (1998b). *The Employment of Educators Act (Act 76 of 1998).* Pretoria: Government Printer

Republic of South Africa (1999). *The Public Finance Management Act (Act 1 of 1999)* Pretoria: Government Printer.

Republic of South Africa. (2001). *The Education Laws Amendment Act (Act 57 of 2001.* Pretoria: Government Printer.

Republic of South Africa. (2005). *The Education Laws Amendment Act* (Act 24 of 2005). Pretoria: Government Printer.

Richardson, V. (2003). *The dilemmas of professional development*. Phi Delta Kappan. Retrieved April 26, 2011 from http://www.pdkintl.org/kappan/k0301ric.html

Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: a guide for social science students and researchers*. London: Sage.

Robyler, M. (2006). *Integrating educational technology into teaching.* Upper Saddle River, NJ: Pearson / Merrill Prentice Hall.

Rodden, N. (2010). An investigation into the barriers associated with ICT use in the Youthreach classroom: A Case study of a Centre for Education in the North West. University of Limerick. Retrieved on January 26, 2013 from http://ulir.ul.ie/bitstream/handle/10344/960/Thesis.pdf?sequence=2

Rogers, E. (2003). *Diffusion of innovations.* 5th Edition. New York: Free Press.

Rossouw, J.P. (2003). Learner Discipline in South African Public Schools — a qualitative study. *Koers, 68*, 413-435.

Roulston, K. (2010). Reflective Interviewing: A Guide to Theory and Practice. Thousand Oaks: Sage.

Rubin, H. & Rubin, I. (2005). Qualitative interviewing: the art of hearing data. Thousand Oaks: Sage.

Ryan, M. & Deci, E. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology 25*, 54-67

Salomon, G. (2002). Technology and pedagogy: Why don't we see the promised revolution? *Educational Technology, 42*(2), 71-75.

Samuel, R. & Abu Baker, Z. (2006) The Utilisation and Integration of ICT tools in Promoting English Language Teaching and Learning: Reflections from English Option Teachers in Kuala Langat District, Malaysia. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, *2* (2), 4-14.

Sang, G., Valcke, M., Braak, V., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54*, 103-112.

Schiller, J. (2002). Interventions by School Leaders in Effective Implementation of Information and Communications Technology: Perceptions of Australian Principals. *Journal of Information Technology for Teacher Education, 11*(3), 289- 301.

Schostak, J. (2006). *Interviewing and Representation in Qualitative Research*. Berkshire: Open University Press.

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. *Learning an Teaching in Higher Education: Gulf Perspectives, 2*(1), 1-24.

Schumacher, P., & Morahan-Martin, J. (2001). Gender, internet and computer attitudes and experiences. *Computers in Human Behavior*, *17*(1), 95-110.

Schunk, D. (2004). *Learning Theories: An educational perspective.* (4th ed). Upper Saddle River, NJ: Merrill Prentice Hall.

Schurink, W., Schurink, E., & Poggenpoel, M. (1998). Focus group interviewing and audio‑visual methodology in qualitative research. In A.S. De Vos. (Ed.) *Research at grass roots, a primer or the caring professions*, 313-333). Pretoria: Van Schaik.

Scrimshaw, P. (2004). *Enabling teachers to make successful use of ICT.* For and on behalf of the British Educational Communications and Technology Agency (BECTA). Retrieved June 23, 2011 from http://www.BECTA.org.uk

Shelly, G., Cashman, T., Gunter, R., & Gunter, G. (2002). *Integrating Technology in the Classroom: Teachers Discovering Technology.* Cambridge: Course Technology. Shelly Cashman Series.

Shenton, A. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information 22,* 63-75.

Shibeshi, A. (2006). *Education for Rural People in Africa.* Rome and Paris: FAO and IIEP).

Shuldam, M. (2004). Superintendent Conception of Instructional Conditions That Impact Teacher Technology Integration. *Journal of Research on Technology in Education, 36*(4), 319-344.

Silverman, D. (2000). *Doing qualitative research: A Practical Handbook.* London. Sage.

Silvernail, D., & Lane, D. (2004). The Impact of Maine'sOne-to-One Laptop Program on Middle School Teachers and Students: Phase one Summary Evidence, Research Report 1, Maine Education Policy Research institute. University of Southern Maine Office.

Siririka,G.(2010). *The practice of Multigrade Teaching in Namibia.* Paper presented at The Southern African Multigrade Education Conference 2010, held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Sotiriou, S., & Dalmagkas, N. (2007). *Designing the Science Laboratory for the School of Tomorrow: Advance Technologies in Education*. Proceedings of the Conference 26-27 January 2007, Greece. Retrieved on July 28, 2011 from http://www.ea.gr/ep/ate2007/upload/2007ate_proceed.pdf

Soule, H. (2003). What do you mean by ICT integration: *Journal of Educational Reform in Namibia*,*16.*

South Africa Institute of Distance Education [SAIDE] (2003). *Consolidated report on SAIDE's Research into Educational Programmes and Opportunities in Rural Areas* Retrieved March 27, 2010 from http://www.saide.org.za/resources

South Africa: Ministry of Education (2005). *Ministerial report on Education for Rural People*. Country report presented at The Ministerial Seminar on Education for Rural People in Africa: Policy Lessons, Options and Priorities held at Addis Ababa, Ethiopia, 7-9 September 2005.

South African National Department of Basic Education. *Thutong. National Educational Portal.* Retrieved on April 10, 2010 from http://www.thutong.doe.gov.za

Stake, R. (1995). *The Art of Case Study Research.* Thousand Oaks, CA: Sage.

Stake, R. (2005). Qualitative case studies. In N.K. Denzin and Y.S. Lincoln (eds.), *The SAGE Handbook of Qualitative Research* (3rd ed.), 443-466. Thousand Oaks, London: Sage.

Stevenson, D. (1997). Information and communications technology in UK schools: An independent inquiry. Chairman of the Independent ICT in Schools Commission. Retrieved November 09, 2011, from http://rubble.heppell.net/stevenson/ICT.pdf

Strategies for teachers using one computer classroom. Retrieved January 22, 2011 from http://www.lburkhart.com/elem/strat

Strauss, I. (1999). An investigation into the availability and Use of teaching and learning material in Multigrade classes in the Free State. Report of a Survey. Research Institute for Education Planning University of the Orange Free State. Bloemfontein. Retrieved April 20, 2010 from http://www.jet.org.za/publications/pei-research/001732_Strauss_LTM%20in%20the%20Free%20State.pdf

Struwig, F., & Stead, G. (2001). *Planning, designing and reporting research.* Maskew Miller Longman, Cape Town: South Africa.

Surry, D. (2002). *A model for integrating instructional technology into higher education. University of South Alabama*. Proceeding of the American educational research association. 1-33.

Surry, D., Ensminger, D., & Haab, M. (2005). A Model for Integrating Instructional Technology into Higher Education. *British Journal of Educational Technology 36*(2) 327-329.

Surry, D. & Ensminger, D (2009) *Supporting the implementation of Online Learning*. Retrieved August 28, 2010 from http://www.usq.edu.au/electpub/e-jist/vol2no1/vol2no1cont.htm

Surry, D. & Farquhar, J. (1997). Diffusion theory and instructional technology. *Journal of Instructional Science and Technology,* 2(1). Retrieved August 22, 2010 from http://www.usq.edu.au/electpub/e-jist/vol2no1/vol2no1cont.htm

Surry, D., Porter, B., Jackson, K. & Hall, D. (2004). Conditions for Creating an Innovation Friendly Environment in K-12 schools. In C. Crawford et el. (eds), *Proceedings of Society for Information Technology and Teacher Education International Conference 2004*, 418-1425. Chesapeake, V.A: AACE.

Tashakkori, A. & Teddlie, C. (2003). Handbook of Mixed Methods in social and behavioural research. USA. Sage.

Tasir, Z., Abour,K., Halim, N., & Harum, J. (2012). Relationship between teachers' ICT competency, confidence level and satisfaction toward ICT training programmes: A case study among postgraduate students. *The Turkish Online Journal of Educational Technology, 11* (1), 138-144.

Taylor, R.P. (Ed). (1980). *The Computer in the School: Tutor, Tool, Tutee*. New York: Columbia University, Teachers College Press.

Taylor, R. & Bogdan, R. (1998). Introduction to Qualitative Research Methods: A Guidebook and Resource. New York: John Wiley.

Taylor-Powell, E. and Renner, M. (2003). *Analyzing qualitative data*. Madison, WI: University of Wisconsin Extension. Retrieved June ,23, 2011 from http://learningstore.uwex.edu/pdf/G3658-12.pdf

Teaching in the one computer classroom. Retrieved January 22, 2011 from
http://www.gsu.edu/~eslmlm/onecomputer2.html

Tearle, P. (2003). ICT implementation: What makes the difference? *British Journal of Educational Teachnology, 34*, 567-583.

Tellis. W. (1997). Application of a case study methodology. *The Qualitative Report* [On-line serial], *3*(3). Available: http://www.nova.edu/ssss/QR/QR3-3/tellis2.html

The International Marketing Council of South Africa. (2005). Retrieved February, 26, 2010 from http://www.southafrica.info/about/social/mdg-050805.htm

The one computer classroom. Retrieved January 22 2011 from http://www.teachnet.com ›Power Tools › How-To › Getting Organized

Thomas, M. (2003). Blending Qualitative and Quantitative Research Methods in Theses and Dissertations. Thousand Oaks: Corwin Press.

Thomas, C., & Shaw, C. (1998). Issues in the development of multigrade schools. World Bank Technical Paper no. 172. Washington DC: The World Bank.

Thutong. South African Education Portal. Retrieved on February 24, 2010 from http://www.thutong.doe.gov.za

Tinio, V. L. (2003). *ICT in education. E-Primers for information economy, society and policy.* Retrieved August 28, 2011 from http://www.eprimers.org/ict/page2.asp

Titus, D. (2004). The implementation of multigrade teaching in rural schools in the Keetmanshoop education region: Leadership and Management challenges.

Toledo, C. (2005). A Five Stage Model of computer Technology Integration into Teacher Education Curriculum. *Contemporary Issues in Technology and Teacher Education, 5*(2), 177-191.

Tondeur, J., Van Keer, H., Van Braak, J. & Valcke, M. (2008). ICT integration in the classroom: Challenging the potential of a school policy. *Computers and Education*, *51*(1), 212-223.

Toffler, A.(1970). *Future Shock.* New York: Random House.

Toprakci, E. (2006). Obstacles at integration of schools into information and communication technologies by taking into consideration the opinions of the teachers and principals of primary and secondary schools in Turkey. *Journal of Instructional Science and Technology, 9*(1), 1-16.

Torero, M., & Von Braun, J. (2005). *ICTs: Information Communication Technologies for the Poor.* Retrieved October 26, 2012 from http://www.ifpri.org/sites/default/files/publications/ib40.pdf

Trochim,W.(2006). *Research Methods Knowledge Base.* Retrieved July 26, 2010 from http://www.socialresearchmethods.net/kb

Tsolakidis, C. (2007). *ICT reinforcing teaching and learning in multigrade schools.* Retrieved February 28, 2010 from http://www.elearningeuropa.info

Tsolakidis, C.(2010). *Multigrade Issues: A Policy Required.* Paper presented at The Southern African Multigrade Education Conference 2010, , held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Tyler, A. (2006). *Chapter 3.* Retrieved November 20, 2011 from http://www.cadair.aber.ac.uk

UNESCO, (2002). Information and Communication Technology in Education. A curriculum for schools and programme of teacher development. Paris: UNESCO. Retreived June 28, 2010 from http://www.unescodoc.unesco.org/images/0012/001295/129538e.pdf

Vallance, M. (2008). Beyond policy: Strategic actions to support ICT integration in Japanese schools. *Australian Journal of Educational Technology , 24* (3), 275 - 293.

Van As, A. (2009). 'n Ondersoek na die gebruik en ontwikkeling van onderrig- en leermateriaal in mutligraadskole in die Wellington landdrosdistrik. CPUT Retrieved January 28, 2012 from http://www.cput.ac.za

Van Fossen, P. (1999). "*Teachers would have to be crazy not to use the Internet*": secondary social studies teachers in Indiana', Paper presented at the Annual Meeting of the National Council for the Socisl Studies, Orlando, FL, November 19-21.

Van Harmelen, U. (1995). Behaviourism, empiricism and education. In P. Higgs, *Metatheories in Philosophy of education,* 51-67. Johannesburg: Heinemann.

Valli, L. & Hawley, W. (2002). Designing and implementing school-based professional development. In W.D. Hawley (Ed), *The keys to effective schools: Educational reform as continuous improvement,* 86-96. Thousand Oaks, CA: Corwin.

Van Wyk, K. (2009). *Can a laptop be used as a teaching tool*? Retrieved September 28, 2011 from http://www.e4africa.co.za

Vithanapathirana, M. (2010). *Multigrade Teaching Innovations in Sri Lanka and Challenges of Scaling-up.* Paper presented at The Southern African Multigrade Education Conference 2010, held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Von Glasersfeld, E. (1995). *Radical constructivism.* Washington DC: Falmer Press.

Vrasidas, C., & Glass, G. (2005). Achieving Technology Integration in Classroom Teaching. In C. Vrasidas and G.V. Glass, *Preparing Teachers to Teach with Technology,*1-20. Greenwich, Connecticut, Information Age Publishing.

Wako, T. (2005). *National education statistics information systems.* Working document prepared for the Ministerial Seminar on Education for Rural People in Africa: Policy Lessons, Options and Priorities, Addis Ababa, Ethiopia, 7-9 September 2005. Paris: ADEA Working Group on Education and Statistics.

Walsh, M. (2001). *Research made real: A guide for students.* Cheltenham: Nelson Thornes.

Walsham, G. (2006). Doing Interpretive Research. *Eurpean Journal of information Systems,15*, 320-330.

Wang, S., Su, J., Liu, Y., Chen, Y., & Lee,C. (2008) *Development and im implementation of web-based teaching aids and materials for a course of automatic measurement System and Applications*. Paper presented at the 37th ASEE/IEEE Frontiers in Education Conference, Milwaukee.

Wang, Q., & Woo, H. L.. (2007). Systematic Planning for ICT Integration in Topic Learning. *Educational Technology & Society*, *10* (1), 148-156.

Watson, G. (2001). Models of Information Technology Teacher Professional Development that Engage with Teachers' Hearts and Minds. *Journal of Information Technology for Teacher Education*, *10* (1and2), 179-191.

Western Cape Education Department [WCED]. (2002). *Multigrade Framework Document.* Multigrade Rural Schools Intervention: 5 & 26. Retrieved July 31, 2010 from http://www.curriculum.pgws.gov.za

Weaver, B., & Nilson, L. (2005). Laptops in class. What are they good for? What can you do with them? *New Directions in Teaching and Learning, 20*, 151-158.

White. (2002). *Writing Your MBA Dissertation.* London, UK: Thomson Learning.

Wilkinson, I. A. G., & Hamilton, R. J. (2003). Learning to read in composite (multigrade) classes in New Zealand: Teachers make the difference. *Teaching and Teacher Education*, *19*, 221-235.

Wilson-Strydom, M., Thomson, J., & Hodgkinson-Williams, C. (2005). Understanding ICT Integration in South African Classrooms. *Perspectives in Education*, *23*(4), 71-85.

Woods, V. & Catanzaro, M. (1998). *Nursing Research.* Mosby, St Louis, MO.

World Education Forum (2000). *The Dakar Framework of Action*. International Consultative Forum on Education for All. Paris.

Yerravali,R. (2010) *Community-based education at RIVER (Rishi Valley Institute for Educational Resources) Rishi Valley,India.* Paper presented at The Southern African Multigrade Education Conference 2010, , held at Paarl, Western Cape, South Africa, 22-24 March 2010.

Yin,R. (2009). *Case study research: design and methods*. 4th Edition. USA: Sage.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. (2002). Conditions for classroom technology innovations. *Teachers College Record*, *104*(3), 482-515.

Zhang, P., Aikman, S., & Sun, H. (2008). Two Types of Attitude in ICT Acceptance and Use. *International Journal of Human-Computer Interaction , 24* (7), 628-648.

APPENDICES

APPENDIX A

Letter to participants

Dear Multigrade Teacher (LAPTOP recipient 2009)

Thank you for participating in this research project. Your contributions are appreciated. The information gained from this research will be utilized towards my Masters Degree at the Nelson Mandela Metropolitan University. My research intends to determine if an existing training programme can assist teachers to use the one laptop for teaching and learning in the Multi-grade Classroom in the Uitenhage District. I will be utilizing the following data collection instruments as follows:

STAGE 1: PRE-INTERVENTION

1. An open-ended questionnaire before the intervention

2. Personal interviews with 9 individual participants before the intervention

3. Focus group interview with two groups with min of 3 persons before the intervention

STAGE 2: INTERVENTION

(Intel teach courses; ICT skills for Success, Intel teach Getting started, Intel teach Elements and Intel teach Essentials). These courses will be conducted over weekends and during short holidays because the trainers are teachers at different schools. Training will be from 08h00 – 17h00. More information per training course will be supplied 14 days prior to the training.

STAGE 3: POST-INTERVENTION

4. An open-ended questionnaire after the intervention

5. Focus group interview with the same two groups mentioned in 3 above.

All information received will be treated with confidentiality. Reference to your observations will be done as MGE 1 and your real name will not be made public. The overall research aim of this study is to enable teachers to use the laptop in the multi-grade classroom by determining their needs in order to use an existing teacher assistance programme, such as Intel Teach, for one-laptop implementation within the multi-grade context. The research objectives are:

- To ascertain the challenges and/or barriers that multi-grade teachers experience;
- To determine the challenges or barriers that mitigate against the use of a laptop in the multi-grade classroom;
- To ascertain what can be done to address the barriers in order to assist with classroom implementation of the laptop for teaching and learning as perceived by the teachers;
- To expose the participating teachers to an existing ICT programme, Intel Teach, with a view to assist the educators in using the laptop for teaching and learning in the multi-grade classroom;
- To determine whether the exposure to the Intel Teach programme promoted a change in the participating teachers' practice, i.e. whether evidence exists to indicate whether teachers are using the laptop for teaching and learning;
- To sensitise and inform the Department of Basic Education regarding the issues that this study investigated and the findings pertaining to the issues; and
- To provide recommendations to the Department of Basic Education regarding what can be done to assist multi-grade teachers within similar contexts regarding how they can be assisted to use the laptop for teaching.

Please contact me should you be interested in the results of this research.

Thank you.   Brenda Subramanien (Cell: 083 320 2856   email: avenas@mweb.co.za)

Appendix B

Application form to conduct research: Department of Education

Province of the

EASTERN CAPE

EDUCATION

Appendix C

Request to conduct research in schools in Uitenhage District

THE DISTRICT DIRECTOR
DEPARTMENT OF EDUCATION: UITENHAGE DISTRICT
PRIVATE BAG X 64
UITENHAGE
6230
17 August 2010

Dear Mrs Bashman

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

I hereby wish to request permission to conduct research in the Uitenhage district. I am registered as a part-time M.Ed student at the Nelson Mandela Metropolitan University in Port Elizabeth doing the full research programme. The research I wish to conduct for my Master's Dissertation involves exploration in finding ways to assist multi-grade educators to utilise the one laptop for teaching and learning in the multi-grade classroom. This project will be conducted under the supervision of Dr Andre Du Plessis and Dr Johann Mc Farlane (NMMU, South Africa).

I am hereby seeking your consent to:
1. Approach the multi-grade educators who have received laptops in the Uitenhage district to provide participants for this project
2. Utilise existing data on multi-grade education in the Uitenhage district

TOPIC

Developing teachers to implement the one-laptop for teaching and learning in the multi-grade context in the Uitenhage district.

RESEARCH AIM AND OBJECTIVES

The overall research aim of this study is to enable teachers to use the laptop in the multi-grade classroom by determining their needs in order to use an existing teacher assistance programme, such as Intel Teach, for one-laptop implementation within the multi-grade context. The following objectives are:

- To ascertain the challenges and/or barriers that multi-grade teachers experience;
- To determine the challenges or barriers that mitigate against the use of a laptop in the multi-grade classroom;
- To ascertain what can be done to address the barriers in order to assist with classroom implementation of the laptop for teaching and learning as perceived by the teachers;
- To expose the participating teachers to an existing ICT programme, Intel Teach, with a view to assist the educators in using the laptop for teaching and learning in the multi-grade classroom;
- To determine whether the exposure to the Intel Teach programme promoted a change in the participating teachers' practice, i.e. whether evidence exists to indicate whether teachers are using the laptop for teaching and learning;
- To sensitise and inform the Department of Basic Education regarding the issues that this study investigated and the findings pertaining to the issues; and
- To provide recommendations to the Department of Basic Education regarding what can be done to assist multi-grade teachers within similar contexts regarding how they can be assisted to use the laptop for teaching.

RESEARCH QUESTION

Can the use of the Intel teach ICT programme assist multi-grade teachers to promote ICT implementation in their teaching in the multi-grade context? The research subsidiary questions are:

1. What are the challenges that a sample of teachers experience when teaching in a multi-grade context?
2. What are the challenges that a sample of multi-grade teachers experience when attempting to implement ICT in their classrooms
3. What are their perceptions of what can be done to meet these challenges?
4. What do they perceive as the positive and negative aspects of the Intel teach training programme?
5. Is there evidence that the Intel teach system enable teachers to implement ICT into their teaching and learning in a multi-grade context?

METHODOLOGY

The research will be conducted using the qualitative research design whereby an interpretative case study will be employed. The research will be undertaken in three phases. Personal Interviews with 9 participants, two open-ended questionnaires and two focus group interviews with the participants will be employed to gather the data. Data gathering will not be done during school hours and therefore there will be no interference with the daily functioning at these schools. There may be a need to do observations which may clarify issues the interviews and questionnaires may overlook.
There will be an intervention in the form of Intel teach training courses. These will be done during weekends and over short holidays so as not to interfere with the teaching and learning programmes at school.

This study could assist in future planning and roll out of ICT resources as well as the ICT implementation of multi-grade in the district and province.

ETHICAL CONSIDERATIONS

1. The educators are under no obligation to assist or co-operate. Participation is voluntary.
2. Appropriate time-frames will be negotiated with the educators on site and will not disrupt teaching and learning.
3. The arrangements regarding this research will be done by myself and the Department wil not be responsible for any costs involved. Leave will be taken to conduct the interviews and onsite observations and questionnaires.
4. Upon completion of my study,the outcome of the research will be conveyed to all participants and I will suply the Department of Education with a copy of the research to the District Director.
5. My conduct will be guided by the code of ehics as prescribed by the Research Council of the University.

I hope that my request will be favorably considered.

Thank you

Yours sincerely

BRENDA SUBRAMANIEN

Appendix D

Permission to conduct research from Department of Education

Province of the

EASTERN CAPE
EDUCATION

STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)43 702 7428 • Fax: +27 (0)43 702 7427/38 • Website: www.ecdoe.gov.za

Enquiries: Dr Heckroodt

Email: bernatie@istrica.com

09 March 2011

Brenda Berenice Subramanien

20 Eric Tindale Place

Vanes Estate

ÚITENHAGE

6230

Dear Mrs Subramanien

PERMISSION TO UNDERTAKE RESEARCH FOR A MASTER'S THESIS: DEVELOPING AN INTERVENTION TO ASSIST TEACHERS TO USE THE ONE LAPTOP IN THE MULTI-GRADE CLASSROOM

1. Thank you for your application to conduct research received from the Uitenhage office on 20 December 2010.

2. Your application to conduct the above mentioned research in 14 Primary Schools under the jurisdiction of the Uitenhage District is hereby approved on condition that:

   a. there will be no financial implications for the Department;

   b. institutions and respondents must not be identifiable in any way from the results of the investigation;

   c. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the District Directors before any research is undertaken at any institutions within that particular district;

building blocks for growth

Page 1 of 2 Subramanien BB

d. you will make all the arrangements concerning your research;

e. the research may not be conducted during official contact time, as <u>educators'</u> <u>programmes should not be interrupted</u>;

f. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to the Director: Strategic Planning Policy Research and Secretarial Services;

g. the research may not be conducted during the fourth school term, except in cases where a special well motivated request is received;

h. your research will be limited to those schools or institutions for which approval has been granted;

i. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis. This must also be in an electronic format.

j. you are requested to provide the above to the Director: The Strategic Planning Policy Research and Secretarial Services upon completion of your research.

k. you comply to all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document completed by you.

l. you comply with your ethical undertaking (commitment form).

m. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Director: Strategic Planning Policy Research and Secretariat Services.

3. The Department wishes you well in your undertaking. You can contact the Director, Dr. Annetia Heckroodt on 043 702 7428 or mobile number 083 271 0715 and email: annetia.heckroodt@edu.ecprov.gov.za should you need any assistance.

Advocate M Mannya 11|4|2016

HEAD OF DEPARTMENT: EDUCATION

building blocks for growth,

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Appendix E

Research proposal acceptance letter HDC

Nelson Mandela Metropolitan University

for tomorrow
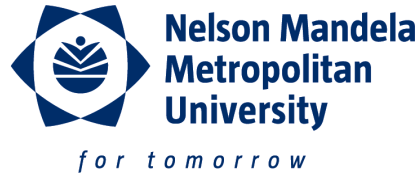
School for Education Research and Engagement
South Campus

Dear Ms Subramanien

At the Higher Degrees Committee Meeting held on 16 November 2010 it was noted that your research proposal be accepted and that you will address the issues which need attention under the guidance of your supervisor.

Congratulations!

Best wishes

Carol Poisat

HDC Secretary

NMMU (South Campus)
Port Elizabeth
Tel No: 041-504 4310
Fax No: 041 504 1610

Faculty of Education

Appendix F

Diagram of data gathering tools used

Before Intervention: Data gathering tools to answer research sub-questions 1, 2 and 3.			
	No of participants participated in data tool	Participant No (MGT#)	Order of data collection
Open Ended Questionnaire 1	20	MGT 1 – MGT 20	1
Individual Interviews 1	9	MGT 2, MGT 5, MGT 6, MGT 9, MGT 11, MGT 14, MGT 16, MGT 17, MGT 19	2
Focus Group Interview 1	2 focus groups Group 1 x 4 males Group 2 x 3 females	MGT 1, MGT 2, MGT 3, MGT 20 (MGT 20 called to attend urgent fam matter) MGT 5, MGT 6, MGT 7	3
After Intervention: Data gathering tools to answer research sub-questions 4 an 5			
Open Ended Questionnaire 2	19	MGT 1 – MGT 20 MGT 13 -deceased	1
Focus Group Interview 2	2 focus groups Group 1 x 3 males Group 2 x 3 females	MGT 1, MGT 2, MGT 3, MGT 20 MGT 5, MGT 6, MGT 7	2

Researcher Observations - before, during and after the intervention.

Appendix G

Personal Interviews – prior to the intervention

1. **What are the problems / challenges that you experience in the classroom as a multi-grade teacher?   [RQ1]**

   (prompts: - name the challenges in terms of the role players yourself / the department / the leadership / learners / parents / resources / the curriculum / policies / etc.)

2. **How do you think can these problems be addressed?   [RQ3]**

   (prompts: - from the challenges you have just mentioned , *name the challenges, replay the recording,* what in your opinion can be done to solve the challenges)

3. **What challenges do you experience with using the one-laptop for ICT integration in your classroom?   [RQ2]**

4. **How do you think can we address these challenges you have mentioned?   [RQ3]**

   (probe: - from the challenges you have just mentioned , *name the challenges, replay the recording,* what in your opinion can be done to solve the challenges)

Appendix H

Focus Group interviews – prior to the intervention

QUESTIONS RELATING TO RESEARCH QUESTION 1 – 3 PRIOR TO TRAINING

- What are the general challenges that a sample of multi-grade teachers experience pertaining to teaching?

- What are the challenges that a sample of multi-grade teachers experience when using ICT within their classrooms?

- What are the perceptions of the sample of multi-grade teachers of what can be done to meet these challenges?

1. What are the challenges that you have in your multi-grade classroom. Please tell me what challenges you experience.

2. Why is …………….. a challenge?
   (PROBE: anything else that might be a challenge in your multi-grade classroom?)

3. How often do you use your laptop?

   2.1 What do you use the laptop for?

   2.2 What prevents you from using your laptop?

   (PROBE: anything else that might be a hinder you from using the laptop in the classroom?)

4. Do you have any barriers in using your laptop in your classroom for teaching and learning?
   4.1 Can you tell me more about what barriers you experience in using your laptop in the classroom?

   4.2 Please tell me why it is a barrier for teaching and learning?

   (PROBE: anything other possible barrier of challenge which prevents you from using it for teaching and learning?)

5. How would you like to use the laptop in the classroom for teaching and learning?
   5.1 What prevents you from using the laptop in this way?
   (PROBE: anything else which might prevents you from using your latop for teaching and learning?)

6. The challenges (*replay the recording*) you have mentioned before, do you have any suggestions or ideas on how you think these challenges in your multi-grade classroom can be solved?

7. In terms of your laptop, what do you think can be done to assist in solving these barriers?

8. You've mentioned *(replay recording)* ……… as a challenge, but can you tell me more about what you would like to see to overcome this.
   8.1 The ……. you are proposing – what do you expect and why do you say so?
   8.2 How often do you think should …… occur?

   (PROBCE: any other suggestions you think could assist multi-grade teaching and learning, what, how, why, explain, describe, tell more,)

Appendix I

Questionnaire set 1 – prior to the intervention

A. PERSONAL INFORMATION

NAME OF SCHOOL		EMIS NUMBER	
SURNAME OF EDUCATOR		INITIALS	
SEX			
MALE		FEMALE	
AGE			
20 – 29		30 - 39	
40 – 49		50 - 59	
MULTIGRADE TEACHING EXPERIENCE			
GRADE	LEARNING AREA / PHASES	EXPERIENCE	LEARNERS PER GRADE / PHASE IN MULTIGRADE CLASS
YOUR TEACHER TRAINING / QUALIFICATIONS			
NAME OF INSTITUTION	DIPLOMA / DEGREE / QUALIFICATIONS	YEAR OBTAINED	CURRENT STUDY
HAVE YOU BEEN TRAINED IN MULTI-GRADE TEACHING?			
YES		NO	
NAME OF INSTITUTION	DIPLOMA / DEGREE / QUALIFICATIONS/ TRAINING	YEAR OBTAINED	SPECIFICS OF TRAINING
TECHNOLOGY USED IN TEACHER TRAINING			
MEDIUM	WHAT / HOW IT WAS USED	STILL USING IT	USED DAILY, Once per week, Once per month, never
TECHNOLOGY CURRENTLY USED IN TEACHING AND LEARNING			
MEDIUM	WHAT / HOW IT IS USED	STILL USING IT	USED DAILY, Once per week, Once per month, never

1. **What are the general challenges you are experiencing as a multi-grade teacher?**

………
………
………

2. **What are the barriers you have in terms of using the laptop for teaching and learning as a multi-grade teacher?**

………
………
………

3. **What challenges are you experiencing in terms of the following:**

3.1 Resources
3.2 Your school
3.3 The Curriculum
3.4 Departmental Support
3.5 Yourself
3.6 ICT's(Information communication Technologies like computer, dvd player, interactive whiteboard, digital camera, Television, etc)
3.7 Administration and Management
3.8 The community
3.9 The learners
3.10 Training

4. **What would you describe as a challenge / barrier to utilising your laptop for teaching and learning in terms of:**

4.1 Your school
4.2 The learners
4.3 The Department
4.4. Training
4.5 Other

5. **What solutions would you suggest to the challenges / barriers you experience in terms of:?**

Multi-grade teaching challenges

……
……
……
……
……
……

6. **What solutions would you suggest to the challenges / barriers you experience in terms of:?**

ICT integration challenges (using your laptop for teaching and learning)

……
……
……
……
……
………
……

Appendix J

Focus Group Interviews – after the intervention

FOCUS GROUP INTERVIEW QUESTIONS   Aim is to provide data for research question 4:
How did the teachers experience the intervention?

1. Do you have any positive or negative comments / suggestions about the facilitator? [RQ 4]

2. What characteristics should the project leader (facilitator) keep in mind while training the participating teachers? Why? Explain   [RQ 4]

3. What should the project leader (facilitator) keep in mind (think about) during the preparation process?   [RQ 4]

4. What did you like about the course?   [RQ 4]

5. What did you not like about the course?   [RQ 4]

6. What have you learned so far?   [RQ 4]

7. What do you find difficult? Or with what do you need more help?   [RQ 4]

8. Which elements / aspects should a teacher training program for computer integration, contain? Why?

9. In your opinion, what should the facilitator be doing / have in mind with teacher development sessions / courses?
   9.1 Prior to the sessions
   9.2 Commencement of the sessions
   9.3 During the sessions
   9.4 After the sessions   [RQ 4]

10. Can you make suggestions on what to change or how we can improve the course? [RQ 4]

11. When and how often do you think should the multi-grade teacher training program for computer integration be conducted?

    AND Why in this way? Give reasons why you say so.   [RQ 4]

Appendix K

Open-ended Questionnaire set 2 – after the intervention

1.   **What was interesting about the ICT training you have received in terms of**

The Trainer

………………………………………………………………………………………………………

………………………………………………………………………………………………………

………………………………………………………………………………………………………

………………………………………………………………………………………………………

The training material

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Your expectations

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Outcomes

………………………………………………………………………………………………………

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………………………………………………………………………………………………………

Other

………………………………………………………………………………………………………

………………………………………………………………………………………………………

………………………………………………………………………………………………………

2.   **What were your ICT challenges prior to the ICT training in terms of using the laptop for teaching and learning in your multi-grade classroom?**

………

………

………

………

………

………

………

………

……..

3.   **Has any of your ICT challenges been addressed with the INTEL training sessions? Please explain your answer (name the challenge and how it has been resolved)**

……….

……….

………..

………..

……….

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………

………..

………..

4.   **What did you experience as positive about the ICT training?**

………

………

………

………

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………

5.   **What did you experience as negative about the INTEL training? Please explain why?**

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6.   **What changes or suggestions do you have for future ICT training sessions?**

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………………………………………………………………………………………………………

7.   **Did the INTEL training courses enable you to help other multi-grade educators who have not been through this intervention, to use the laptop for teaching and learning in the classroom? Tell us how.**

………………………………………………………………………………………………………

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………………………………………………………………………………………………………

8. LAPTOP USAGE: <u>BEFORE THE TRAINING</u>

Rating the usage for all questions in question 8 should be read for

| 1 = Never | 2 = Rarely | 3= Sometimes | 4= Often | 5 =Fairly Often |

8.1   Your laptop usage <u>before</u> the ICT training: (*Please tick the most appropriate number*)

PROGRAMMES	Indicate usage					PURPOSE
	1	2	3	4	5	
How often did you use your laptop before the ICT training?						

8.2   BEFORE THE TRAINING: Which programmes did you use for teaching and learning in our classroom <u>before the training</u>? : (*Please tick the most appropriate number*)

PROGRAMMES	Indicate usage					PURPOSE
	1	2	3	4	5	
MS WORD						
MS EXCELL						
MS POWERPOINT						
SASAMS						
INTERNET						
EMAIL						
OTHER (please indicate)						

8.3   BEFORE THE TRAINING: Which functions did you use for teaching and learning on your LAPTOP <u>before the training</u>? : (*Please tick the most appropriate number*)

FUNCTION	Indicate usage					PURPOSE
	1	2	3	4	5	
WEBCAM						
BLUETOOTH						
USB PORTS						
DVD-DRIVE						
DATA CARD PORT						
OTHER (indicate)						

8.4   ICT INTEGRATION

BEFORE THE TRAINING: What did you use your laptop for <u>before the training</u>?   : (*Please tick the most appropriate number*)

UTILISATION	Indicate usage					How? Indicate the Resources or Other ICT used with the laptop
	1	2	3	4	5	
Administration						
Lesson planning and preparing classroom activities						
TEACHING AND LEARNING in the classroom						
Assessment and Examinations						
Correspondence						
SASAMS						
Research						
Internet						
Email						
Computers4Kids						
CAMI maths						
MASTER maths						
Learnthings software						
ENCARTA						
OTHER software programmes (*please name the programme you use*)						
PRIVATE USE						
Recreational use						
Other (*please name the use)*						

9. LAPTOP USAGE: <u>AFTER THE TRAINING</u>

Rating the usage for all questions in question 9 should be read for

1 = Never	2 = Rarely	3= Sometimes	4= Often	5 =Fairly Often

9.1 AFTER THE TRAINING: Your laptop usage after the ICT training <u>after the training</u>: (*Please tick the most appropriate number)*

PROGRAMMES	Indicate usage					PURPOSE
	1	2	3	4	5	
How often did you use your laptop after the ICT training?						

9.2 AFTER THE TRAINING: Which programmes do you use for teaching and learning in our classroom <u>after the training</u>? : (*Please tick the most appropriate number)*

PROGRAMMES	Indicate usage					PURPOSE
	1	2	3	4	5	
MS WORD						
MS EXCELL						
MS POWERPOINT						
SASAMS						
INTERNET						
EMAIL						
OTHER (please indicate)						

9.3 AFTER THE TRAINING: Which functions do you use for teaching and learning on your LAPTOP <u>after the training</u>? : (*Please tick the most appropriate number)*

FUNCTION	Indicate usage					PURPOSE
	1	2	3	4	5	
WEBCAM						
BLUETOOTH						
USB PORTS						
DVD-DRIVE						
DATA CARD PORT						
OTHER (indicate)						

9.4   ICT INTEGRATION

AFTER THE TRAINING: What do you use your laptop for <u>after the training</u>?   : (*Please tick the most appropriate number)*

UTILISATION	Indicate usage					How? Indicate the Resources or Other ICT used with the laptop
	1	2	3	4	5	
Administration						
Lesson planning and preparing classroom activities						
TEACHING AND LEARNING in the classroom						
Assessment and Examinations						
Correspondence						
SASAMS						
Research						
Internet						
Email						
Computers4Kids						
CAMI maths						
MASTER maths						
Learnthings software						
ENCARTA						
OTHER software programmes (*please name the programme you use)*						
PRIVATE USE						
Recreational use						
Other uses (*please name them)*						

10.   Have you designed a lesson on your laptop for classroom use? Please explain a lesson on powerpoint you designed.

…….

……

……

……

……

11. **ICT RESOURCES**

Which of the resources below do you use with your laptop?

ITEM	YES	NUMBER QUANTITY AT SCHOOL	Received resource from			NO
			Departmental roll-out	**Sponsor / donation**	**Fundraising**	
Computers at school						
Printers at school						
Data projector at school						
Interactive Whiteboard						
Television						
DVD-player						
CD-player						
Digital Camera						
Scientific Calculators						
Laptop						
Internet at school						
e-rate						

12. **Could you use the laptop well for teaching and learning before the INTEL Training? How did you use the laptop for teaching and learning before the training?**

……………………………………………………………………………………………………….

………………………………………………………………………………………………………

13. **Did the INTEL Training help you (empowered you) to use the laptop better than before the training for teaching and learning? If YES, how did the INTEL training help you to use the laptop in your classroom for teaching and learning?**

……………………………………………………………………………………………………….

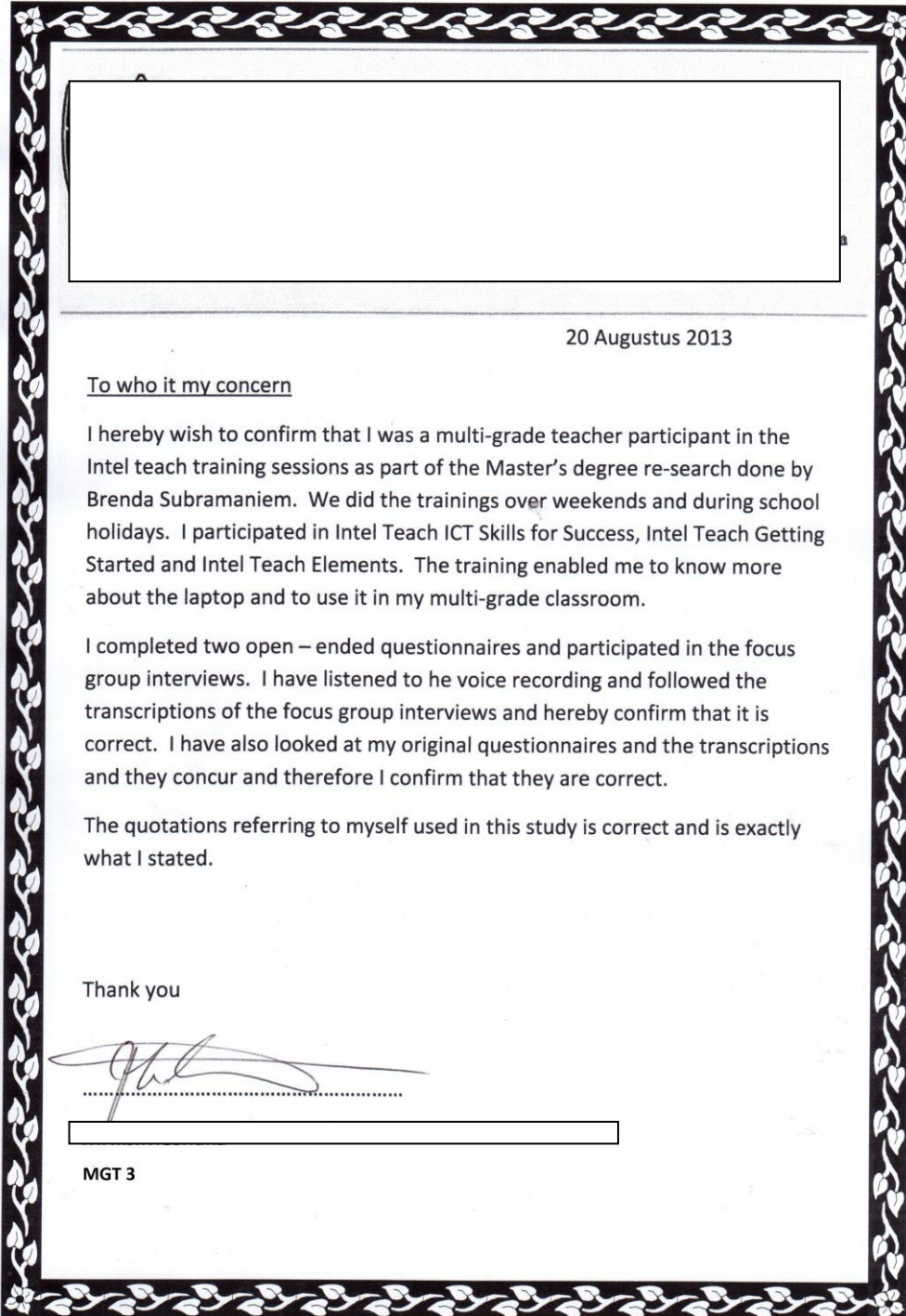……………………………………………………………………………………………………….

14. **What aspects of the ICT training sessions are you implementing for teaching and learning in the multi-grade classroom? Explain. How are you using the laptop for teaching and learning after the training? (Do you use it differently than before?)**

……………………………………………………………………………………………………….

……………………………………………………………………………………………………….

Appendix L
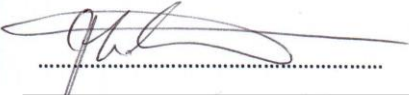
Confirmation by participants

20 Augustus 2013

To who it my concern

I hereby wish to confirm that I was a multi-grade teacher participant in the Intel teach training sessions as part of the Master's degree re-search done by Brenda Subramaniem. We did the trainings over weekends and during school holidays. I participated in Intel Teach ICT Skills for Success, Intel Teach Getting Started and Intel Teach Elements. The training enabled me to know more about the laptop and to use it in my multi-grade classroom.

I completed two open – ended questionnaires and participated in the focus group interviews. I have listened to he voice recording and followed the transcriptions of the focus group interviews and hereby confirm that it is correct. I have also looked at my original questionnaires and the transcriptions and they concur and therefore I confirm that they are correct.

The quotations referring to myself used in this study is correct and is exactly what I stated.

Thank you

MGT 3

Nelson Mandela Metropolitan University

Port Elizabeth

6000

12 August 2013

Confirmation: Participant in the Master's Research conducted by Brenda Subramanien

I hereby wish to confirm that I was a multi-grade teacher participant in the Intel teach training sessions as part of the Master's degree research done by Brenda Subramanien. We did the trainings over weekends and during school holidays. I participated in Intel Teach ICT Skills for Success, Intel Teach Getting Started and Intel Teach Elements. The training enabled me to know more about the laptop and to use it in my multi-grade classroom.

I completed two open-ended questionnaires and participated in the focus group interviews. I have listened to the voice recordings and followed the transcriptions of the focus group interviews and hereby confirm that it is correct. I have also looked at my original questionnaires and the transcriptions and they concur and therefore I confirm that they are correct.

The quotations referring to myself used in this study is correct and is exactly what I stated. I am very proud that I could be of assistance in this research on multi-grade.

Thank you

....

MGT 1

Nelson Mandela Metropolitan University
PORT ELIZABETH
6000
23 August 2013

Confirmation: Participant in the Masters Research

I hereby wish to confirm that I participated in the Intel teach computer training programme as part of the Masters research conducted by Brenda Subramanien. I attended the Intel Teach ICT skills for success, Intel Teach Getting Started and Intel Teach Elements computer courses over weekends and school holidays. The training helped me to know more about the laptop and how to use it in my multi-grade classroom

I participated in the personal interview and in the focus group interviews. I also completed two open-ended questionnaires. I have listened to the recordings and followed the transcriptions and they are exactly what I have stated. The quotations referring to myself in the study are correct. I have looked at my original questionnaires and the transcriptions are correct.

I wish Brenda every success in her studies and appreciate the effort she has made towards assisting us in the multi-grade schools.

Thank you.

MGT 5