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The appropriation of educationpolicy on information and communication technology in South African schools

by

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ABSTRACT

The purpose of this study is to explore how education policy on information and communication technology (ICT) influences teaching and learning in South African schools. An instrumental case study applying backward mapping principles as a strategy of inquiry was used. Utilizing a social constructivist lens and guided by a theoretical framework of a socio-cultural approach to policy analysis, this exploratory qualitative research study set out to investigate how teachers in South African schools appropriate education policy on ICT. The case study includedthree schools from diverse socio-culturalsettings, with two participating teachers at each of the identified research sites. The principal at each school and e-learning specialists (officials) at the District and Provincial Departments of Education constituted additional data sources. Data collection methods included interviews, classroom observations, field notes and document analysis.Constructivist grounded theory methods and computer assisted qualitative data analysis software (CAQDAS)wereemployed in the analysis of data.

It was found that, teachers' professionalism and agency arecrucial in formulating and implementing a school-based e-education policy in practice.The national e-education policy currently exists as an "invisible policy" within the school context. Secondly, teachers reposition themselves as social and cultural actors of school-based policy appropriation and formulation rather than as recipients of, or reactors to the national e-Education policy. Thirdly, the lack of systemic support to teachers acted as the catalyst for the emergence ofcommunities of practice between schools. The notion of "our" system as opposed to an imposed system prevails. Fourthly, teachers' ignorance of the national e-Education policy indicates the need for policy development and implementation at school level and denotesa new construct to policy appropriation. I theorise that teachers' beliefs, attitudes, professionalism and will to improve teaching and learning through the use of ICT are integral and necessary conditions for effective policy implementation.

Keywords

Appropriation

Information and communication technology

e-Education

Policy implementation

Teacher professionalism

Communities of practice

DEDICATION

This thesis is dedicated to my wife Saloshna, for believing in me,nurturing and supporting me through this difficult period.

I owe all I am to you.

To my children Shavani and Mogeshin

forgiving me the freedom to pursue my studies with constant encouragement and support.

To my autistic son Suthakir, who will never be able to read these words,

thank you for sacrificing our ‘together time’.

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e-learning **e-education**	• The design, development and delivery of technology-enhanced learning experiences, using a multimedia such as: web-based resources; audio-visual material, interactive whiteboards. • In the South African context, e-education involves the use of ICT to accelerate the achievement of the national education goals. e-education also includes the connectivity between learners, teachers, support services, and providing platforms for learning. The broader goal of e-education is to improve teaching and learning through effective use of technology and pedagogy(Department of Education, 2004). • E-learning is flexible learning using ICT resources, tools and applications, focussing on accessing information, interaction among teachers, learners and the online environment, collaborative learning, and production of materials and resources to enhance learning (Department of Education, 2004).
Learners	• In the current study students, learners and pupils are terms that are synonymous. However, the term learner will be used consistently. A learner, as implied in this research is a person who is in learning in the formal schooling period.
Schools	Schools are classified as public, government or state schools; former model C schools; or independent schools. • Former model C (or inner city) schools are public schools that were previously (prior to 1994) designated for white learners only. Both terms 'model C' and 'inner city' school will be used interchangeably. • Township schools are public schools, typically situated in suburbs out from the city centre and previously designated for black persons. • Independent (or private) schools are defined as schools that receive minimal financial support from the state.
Policy	Policy and reform are terms used interchangeably, and may imply authorised policy or school based policy.
Macro, meso and micro	In this study, macro implies national government; meso represent provincial, district and school levels of government. Micro represents the classroom and teacher level.
DoE	At the time of conducting this research the national department of education was the DoE, and is referred to as such in this thesis. Currently the DoE has been restructured into the department of basic education and the department of higher education.

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
BECTA	British Education and Communication Technology Authority
CELTS	Cluster e-Learning Teams
CES	Chief Education Specialist
DCES	Deputy Chief Education Specialist
DoE	Department of Education
EFA	Education For All
ICT	Information and communication technology
IQMS	Integrated Quality Management System
LEA	Local Area Authorities (equivalent to District Offices)
MoE	Ministry of Education
NCS	National Curriculum Statement
NEPAD	New Economic Partnership for Africa Development
NGfL	National Grid for Learning
NGO	Non-Government Organisation
OBE	Outcomes Based Education
OFSTED	Office for Standards in Education
PELTS	Province e-Learning Teams
SIP	School Improvement Plan
SITES	Second Information Technology in Education Study
TELI	Technology Enhanced Learning Initiative
USEIT	Use, Support, andEffect of Instructional Technology

CHAPTER 1

Orientation to the study

"The whole failed history of modern educational reform has addressed the 'needs of the child'. It has hardly paid any attention to the work of the teacher, the one critical player in the school who makes the biggest difference" (Marantz-Cohen, 2002, p. 532).

1.1 Introduction

This study is an inquiry into the experiences of teachers as they use information and communication technology (ICT) to mediate policy in their classroom practice. Teachers are significantly situated at the point where policy meets practice. This study investigates how teachers appropriate[1] the South African national e-education policy in their teaching and learning repertoire. Currently much research in this field of study is based on the nature and focus of the national ICT policy (Plomp et al., 2009; Kearns, 2002), the rationale for introducing ICT into schools (Hawkridge, 1990), the application of ICT in teaching and learning (Cuban, 1998; Bekker, 2000), teacher training and changed pedagogy (Kozma & Anderson, 2002), as well as ICT infrastructure and access (Farrel & Wachholz, 2003). There is, however, very little research on how education policy on ICT is implemented in schools. Accordingly, in this study I ask how education policy on ICT influences teaching and learning in South African schools.

As facilitators of learning, teachers and teaching arethe foundation upon which the future democracy rests. Both teachers and teaching play crucial roles in shaping student learning within a socio-cultural context. In South Africa the National Department of Education (DoE) introduced the e-education policy with the intention to change teacher pedagogy and learner achievement through the use of information and communication technology (Department of Education, 2004). The policy aims to "transform learning and teaching through information and communication

[1] "Appropriation" is defined as "the ways that creative agents interpret and "take in" elements of policy, thereby incorporating these discursive resources into their own schemes of interest, motivation, and action, their own "figured worlds" (Levinson et al., 2009, p. 799)

technologies" and thus to contribute to the economic growth and social development of the country. The basic tenet of the policy is that through ICT, schools will improve their level of functioning, teachers will change their teaching pedagogies and student learning will improve.

This chapter provides an overview of the current study and consists of four sections. First, the chapter addresses the "what", the "why", and the "how" of the study. It attempts to offer an orientation to the study, by presenting the introduction and background context, the rationale, problem statement and research questions that guided the study. Second, a general synopsis of the two paradigmatic lenses and the theoretical framework that underpin this study is presented. Third, the researcher assumptions, conceptualization of terms, research design and methodologyare explained. And fourth, the chapter concludes withensuing chapters of this study.

1.2 Background context

The post apartheid era in South Africa fuelled huge changes in the education system and resulted in a barrage of new education policies for schools (Sayed &Jansen, 2001). Since South Africa's first national democratic elections in 1994, the government has issued several curriculum-related reforms to "democratise education" (Jansen& Christie, 1999). In 1997, a comprehensive reform called Curriculum 2005 with the philosophical paradigm of "outcomes-based education" (OBE) underpinned the new education system. Teachers were at the very heart of this new policy initiative, as they had to implement the new curriculum innovation and adopt new policy mandated methods for teaching and learning. Coupled with the new curriculum, teachers had to radically change their mindsets with respect to the OBE paradigm. In 2002, another curriculum reform was initiated by government, called the revised national curriculum statement (NCS) (Department of Education, 2002), which still embraced the tenets of OBE. The NCS did not make provision for the use of ICT (Blignaut & Howie, 2009), but encouraged curriculum integration, where appropriate,in order to achieve educational outcomes. However, the core curriculum did not provide guidelines on ICT in teaching and learning, and learning outcomes were not aligned with the use of ICT (Holcraft, 2004). Recently, the minister of

education announced another educational reform, namely "curriculum 2025" (Mahlangu, 2010), which implies further changes to curriculum delivery.

Computers were introduced in South African schools during the 1980s, primarily in independent schools and some well resourced public schools (Howie et al., 2005). Since then ICT has become commonplace in most schools, and in particular public schools (Plomp et al., 2003). The Technology Enhanced Learning Initiative (TELI) of the Department of Education was the first initiative to provide a planning document that introduced guidelines for the integration of technologies into teaching and learning at educational institutions (Howie et al., 2005). ICT for teaching and learning gradually made its entry into a broader range of schools, without schools being ready to exploit its usefulness to improve the quality of teaching and learning. Yet, political rhetoric and government policy advocated for teachers to use computers regardless of the context that practitioners in particular and schools in general found themselves (Surty, 2007; Pandor, 2007; PNC on ISAD, 2007).

The use of ICT in schools and its integration into teaching and learning had and continue to enjoy wide political, educational and scholarly attention. Annually, school governing bodies, government and private sector partnerships apportioned larger education fiscal budgets for the acquisition of ICT in schools (Evoh, 2007). Prior to the formulation of the national ICT policy in education, many schools had already identified the need to implement ICT in their teaching and learning practices. Czerniewicz and Hodgkinson-Williams (2005) indicate that the uptake of ICT in schools continued regardless of the lack of policy support. In 2004, the White Paper on e-education (Department of Education, 2004) (hereafter referred to as e-education policy), as the first formal education policy on ICT, paved the way for ICT implementation in South African schools. Numerous ICT initiatives in education had not reached schools and reforms seemed to favour the implementation of broader curriculum reforms over e-education policy (Blignaut & Howie, 2009).

1.3 Rationale for the study

During my latter years in the teaching profession, it was evident that teacher beliefs, attitudes and leadership were integral factors in the culture of teaching and learning. As a principal, I was integral to a process that employed a top-down hierarchy to implement policy mandates, more specifically the various curriculum reforms that impacted on the classroom practice of teachers. I found that while research argued for the inclusion of actors in the decision making process of policy formulation (Sutton & Levinson, 2001; Dyer, 1999; Elmore, 1980; Cuban, 2001), the nature of educational reform efforts continued to exclude teachers as educational professionals. Thus, to my mind educational policy reform did not reflect the realities of teaching and learning in classrooms.

Having worked in the field of education at all levels of the education system, and particularly as a principal of a school, I had become sensitive to how teachersas mediators translate policy into practice on the classroom floor. In 2006, I began work as a lecturer in a faculty of education. Mymain focus of scholarship was computer integrated education. Coupled to this I have an enduring interest in how ICT policy is implemented in classrooms. It seemed to me that ICT policy implementation was an emergent field of expertise, sharing similarities with other education policies but unique in terms of its own implementation complexities. This, together with my awareness of ICT initiatives in most schools, created an intellectual puzzle of how teachers appropriate ICT policy to influence teaching and learning.

A growing body of literature on bottom-up policy implementation asserts that negotiation and interpretation of policy by teachers is crucial to practice (McLaughlin, 1987; Hamann & Lane, 2004; Spillane, 1998; Sutton & Levinson, 2001; Elmore, 1980). Many varied descriptions and explanations of policy in practice are given prominence by researchers: McLaughlin (1987) posits that policy is a process of “bargaining and negotiation” by local actors. Spillane (1998) suggests that policy in practice takes place through “sense making” and Sutton and Levinson (2001) explain policy in practice as an “appropriation” of policy by actors. What is consistent in the literature, is that the practice of policy is determined by actors situated at the point of

policy implementation and may be different to policy as conceived by the policymaker (Hamann & Lane, 2004). A review of literature in the field of national ICT policy implementation revealed that this is a little understood phenomenon that has not been significantly explored. In this regard I pursued an exploratory approach to investigate how teachers are implementing the e-education policy in their classroom practice.There are few studies on educational policy implementation in the international area. Elmore (1980, p. 601) claims, "when one looks to the implementation literature for guidance, there is not much to be found". Dyer (1999, p. 46) argues that,

> *Policymakers looking to research on implementation studies will unfortunately find the cupboard somewhat bare, for among the 'meagre literature on implementation' there are few studies of education policy implementation in developing countries.*

Similarly, in South Africa there are few studies on educational policy implementation (Jansen & Christie, 1999; Sayed, 2002; Tickly, 2003; Sayed & Jansen, 2001), and even less research on educational ICT policy implementation. Of the research conducted in the field of policy implementation, none has utilized the backward mapping model to generate insights into the "blackbox" of processes involved in implementing policy. In the context of this study, where comparatively little is known about the ICT in education policy implementation process, the use of a socio-cultural approach to policy studies (Sutton & Levinson, 2001) and a backward mapping model (Elmore, 1980) to investigate policy implementation may generate numerous insights into the dialogue of policy implementation.The use of these two complementary methodological paradigms in a bottom-up implementation study may further contribute to our improved understanding of policy implementation and open new strategies to achieve policy mandates.

1.4 Statement of the research problem

Global national ICT in education policies placed education as the central actor to pursue and attain national ICT objectives. Most countries in the world have an existing blueprint for integrating ICT in schools. Similarly, South Africa attempted to keep abreast with global trends and developed the mentioned national ICT policy

(Department of Education, 2004) encapsulating a progressive vision to catapult the country into the 21st century. The infiltration of ICT into classrooms has prompted government policy in South Africa and policymakers all over the world to claim that ICT can improve the quality of teaching and learning (Reynolds, Trehane, & Trip, 2003). The South African ICT policy in education is a recent policy in comparison with international trends within the context of developed and developing countries. The e-education policy (Department of Education, 2004) is exceptional in design in that it evidently includes all rationales as delineated by Hawkridge (1990) namely, social, pedagogic, vocational and catalytic rationales. In contrast other countries pursue educational ICT policies with selective focus on particular rationales to initiate ICT integration into school curriculum development (Cox & Marshall, 2007; Tondeur, van Braak, & Valck, 2006).

Numerous provincial initiatives, for example, Gauteng online[2] and Khanya[3], were taken by the South African government in partnership with the private sector to provide schools with access to ICT infrastructure. This was done in an attempt to meet the 2013 goal of the e-education policy to transform all schools into e-learning schools and to develop ICT competent learners (Department of Education, 2004, p. 17; Wilson-Strydom, Thomson, & Hodgkinson-Williams, 2005). Governments, including South Africa, are gradually shifting policy focus to realise "learning with technology" as opposed to "learning about technology" (Jonassen, Peck & Wilson, 1999).Other non-government programmes such as Intel's (Teach to the Future), Microsoft's(Partners in Learning), and government programmes (SchoolNet, South African Institute for Distance Education (SAIDE), Thutong educational portal) are initiatives to respond to the e-education policy.

A review of the extant literature on policy implementation indicates that most research in this field endorses a top-down approach to policy implementation studies. Much research focuses on teachers as conduits of policy (Fitz, 1994;Harrison et al., 2002; Rosekrans, 2006; Culp et al., 2003) and not on how better to engage teachers in the implementation of policy (Marshall, 1997; Walsh, 1984).My study utilises a

[2]Gauteng online - Gauteng provincial government initiative for provisioning and ICT access to schools
[3]Khanya -Western Cape provincial government initiative for ICT provisioning and ICT access to schools

backward mapping approach (Elmore, 1980) in which teachers are not merely viewed as policy imbibers but as interpreters, decision makers and constructors of policy. The problem of policy implementation then arises as to how the national e-education policy translates into practice in schools for teaching, learning and institutional effectiveness? How are teachers interpreting and implementing the national policy on e-education? And, what are the contextual issues that influence policy implementation?

Within a developing country context, there is little research that governments can draw on about the policy implementation process (Dyer, 1999). Similarly, in South Africa, little is known about policy implementation. Consequently the country cannot afford "wasted resources" that can result from misjudging the ease of policy implementation (Dyer, 1999; Fullan, 2001; Elmore, 2004; Sutton & Levinson, 2001; Levinson, Sutton & Winstead, 2009).Misjudging the ease of policy implementation may be one of the most common planning errors made by governments, particularly in developing country contexts (Dyer, 1999; Haddad, 1994). If implementation stages are not well planned, local actors may resist policy or unexpected policy outcomes may result, particularly as abstract policy moves across multiple implementation stages (Dyer, 1999). Furthermore, in developing country contexts emphasis seems to be placed on policy formulation rather than on implementation (Jansen, 2001). Thus, policy formulation is seen as distinctly different to policy implementation which is viewed as a policy add-on.

However, it is the practice of actors that determines the limits and success of policy implementation (Smit, 2001). Most policy related research focuses on policy analysis, implying a top-down approach that begins with the policy intent and views policy implementation as being regulated by the policymaker. In my study, policy implementation research focused on bottom-up processes to determine whether the policy intent had the desired effect (Dyer, 1999).

1.5 Research questions

My main research question is: How does education policy on ICT influence teaching and learning within South African schools?

Sub-questions:

- How do teachers appropriate educationpolicy on ICT in schools?
- What is the ability of the hierarchical unit (principal, district and province) within the education system to affect the behaviour of the teacher that is the target of the policy?
- What resources does this unit (principal, district and province) require in order to have that effect?

1.6 Paradigmatic perspectives

1.6.1 Methodological and epistemological paradigm

Methodologically my lens identifies my view as a qualitative inquirer. The lens through which I conducted this study establishes my decisions and sense-making of how long I remained in the research field, whether data collection was saturated with respect to themes and categories, and how the analysis of data would advance into narratives to support the argument (Creswell & Miller, 2000) (See chapter 3). I establish myself as a qualitative inquirer by assuming that reality is socially constructed as perceived by participants in this study. This lens was useful in representing multiple perspectives of participants' realities. In this regard I employed 'member checking' to assess whether I captured participants' interpretations accurately. MetatheoreticallyI am drawn to the tenets that govern social constructivism as my worldview. This epistemological paradigm shaped the choice of procedures employed in the study (Guba & Lincoln, 1994). The social constructivist epistemological paradigm advocates that reality exists through people's subjective social experiences of the world. In this study a social constructivist paradigm afforded me the opportunity to interpret teachers' perspectives of policy implementation. This paradigm offered a lens to explore the experiences of participants in their local context.

1.6.2 Theoretical framework: Socio-cultural approach to policy studies

This section outlines the socio-cultural approach to policy studies and its relevance to the inquiry of teachers' experiences in implementing the e-education policy.The socio-cultural approach to policy builds on the ontological, epistemological, and methodological assumptions of my study. The socio-cultural approach to educational policy is distinguished by various characteristics, namelypolicy as a socio-cultural practice, policy as agency and, policy as a practice of power.

1.6.2.1 Policy as a socio-cultural practice

How individuals construct knowledge and locate their experiences is dependent on the socio-cultural context of the individual. The socio-cultural approach seeks to expand our understanding of the cultural, contextual, and political dimensions of education policy. According to Sutton and Levinson (2001, p. 1), the socio-cultural approach to education policy studies redefines the notion of policy as "a complex social practice, an ongoing process of normative cultural production constituted by diverse actors across diverse social and institutional contexts". Particular attention is given to the cultural meanings people use to interpret their experience and to generate social behaviour. Policymakers and recipients of educational policy are cultural beings with unique value systems, beliefs, attitudes and identities that influence the policy process. Processes of policy formation occur across many social contexts.

The socio-cultural approach views policy as a social practice that categorises and shapes actors at various levels of the system depending on the context and perceptions of the actors at each level (Sutton & Levinson, 2001). As an ongoing social practice, policy is applied in ways that are particular to specific situations, and within these situations there exists an interaction in which the social actors, policy, and situations inform one another. In this way, the cultural phenomenon to be studied is constituted by the way in which the policy, practices, social actors, and the present social definition mutually constitute the situation. This view suggests that policy can be somewhat incongruent at different levels of organization in educational institutions, and as an official policy moves across multiple settings in a school, it is appropriated

by various social actors, thus it can and often does, take on many forms.The current study focuses on teachers' experiences as implementers of the e-education policy and in this regard a socio-cultural approach attends to the "cultural meanings people use to interpret their experience and generate social behaviour" (Sutton & Levinson, 2001).

1.6.2.2 Policy as agency

Contrary to policy that exists as the official tool of government, officially authorized and supported by enforcement mechanisms, policy formation also occurs across other varied social contexts. Policy may develop spontaneously and informally in places not officially mandated with making policy. Schools may enact their own policy to determine appropriate procedure and conduct, which may be "documented and codified, or it may exist in unwritten form, through ongoing institutional memory and practice" (Levinson, Sutton & Winstead, 2009, p.770). The socio-cultural approach to policy studies is used in my study to emphasize the validity of local, unauthorised forms of policy, as developed in schools.

Practice on the other hand, takes place within particular situations across varied social contexts, "practice gets at the way individuals, and groups, engage in situated behaviours that are both constrained and enabled by existing structures, but which allow the person to exercise agency in the emerging situation" (Sutton & Levinson, 2001, p. 3). How teachers mediate and understand the e-education policy depends on their beliefs, attitudes and professionalism which in turn influence their social interactions. In this regard qualitative socio-cultural research into the everyday practice of teachers conceives the policy process as a spontaneous response to socio-cultural contexts, in which "the purposeful practice of diverse social actors reinstates agency across all levels of the policy process, making it possible to see policy not only as a mandate but also as a contested cultural resource" (Sutton & Levinson, 2001, p. 3). Elmore and McLaughlin (1988) posit the notion that implementation shapes policy and that the attention is focussed more on the meaning of policy in the lives of those affected by it.

Policy can also be a practice that works on the view of the self in relation to the policy context. Policy within an institution is constantly 'negotiated' and 'reorganised' by the actors in their daily repertoire of institutional life. Aligned with the socio-cultural epistemological view of constructing knowledge through social and cultural participation, teachers' perceptions of e-education and what decisions they make relevant to the policy also influence their view of self. The socio-cultural approach to policy analysis further notes that as policy filters down to be implemented at varying levels within the school context, the local actors at the lowest level of implementation may modify their actions in adherence to policy, or purposefully delay implementation or simply resist policy directives through inaction. Policy thus needs to be analyzed in terms of how people appropriate its meanings. Appropriation focuses on the way teachers "take-in" and incorporate elements of policy into their existing frames of reference, namely professional confidence, professional interpretation and professional consciousness.

1.6.2.3 Policy as a practice of power

The socio-cultural approach explains policy as a "practice of power and interrogates the meaning of policy in practice" (Sutton &Levinson, 2001, p.1). Policy making, in itself, is directly linked to issues of power by means of the power dynamics that the language of policy encourages through implementation in schools and classrooms (Levinson, Sutton & Winstead, 2009). Levinson and Cade (2002, p. xiii) define policy as "the exercise of power in the distribution of rewards and resources". Sutton and Levinson (2001) focus on policy actors across a variety of levels and at various sites. Policy implementation is a practice of social relations between the policymaker, those who implement policy, and the learners and teachers who are influenced by such decisions (Sutton & Levinson, 2001; Levinson, Sutton & Winstead, 2009; Cade, 2003).

Sutton and Levinson (2001) give special attention to the multiple modalities through which policy is formulated and appropriated. For example, as province and district interpret e-education policy, particular meanings and subsequent decisions are made that affect the local school. In turn, the administration at the local school then

interprets these meanings within their own individual knowledge and school context. The teacher then mitigates these meanings along with her own understandings that are influenced by school power dynamics regardless of the original intent of policymakers. The socio-cultural approach to policy can provide a clear exploratory understanding of how policy mandates influence the realities of policy implementation in schools. In mysphere of study national government created the e-education policy, while provinces were mandated to implement the policy objectives within the established systemic structures and schools.

1.6.2.4 Summary

A synopsis of empirical literature on the socio-cultural approach to education policy studies revealed a number of features: First, local actorsattach cultural meaning to interpret their experience and to generate social behaviour. Second, local actors engage in situated behaviours which may be inhibited or promoted, but allows for agency to be exercised. Third, local actorsfocus attention on the meaning of policy in their lives. Fourth, local actorsassign different meaning to the same words (or text) in policy. Fifth, local actors'resistance to policy may be conceived as a kind of appropriation, in that it may culminate in the need for alternative policy. Sixth, local actors appropriate meaning to policy, and analyse policy. And seventh, local actors are agents of change generating new and enabling policy to suit their local context and understanding.

1.7 Research assumptions

From literature I formulate a number of assumptions (Sutton & Staw, 1995) relevant to the current study. First, once policy has been formulated it will be implemented (Smith, 1973). Second, policy that is officially authorized and backed by government enforcement mechanisms filters in a linear fashion from macro to meso to micro levels in the education system (Younie, 2006; Harrison et al., 2002; Lim, 2007). Third, actors at these various levels are knowledgeable about authorized policy, and implement policy according to guidelines (Bell & Stevenson, 2006). Fourth, teachers may modify their actions in adherence to policy, or purposefully delay

implementation or simply resist policy directives through inaction. Fifth, systemic structures provide sustained policy support and resources to teachers (McLaughlin, 2005). And sixth, the practice of policy is determined by actors situated at the point of policy implementation and may be different to policy as conceived by the policymaker (Hamann & Lane, 2004). I revisit these research assumptions in chapter six.

1.8 Conceptualization of terms

The following terms are used in the title of this study or in the design of the researchquestions, and warrant a definition as used in this study.

- **Government policy**

Levinson,Sutton and Winstead (2009, p. 5) define policy as a "normative cultural discourse with positive and negative sanctions, that is, a set of statements about how things should or must be done, with corresponding inducements or punishments". Furthermore,Levinson, Sutton and Winstead (2009, p. 769) indicate that policy defines reality, orders behaviour and may or may not allocate resources. In the context of this study, government policy is what Sutton and Levinson (2001) define as being officially authorized mandates that are supported by "enforcement mechanisms of government". Policy may also be developed in agencies or offices that are "constitutionally charged with making policy". According to Sutton and Levinson (2001) authorized policy is principally a concern of the sovereign state and "policy may be documented and codified or it may exist in unwritten form, through ongoing institutional memory and practice". According to Bell and Stevenson (2006), state policy (national or local), has an impact on what happens at schools, and on the lives of the people that work in these institutions.

- **Appropriation**

I use the term appropriation as defined by Sutton and Levinson (2001). Levinson, Sutton and Winstead (2009) adopt the word "appropriation" as an alternative to

"implementation". Accordingly, they define "appropriation" as "the ways that creative agents interpret and "take in" elements of policy, thereby incorporating these discursive resources into their own schemes of interest, motivation, and action, their own "figured worlds" (Levinson et al., 2009, p. 799). Appropriation is a kind of taking of policy and making it one's own. Sutton and Levinson (2001) indicate that the process of appropriation occurs when authorized text or policy is mediated by various means and various institutional contexts to which it applies. Appropriation takes into account local actors' sense making in the implementation of policy, but goes further "[to] point to the possible recursive influence of local actors on the formation of authorized policy, even as it recognizes and valorises rather more local, unofficial types of policy formation that are the outcome of these actors' encounter with authorized policy" (Levinson et al., 2009, p. 799).

- **Information and communication technology (ICT)**

I used Newhouse's (2002) broad definition of information and communication technology. ICT is typically used to refer to computer technologies but also other technologies used for collection, storage, manipulation and communication of information. The White Paper on e-education defines ICT as the convergence of information technology and communication technology.

- **Ability**

In this study I define "ability" as having the power to perform an act whether innate or as a result of learning and practice (Drislane & Parkinson, 2010). Ability was indicated by systemic policy outputs such as guidelines, mission and vision statements, and initiatives of the hierarchical unit.

- **Hierarchical unit**

Hierarchical unit as a construct is defined as a group of interacting, interdependent elements (principal, district and province) forming a complex educational

organizational whole. A hierarchical unit regularly interacts as a unified whole towards the achievement of a goal. Furthermore, within the context of the current study, institutional hierarchy is ranked according to level of political authority and power bestowed upon it by national government mandates (Drislane & Parkinson, 2010).

- **Educational system**

Within the context of the current study, the educational system consists of primary and secondary school education (In South Africa - general education and training band) over which provincial and local districts exercise administrative control (Education in South Africa, 2010). The ICT policy and resource support to schools were aspects of the district and provincial e-learning directorates that were of significance in my data.

- **Affect the behaviour of the teacher that is the target; to have that effect**

The term “affect the behaviour” as used in this study implies to “have an influence on” the “overt or covert observable and measurable activity of the teacher” (Drislane & Parkinson, 2010). The “teacher that is the target” of the policy implies educational policy reform that is intended for teachers to implement. Observation of teachers’ classroom practices was the essence of identifying change in pedagogic behaviour.

The term “effect” means any result of another action. In this study the effect was identified as the change in behaviour of teachers’ practice as a direct consequence of district, province and principals’ ability to do so. During interviews the effect of policy on behaviour was indicated byteachers’ reference to:e-education policy, e-education circulars, ICT curriculum integration plans, lesson plans,ICT teaching and learning resources, principal’s e-learning support and the e-learning system. In observation of teachers’ ICT-classroom practices the effect of policy on behaviour was indicated by ICT integrated teaching and learning.

- **Resources**

According to Levinson et al. (2009) policy defines reality, orders behaviour, and may allocate resources. In this regard resources may satisfy a particular policy implementation need, like: financial, physical, policy, guidelines, training or expertise development.

1.9 Research design and methodology

According to Lincoln and Guba (1985, p. 221) “research design is the plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance”. The design is therefore all that the researcher does from writing the research problem and questions, determination of cases, sampling participants, data gathering and analysis. In chapter 3, I provide a comprehensive discussion of the research design and methodology. Figure 1.1 below gives a synopsis of the research design, strategy of inquiry and phases of inquiry. Subsequently a brief summary of the research process and phases of inquiry areoutlined.

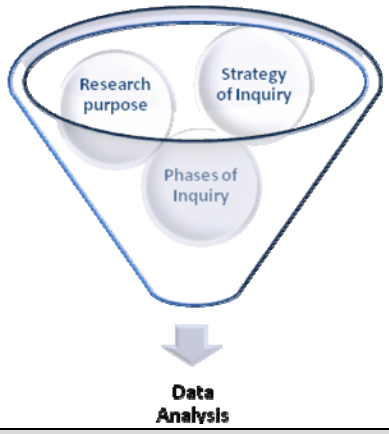
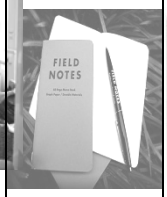
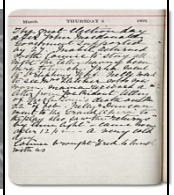
<table>
<tr><td colspan="6"> 
</td><td>Triangulationthrough multiple methods of data collection, multiple data sources and the use of two complementary theoretical approaches</td></tr>
<tr><td colspan="2">Research purpose</td><td colspan="5">Strategy of Inquiry</td></tr>
<tr><td colspan="2" rowspan="3">Qualitative exploratory design</td><td colspan="5">Instrumental case study based on backward mapping principles</td></tr>
<tr><td colspan="4">Selection of cases</td><td>Selection of participants</td></tr>
<tr><td colspan="4">3 schools - maximum variation purposeful sampling</td><td>Purposeful sampling</td></tr>
<tr><td></td><td colspan="6">Phases of inquiry</td></tr>
<tr><td rowspan="2">Method and instrument</td><td>  </td><td>  </td><td>  </td><td> 
</td><td>  </td><td>  </td></tr>
<tr><td>Interview</td><td>Observation</td><td>Informal conversa-tional interviews</td><td>Field notes</td><td>Researcher journal</td><td>Document review</td></tr>
<tr><td>Participant</td><td>Semi-structured face-to- face interviews: teachers (6), principals (3), district (1), province (2)</td><td>Observation of teachers’classroom practice</td><td>Informal interviews with teachers</td><td>To reconstruct the accounts of teachers, or salient events within context (school) of study.</td><td>Deepen my understand-ding of the research processes and to make my work more public</td><td>Interpreta-tion of text in artefacts; policy documents etc. Teacher, Principal</td></tr>
<tr><td>Analysis of data</td><td>Grounded theory methods</td><td>Qualitative video analysis approach</td><td>Manual process of coding and categoriza-tion of the data</td><td colspan="2">Content analysis as a method that is commonly applied to narrative data</td><td>Content analysis and textual analysis of extant text</td></tr>
</table>

Figure 1.1: Research design, strategy of inquiry and data collection methods

1.9.1 The research process and phases of inquiry

I used an exploratory qualitative design aligned to a social constructivist methodology in this study. The focusof the inquiry was not on teachers per se but bounded by the process of teacher policy appropriation and thus an instrumental case study approach was appropriate (Silverman, 2006). I followed backward mapping case study principles (Elmore, 1980).

The cases for the study were defined by schools with teachers using ICT to teach the national curriculum. I purposefully selected three schools from diverse socio-cultural settings for maximum variation (Glesni, 2007). The three primary schools, located in the Gauteng province of South Africa, provided the research sites for this study: a former model C[4] school, atownship[5] school and an independent[6] school. The purposeful selection of teacher participants (n=6) for the study was done through defined criteria. Principals (n=3) at each school, district (n=1) and provincial (n=2) leaders at specific directorates, were purposefully selected as essential participants to backward mappingprinciples.

Semi-structured face-to-face interviews (Fontana & Frey, 2005) represented the main data collection method. I conducted classroom observations of teachers' classroom practices, in which I positioned myself as a reactive observer (Angrosino, 2005). Interviews and classroom observations took place over a period of eighteen months. I conducted informal conversational interviews (Peräkylä, 2005) with teachers throughout the research period. I used field notes to record observations (Fontana & Frey, 2005). I used a researcher journal, to remain focused on the research problem (Hebert, 2002). The analysis of documents (Denzin & Lincoln, 2005)also constituted empirical material. (See Chapter 3 for a synopsis of selected documents).

[4] Former model C schools were public schools (classified prior to 1994) catering mainly for white learners
[5] Township schools are schools that are currently situated within 'black' communities
[6] Independent schools are autonomous private schools that receive minimal state subsidy and target affluent communities.

I analyzeddata using constructivist grounded theory methods (Glaser & Strauss, 1967; Charmaz, 2001). Codes were generated from data analysis software (Atlis.Ti^{TM}) and continuously modified by the treatment of the data "to accommodate new data and new insights about those data" (Sandelowski, 2000, p. 338). The extensive codes were further analyzed *a priori* to identify data related to key concepts in the research questions and through open coding (Miles & Huberman, 1994). This was a reflexive and interactive process that yielded extensivecodes, themes and categories. I conducted multiple readings of the data, organizing codes and themes into higher levels of categories within and across the interviews, observations, and other sources of data (Merriam, 1998).

1.9.2 Enhancing the quality of the study

In an attempt to enhance the quality of this study I implemented strategies of dependability, authenticity, credibility, confirmability, and transferability (Creswell & Miller, 2000). As the social constructivist lens views reality as socially constructed, that which we see is our interpretation and that which others report to us is their interpretation of social experiences of the world (Gasson, nd). Emerging from this view of the world, I endeavoured to ensure that findings were dependable and authentic. To ensure dependability of my findings, I made explicit the processes through which findings were derived. In this regard I maintained an audit trail by defining in detail the procedures that I employed in data collection and analysis. For authenticity, I ensured that findings were related to the main participants in the research context, namely teachers, principals and systemic officials.

According to Creswell and Miller (2000), credibility refers to the extent to which different stakeholders may make the same inferences from the data, and the extent to which the researcher represents the reality from the viewpoint of participants, other researchers and external peers. The choice of validity procedures for a study is dependent on the researcher's lens and paradigmatic assumptions (Creswell & Miller, 2000). In this study I attempted to reflect accurately on participants' account of the social phenomena and to ensure that this account would be credible to them. In this regard I employed various procedures (Guba, 1981; Creswell & Miller 2000) to

ensure credibility, namely triangulation across data sources and methods; noting instances of disconfirming evidence; use of a researcher reflexive journal; member checking; maintaining an audit trail; and, describing context, participants and themes in rich and thick detail.

Although no study can provide findings that are universally transferable, the aim of research is to produce information that can be shared and applied beyond the study context to other settings (Guba, 1981). In this regard I collected rich and thick data that may permit comparison of this study context to other possible contexts. To enhance transferability, I provided thick description of the study context such as demographics of the participants. Furthermore, I employed purposeful sampling that was not intended to be typical or representative. Thus descriptions, notions, and theories within the specified settings may be used for transferability without the findings of the study being transferable. In an attempt to represent findings that reflected participants' experiences (and not mine) within the context of the study, I used a method of constant reflexivity. In applying the construct of confirmability (Gasson, nd; Guba, 1981) I acknowledge my implicit influences, beliefs and biases as part of a social context that may affect the phenomenon under study. To limit my biases and prejudices in the social context, I recorded my reflections in a researcher journal. Triangulation of data, as already noted in credibility, was also applied as a strategy for confirmability. Quality criteria are addressed comprehensively in chapter three.

1.9.3 Scope and limitations

This study focussed on teachers in primary schools and the policy administrators at school level and beyond the school's boundary. The study also focussed on experiences of teachers as they appropriate education policy on ICT in their teaching repertoire. This study did not include teachers, principals andlearners at secondary schools. This study identified and investigated primary school teachers that were teaching the national curriculum through the use the ICT and does not include the experiences of teachers teaching ICT as a standalone subject discipline.

This study embraced an instrumental case study approach to provide insight into how teachers appropriate ICT policy on education, and with no intention to drawing generalizations beyond the context of this study (Stake, 2005, p.461). I followed qualitative research methods as a systematic and reflective process in the generation of new knowledge that may be contested, shared or imply transferability beyond the current study context (Multerud, 2001). In this regard, I did not intend to generalise the findings of this study to other contexts. However, the insights gleaned could contribute to inform education on policy implementation at schools and how teachers appropriate education policy.

1.9.4 Ethical considerations

Just like any research that involves human behaviour, measures were taken to ensure that all ethical concerns with regard to voluntary participation, informed consent, confidentially and anonymity were adhered to (Christians, 2005; Cohen, Manion &Morrison, 2006). Care was therefore taken to protect the personal dignity and confidentiality of the teachers who were the main participants in the study. Christians (2005, p. 144) suggests that participants must agree to voluntarily participate "without coercion" with "full and open" disclosure of information by the researcher. This was achieved through an introductory interview explaining the objectives, nature of the study, how results would be released and used, and allowing participants to check and confirm their [inter]views before reporting in the study (Moss, 2004; Lemmer & van Wyk, 2004). Furthermore, no actual names of participants were indicated in reporting their views and practices.

Before entering the field, I first sought the permission from the relevant department of education in Gauteng Province in South Africa. Next I solicited the approval of principals at various research sites. Before conducting interviews and observations I sought participating teachers' approval as well as the approval oflearners' parents, district and province leaders. Finally learners were issued with letters of assent explaining their level of participation. All participants completed a consent form to indicate their voluntary participation and right to withdraw from the study at any time

without giving any explanation (See Appendices A, A2-A5). Chapter Three, gives a detailed exposition of this section.

1.10 Outline of chapters

Chapter 1

In this chapter an overview of this study is provided. The overview includes a brief background context, justification for the study and the context of the three schools. Also included in this chapter are the problem statement and the associated research questions. This chapter explains the assumptions on which this study was based and concludes with the theoretical framework that acts as a scaffold for this study. Finally, I note the strategies for ensuring credibility and the ethical considerations of anonymity and confidentiality.

Chapter 2

This chapter focuses on the review of the literature on empirical studies that relate to this study. A core interest in the review of the literature is to establish what is already known in the field about my proposed study. The review was primarily undertaken to identify the debates in the field with particular interest in existing gaps and silences in the field that gave credence to this study.

Chapter 3

Chapter three describes the research design. In this chapter the meta-theoretical and methodological paradigms that underpin this study are presented. The methodological grounding is pursued in depth by explaining the selection of cases, research sites and participants. The chapter expands on the methodology for sampling, instruments of data collection and the research process. This chapter includes an in-depth explanation of the process of data analysis and concludes with issues of trustworthiness to enhance the quality of the study.

Chapter 4

This chapter draws on the emerging themes that were identified through data analysis. It is through these themes that experiences of six participant teachers are narrated and analyzed. Principally the research question of how teachers appropriate education policy on ICT in schools is addressed. The main focus of this chapter was on analysing data obtained from teachers as a unit of analysis. The chapter is concluded by conducting a literature control against the results of data analysis.

Chapter 5

Chapter five similarly draws on the emerging themes that have surfaced through data coding and categorization. The emergent themes represented the experiences of principals and those of district and provincial e-learning participants. The main focus of this chapter was on analysing data obtained from systemic structures beyond the teacher. The chapter is concluded by conducting a literature control against the results of data analysis.

Chapter 6

This chapter presents a summary of the key findings and foregrounds these findings against the theoretical framework of this study. The literature research assumptions are revisited in light of findings of this study. New knowledge that emerged from this study and suggestions for further research are presented. The chapter concludes with recommendations for policy implementation to improve teaching and learning.

1.11 Conclusion

There is significant interest by government, both in South Africa and internationally to increase the use of ICT in teaching and learning. It is well documented that most developed and developing countries have made either systemic changes or incremental changes by restructuring, modifying or enhancing their policies on ICT and curriculum to illustrate their commitment to pursue their education agenda and

rationale. In this regard numerous studies focus on government intentions in policy formation, and much research emphasis is on policy implementation as policy traverses from the intention of the policy maker to the classroom of the teacher. Very little policy implementation research especially in ICT policy on education is positioned at the classroom level, where focus is on the teacher who is at the crossroads of policy and practice. This study sought to inquire from a bottom-up analysis of policy implementation beginning with understanding teachers who are situated at the point of implementation.

In this opening chapter, I have presented an introduction to the study. This included among other aspects, the background, the problem statement, study objectives, research questions, rationale and significance of the study, delimitation and limitations of the study. A brief description of the research design, data gathering strategy, instruments, research sites, study sample, strategy of inquiry and analysis of the gathered data was also outlined. In chapter two I present a literature review of debates in the field.

CHAPTER 2

Exploring the debates in the field

2.1 Introduction

The purpose of this chapter is to provide a review of the literature on ICT (Information and Communication Technology) policy implementation in educationfrom both international and national viewpoints. This review sets out to explore issues that are relevant to my study and to inform policy. The literature review commences by presenting an overview of the debates in the international field and concludes by situating the South African scenario within the context of these debates. Common threads running through both the national and international landscape aremacro and meso-micro level policies of ICT on education.At macro level the focus is on initiatives and issues withingovernment (national, provincial and district) ICT in education policy implementation. The meso-micro level draws attentionto particular ICT in education policy issues that influence policy implementation at school and classroom levels.

This review of the literature is grounded in research based on comparative studies, NGO, national and international surveys, ICT in education projects, international reports and academic empirical literature that spans both developed and developing countries. The review of research literature does not report on the findings of each country per se, but on ICT in education policy implementation issues that have common threads within the international debates.

2.2 The rationale of governments for an ICT policy in education

Governments, policymakers and administrators of schools have placed ICT in schools, with the intention that ICT is the panacea to all problems in education (Jung, 2005; Selwyn, 2007; Selwyn, Gorard, & Williams, 2001).Most governments hold the expectation that by placing ICT in schools, all will bode well and that the new

technology will naturally enhance teaching and learning. Yet such intentions when exposed to empirical research, prove to be insubstantial and rhetoric. Numerous scholars (Underwood et al., 2007; Cuban, 2001; Selwyn, Gorard & Williams, 2001; Butcher, 2003; Selwyn, 1999; Condie et al, 2007; Thomson, Nixon & Comber, 2006)in the field have questioned this universal quest to place computers in schools, and the policy intentions that accompany this innovation.

To begin to understand ICT policy in education, it is necessary to understand what motivates governments to implement ICT in schools. Hawkridge (1990) outlines four rationales of ICT policy formulation that are generally utilised by countries for the introduction of ICT into schools. First, a social rationale defines the importance of ICT in society and provides impetus for school integration. Second, a vocational rationale calls on the need to equip learners for future workplace employment. Third, a pedagogical rationale expresses the notion that ICT in schools will improve the quality of teaching and learning. And fourth, a catalytic rationale suggests that ICT will enhance the general performance of schools, integrating the functions of teaching and learning, management and administration. Tondeur et al. (2006) suggest that current curriculum developments in developed countries tend to focus mostly on the social and vocational rationales as delineated by Hawkridge (1990). According to Duguet (1990, p. 165) strategies and policies for introducing ICT into schools differ from country to country only by the intention of the policymakers or government. Some countries tend to impose a “restricted” policy that has a primary intention to promote instruction in computer science and computer literacy, as opposed to those countries that impose “comprehensive” policies that are intended to increase the effective use of ICT-based teaching and learning across the curriculum. Duguet (1990) argues that the social and vocational rationales as propounded by Hawkridge (1990) are restrictive policies, while pedagogical and catalytic rationales are comprehensive policies that are generally transformative in nature.

According to Pelgrum and Plomp (1993), it is not one single rationale that guides policy makers or governments, but rather a combination of rationales. The selection of particular rationales does, however, determine to a large extent the nature of the implementation strategies. Both Hawkridge (1990) and Duguet (1990) indicate that

the significant difference is that most developed countries have ICT policies that are comprehensive in nature, while developing countries continue to produce policies that are typically restrictive. They propose that developing countries should transcend this barrier by developing ICT policies that are more holistic in their approach to ICT planning.

Many varied rationales may exist for countries to introduce computer technology in education, but all countries have to respond to factors and challenges that arise beyond education. According to Dugeut (1990, p. 165) national, provincial, local and district policies for introducing ICT into schools are expected to respond to "pressures" that are external to the education sector. Here again the difference between developing and developed countries lies only in the extent to which these pressures influence the ICT in education policy.

2.3 International landscape: Macro level – Are policiesimplemented as planned?

2.3.1 ICT policy implementation: Trends and strategies

Findings from an international comparative study(Kearns, 2002) on ICT in education policies of ten countries (Australia, Canada, Finland, Ireland, Malaysia, New Zealand, Singapore, Sweden, United Kingdom and United States) indicate that most developed countries pursued particular trends in their phases of policy implementation at the macro level. Three discernible phases of ICT policy were identified: Phase One - ICT policy is characterized by providing access to computers in schools, with emphasis on teacher professional development and the development of online content. Phase Two - the mainstreaming and integrating role of ICT into education in a more strategic way, with emphasis on objectives and links to overall education strategies. Phase Three - the transformation of teaching and learning, principally "transforming the way we learn" (Kearns, 2002, p. 22).

The ten countriesresearched (mentioned above) have since surpassed these phases (Kearns, 2002, p. 22). Notably, Sweden and the United States of America, both

forerunners in international ICT policy, are currently on their third national plan for ICT in education and on the brink of venturing into the third phase of policy implementation. Furthermore, findings placed emphasis on the fact that none of the countries surveyed had progressed to a stage to fully implement phase three of policy implementation. However, collaboration between countries of the ICT league (Canada, Netherlands and the Nordic countries) are beginning to explore ways to progress to the third phase of policy for ICT in education. Furthermore, most countries are faced with the enormous challenge of how to best deal with the "exponential pace of technological, social, and economic change" Kearns (2002, p. 4).

The key is how countries have responded to this change in developing policy for ICT in education. Kearns (2002, p.14) states that traditional policy approaches to government processes, mechanisms and initiatives tend to be poorly suited to the current requirements of a dynamic knowledge society. There is a need for new approaches that meet the conditions and challenges of the dynamically changing information age. Most of these countries have extended their education ICT policy to develop ICT action plans, which act as policy instruments to promote the effective use of ICT in education and training.Malaysia is one of many developing nations that has taken up the challenge and is fast-tracking its ICT capabilities in an attempt to leapfrog the country into a developed nation (Belawati, 2003; Chan, 2002).

2.3.1.1 Slow pace of change

A number of research studies in this field, indicate that ICT in schools is unfolding at a disappointing "slow pace of change" (Dale et al., 2004; OECD, 2001; Kerns, 2002; Pelgrum & Plomp, 1993; Lee, 2003; Younie, 2006; Murphy & Beggs, 2003; Smolin & Lawless, 2007). The OECD (2001, p. 88) found that "compared with many other sectors, education has been slow to make changes in organizational practice and culture through the use of ICT". Research findings of a comparative study indicate that the adoption of ICT in schools seemed to follow the same pattern as any other educational innovation (Kerns, 2002). Fluck (2003, p. 1) posits that ICT has had as much "impact as any other innovation". This clearly suggests that ICT as a relatively new innovation has not necessarily translated into new teaching-learning strategies, as

expected by policymakers. There is a need for research to identify strategies that would accelerate the pace of change and ICT innovation in education systems (Kearns, 2002). Lee (2003) argues that the slow pace of change and the degree to which ICT was utilised in Korean schools was a result of government's haste to promote its educational informatization project without studying its effectiveness in school practice.

Implementing government policy in ICT "is a complex procedure and not a direct translation from government policy to practice" (Younie, 2006, p. 385). Furthermore, Younie (2006) argues that change is either very slow or tends to fail because government policy has to pass through various agencies and systemic levels. The conduit through which policy traverses, from macro to micro levels within the system, impacts on policy effectiveness and delivery. In contrast,Pelgrum and Plomp (1993), suggest thatthe reason for disappointing progress in integration of ICT in education may be due to simplistic government policies. It is these arguments that raise the challenge to identify policy implementationand policy appropriation issues at micro level that are relevant to my study.

2.3.1.2 Multidimensional approach and systemic change

Policy implementation should be "multidimensional"in its approach. Policy implementation should not only focus on material issues such as infrastructure, funding, and teacher training but also on change management at meso and micro level (Younie, 2006). Accordingly Younie (2006, p.385) claims that policy implementation should be viewed as a dynamic process that is "fluid, reiterative and non-linear". Policy can be materialised into practice by government, if government accepted and remainedconstantly aware of the complexity of policy implementation, particularly at local levels. Accordingly, a multidimensional approach to policy would yield an understanding of the way teachers interpret policy and engage in the implementation of ICT policy at micro level. The implementation of government policy is a complex process and one that is multifaceted (Plomp et al., 2009; Younie, 2006).

Researchers have advocated for systemic change for the successful integration of ICT in education (Joseph &Reigeluth, 2005; Sutherland et al., 2004; Younie, 2006). The implementation of an ICT policy on its own without complementary changes in the education system as a whole would fail to meet the requirements of the information society. Joseph and Reigeluth (2005) argue that it is only through systemic change, as opposed to piecemeal change, that the education system can meet the challenges posed by the information age. The metaphor of a "jigsaw puzzle" is used to suggest that piecemeal changes arelike incremental reform, where one change in reform must invariably impact on other linked changes in reform. Joseph and Reigeluth (2005) strongly advocate a systemic approach where all aspects of the education system (government policy, school governing bodies, district offices, schools and classroom practice) change simultaneously.Sutherland et al. (2004, p. 423) posit that policymakers tend to have a "utopian vision" of their expectations with regard to ICT in schools and should not treat ICT as an "unproblematic innovation that will somehow lead to enhanced learning".

2.3.1.3 Simplistic policies and competing priorities

Unlike many developed countries, Africa as a continent is experiencing the same invidious challenges and ICT policy implementation problems as most other developing countries. Furthermore, within the African continent many NGOs and trans-national government initiatives (such as NEPAD and EFA), have common policy frameworks that are spread over the entire continent. On the African continent, most countries hold political views that ICT offers great promise of being the universal remedy that will create an opportunity for unprecedented economic growth, control pandemic diseases, create distance education opportunities, give impetus to the democratization process and good governance, and leapfrog countries out of economic stagnation (Butcher, 2003; Selwyn, Gorard & Williams, 2001). These are but a few of the African continent's "wish list", but the reality is that Africa is plagued by numerous undesirable inhibiting factors that are unique to third world countries in Africa, as opposed to other developing countries. In this regard Africa has major "competing priorities such as the combat against HIV/AIDS, poverty and illiteracy, and local constraints including poor technology penetration, unaffordability of

equipment and lack of capacity" (Butcher, 2003; James, 2004). Africa has many struggling nations that are plagued by political uncertainty, weak ICT infrastructure, poor policy and regulatory frameworks and limited human resources.

According to van Reijswoud (2006, p. 1) Africa had many national ICT policies, but not many ratified ICT policies, further indicating that "ICT at continental level still has a lot of changes ahead". Africa needs to pursue the challenge of being placed at the cutting edge of technology or risk further deterioration within the next two decades in its position within global development (Shrestra, 2000). The educational reforms of Africa still need to keep abreast with the relative "faster pace of events on the move around them"to meet thelearning needs of learners (Shrestha, 2000, p. 3).

Not all countries prioritize ICT in education as an area of concern. India as a developing country recognised ICT in education as an important policy requirement, but placed other more pressing issues, such as economic prosperity as a greater national objective. Among the list of exigencies were uncoordinated efforts, lack of electricity, poor communication infrastructure and non-sustainability in the use of ICT for education. ICT implementation in India boasts many successes, particularly in rural development, healthcare and transportation but not in the education arena. Furthermore, India aimed to become a world leader in the information society and knowledge economy with education as a focussed priority, but since government policy in ICT has been a 'solely' government prerogative it was devoid of public discourse and input (Bajwa, 2003a). Apart from a general lack of political will in the ICT policy arena, political debates in India were at play. Some politicians acknowledged the positive impact that ICT may have on teaching and learning while others claimed that ICT could not be the focus of a nation that still prioritised agricultural and economic development. Thus policymakers in India are facing a dilemma of how to make ICT accessible for economic, social and educational needs. However, without the financial resources to satisfy the most basic needs of housing, schools, hospitals and healthcare ICT in education has weak political and policy preponderance. It was evident that though India had established significant ICT capacity, it had been directed towards strengthening the economy as a priority.

Education ICT policy (or the lack thereof), without government's enabling role seemed to have taken a back seat.

However, in developed countries it would seem that the competing issues deal more with educational rather than socio-cultural concerns. In Europe, the national curriculum frameworks can also be in conflict with the contextual characteristics of the local school system such as school policy, school culture and teacher beliefs. These are the real issues that schools have to contend with and may act as significant barriers to introducing ICT to enhance teaching and learning (Tondeur, Braak & Valcke, 2006).

2.3.1.4 Changes to national curriculum policy

National policy that guides ICT curriculum integration takes on a variety of nuances and occupies centre stage in the global arena.Most developed and developing countries are gradually changing their national curriculum policy to accommodate the integration of ICT in teaching and learning (Cox & Marshall, 2007; Plomp et al., 2009). First world countries such as Canada, Australia, United Kingdom and the USA are strategically planning to simultaneously address ICT issues such as infrastructure, teacher training and computer integration into the curriculum (Fluck, 2001). Fluck (2001) indicates that although economics is the major factor in determining the way countries implement ICT equipment in schools, it is the ICT policy in education that plays a crucial role. He suggests that:

> *some criteria for assessing the progress of policy decision would have to examine the success of ICT deployment in schools. Such criteria might include quantitative and qualitative comparisons of ICT infrastructure provision. Student learning using this equipment could also be measured similarly... Another level of evaluation would gauge the degree to which the range of relevant policy initiatives had moved the country towards Phase 3.* *(Fluck, 2001, p. 149)*

In Australia there is an absence of a national ICT curriculum policy but a ratified national schooling framework does exist (Elliot, 2004). A study conducted on the effective use of ICT in the absence of any mandated (policy) role for ICT in teaching and learning found that there still exists a huge gap between rhetoric and reality

(Elliot, 2004). Moyle (2006, p. 32) arguesthat visions for incorporating ICT into teaching and learning in Australia must be supported by "system and sector ICT visions and plans".Furthermore, there needs to be an improved educational link between policymakers, technical experts and curriculum experts. System level policies must support the school's ICT policy, or risk losing credibility among schools (Moyle, 2006).

Norway has taken the lead in changing national curriculum to accommodate ICT in schools. In this regard, the new revised national curriculum which was implemented in the 2006-2007 period placed ICT as one of five basic skills to be embedded in all subjects and at all levels (Pedersen et al., 2006; Erstad & Quale, 2009). The major change in the curriculum relates to ICT integration specifications in different subjects to promote learning. Central government regulates syllabus content, subject combinations and examination requirements. However, schools are free to design their own methods for organising teaching and learning (Erstad & Quale, 2009).

In Cyprus most parents and teachers seemed to favour the introduction of ICT in elementary school (Karagiorgi, 2000). But, there was an ambivalence of opinion whether ICT should be a discrete subject (techno-centric model) or integrated into the entire curriculum (humanistic model). Teachers tended to lean towards an ICT curriculum integration model, which was attributed to theirattitude and awareness of the value of ICT application across the curriculum (Papanastasiou & Doratis, 2009). Even though government policy opted for an integrated cross-curricular approach, how the policy would be achieved was not evident (Charalambous, 2001). Furthermore, Karagiorgi and Charalambous (2004) argue that the challenge policymakers encounter is not only in identifying and adopting an appropriate model (whether techno-centric or humanistic) for ICT in the national curriculum, but in creating mechanisms to support the appropriate model. ICT use and application was as a result of individual initiatives, due to an "open-ended" government policy on implementation (Karagiorgi, 2005, p. 31).

The above findings seem toemphasize that the development of an ICT policy in education needs to be people orientated, has a focus on the innovation, and is practical in implementation.

2.3.1.5 Successful ICT policy implementation

Many countries (Finland, Norway, Netherlands, Singapore) and Hong Kong (while Hong Kong is a Special Administrative Region (SAR) and not a separate country, it will be referred to as a "country" in this thesis for the sake of convenience) have made significant progress in integrating ICT into education (Plomp et al., 2009). The Second Information Technology in Education (SITES Module-2) study indicates that Singapore stands above all other countries, developed and developing, in respect of ICT policy in education implementation and ICT integration (Howie, Muller & Paterson, 2005). Singapore is noted to have made substantial progress by developing a macro ICT policy in education that resulted in high levels of implementation at micro level. Consequently, Singapore has made significant policy implementation strides in its quest to use ICT to transform teaching and learning in schools. Pelgrum (2001) argues that with the exception of Singapore, a huge gap exists between the ideal (policy intentions) and the reality (policy in practice) in most other countries.

The Singapore Ministry of Education (MoE) identified four key ICT policy strategies (Lim& Tay, 2003) namely, curriculum and assessment, learning resources, teacher development, physical and technological infrastructure. According to Lim and Tay (2003) lessons learned from the Singapore experience included the following: First, the ICT master plan of Singapore was situated in an education system that is well planned. Second, ICT must be perceived and used as a mediating tool to ensure that the masterplan is education driven and not technology driven (Lim& Tay, 2003, p. 2). Third, the ICT master plan should not be a standalone policy which bears little cohesion or no relation to other educational policies and initiatives. And fourth, the education system should react to the introduction of ICT and therefore teaching, learning and assessment practices need to be modified to accommodate the new technology. A significant finding that emerged from Lim and Tay's (2003) study was the fact that Singapore's national ICT policy in education was formulated with the

intention that it could be "operationalised" into goals that could be managed, was realistic and achievable. Lim and Tay (2003) suggest that within the Singapore MoE there was a dedicated division within the systemic hierarchy of the government that was responsible for co-ordinating and implementing the ICT master plan.

Another country that seems to be moving in the direction of successful implementation of ICT policy in education, although not as advanced as Singapore, is Hong Kong (Plomp et al., 2009). Achievements of ICT in education in Hong Kong were not only due to the readiness of schools to embrace new technology and to involve teachers but also underscored the impact of policy initiatives of the Hong Kong department of education. The national ICT policy in education fostered ongoing support to schools that culminated in successful ICT policy implementation (Law, Yuen, Ki, Lee & Chow, 2000).

2.3.2 Responses to ICT policy in education

2.3.2.1 ICT policy focus

Various researchers suggestthat governments are often misguided by the focus they place in their ICT policy in education (Dale et al., 2004; Panel on Education Technology, 1997; Plowman & Stephen, 2003; Beastall, 2006; Mulkeen, 2003b). An analysis of policy documents and case study interviews with principals in schools in the United Kingdom indicated that the focus of ICT policy and the management of ICT policy were on provisioning of hardware and infrastructure. The ICT policy neglected to inform schools on *how* ICT might be used in classroom practice (Dale et al., 2004). Beastall (2006) and Dale et al. (2004) claim that ICT integration, teaching and learning should be the focal point of policies defined by supranational, national, local authorities and school management.

Lee's (2003) comparative study of ICT policy integration initiatives in Germany, Korea and USA schools found that there are policy convergences between these countries. All three countries had a top-down national framework for ICT policies; however, in Korea stronger impetus was exerted from central government in that

every policy objective was delivered effectively and efficiently. All three countries had almost the same spectrum of core policy, namely infrastructure, use of digital content and resources, learner-teacher use of ICT and teacher training. However, where these countries differed was in the focus of their respective ICT in education policies. In Germany the focus was on infrastructure, digital content and resources. In the United States emphasis was on teacher training and performance enhancement of learners. And, in Korea there was an equal emphasis on all of the abovementioned aspectsof the policy spectrum. The Chilean "Enlaces' experience contributes to this debate by arguing that designing an ICT policy in education is a far more complex task than merely deploying hardware in the schools (Hepp, 2003; Hinostroza et al., 2003).

2.3.2.2 An inclusive approach to the formulation of policy

Recent policy initiatives illustrate that many governments are adopting an inclusive approach in developing an ICT in education policy.There seems to be an increasing attempt by governments to include all relevant stakeholders in the development of an ICT in education policy (Dale et al., 2004; Beastall, 2006;Hepp, 2003;Mulkeen, 2004). The Irish Department of Education and Scienceproduced a three year strategic policy plan named the 'Blueprint for the Future of ICT in Irish Education'. This policy plan was gratuitously funded and yielded positive results due to participation from all sectors of education, namely parents, teachers, school management, local communities and government (Mulkeen, 2004).

The Chilean ICT in education project (Enlaces) supported the notion of stakeholder inclusivity (Hepp, 2003). Policymakers at national levelclearly defined and communicated the rationale, goals and timeframes for the expected outcomes to all relevant stakeholders (teachers, school leaders, administrators and parents) in the education system. Developing inclusive policies was also evident in Singapore in which national ICT policy in education expected schools to have a clear and shared vision of its ICT integration strategies by all stakeholders (Lim& Tay, 2003). It would seem that countries that encouraged participation by all stakeholders (government,

local government, school leaders, teachers and parents) in policy formulation achieved successful ICT integration into teaching and learning.

2.3.2.3 Policy deficits

The lack of policy guidelines to support schools seems to depict a familiar policy implementation problem that is apparent in most education systems in the international arena. Dale et al. (2004) maintainthat the lack of macro-micro level interaction is illustrative of the principle that though policy sets limits to practice, it is also the reality of practice that sets limits to policy. In the United Kingdom, macro level ICT policy in education offered little advice on *how* schools should use ICT(Dale et al., 2004; Pelgrum & Plomp, 1993; Beastall, 2006). The National Grid for Learning (NGfL) as the main policy driver of ICT in education in the United Kingdom, issued

> *little specific guidance on the ways that ICT might augment or combine with existing approaches to teaching and learning to bring this about, and it was relatively silent about how these changes might be different from other curricular and pedagogic changes.*
> (Dale et al., 2004, p. 469)

In addressing principals' concern about how computers were to be used for educational purposes, Pelgrum and Plomp (1993) and Beastall (2006)found that in most cases policies had not been formalised and thus there was no written policy documentation to guide school administrators.

This lack of national policy to support ICT in education was also evident within the United States prior to 1997. The government of the USA commissioned the Panel on Educational Technology(1997, p. 6) to determine the state of ICT integration in schools. A number of relevant recommendationsregarding policy for the use of ICT in schools were made to the government: First, there should be a policy focus on *learning with technology* and not a techno-centric approach of *learning about technology*. Second, emphasis should be on curriculum content and pedagogy and not on hardware and technical issues. Third, there should be more emphasis placed on the professional development of teachers. Fourth, the education system should be geared for equitable and universal access to ICT. Fifth, greater experimental research

programmes into the use of ICT in schools should be initiated. And sixth, district offices should provide greater support to teachers, particularly in schools where there is an absence of dedicated computer coordinators. This report was consistent with other international research findings on policy deficits of ICT in education.

More recent literature (Kearns, 2002, p. 5) indicates that considerable improvement has been made with respect to most recommendations, but is still concerned whether "technology is outpacing policy". Kearns (2002) indicates that the United States is on the threshold of the third phase of policy for ICT in education which "goes beyond foundation policies to consider pedagogical innovation in the use of ICT and the major development of e-learning". The third phase of policy for ICT addresses the first recommendation by transforming the way people learn in a society. A review of progress in 2000 showed substantial progress in achieving the above mentioned recommendations. In 2000, the United States 2000 National Education Technology Plandefined more ambitious policy objectives. These objectives were stated as goals: First, students will have access to ICT in their classrooms, schools, communities and homes. Second, teachers will use technology effectively to help students achieve highacademic standards. Third, students will have technology and information literacy skills. Forth, research and evaluation will improve the next generation of technologyapplications. Fifth, digital content and network applications will transform teaching and learning.

Similarly,India has policy and technology "know how" to implement ICT intervention in education but "what is missing and what fails is in the translation of policy and technology into good practice"(Reddi & Sinha, 2003, p. 252). Although there is a paucity of government policy documentation and knowledge sharing of interventions of ICT in education, India had made remarkable progress in its ICT development program(Reddi & Sinha, 2003). Bajwa (2003a, p. 59) claims that the progress of India is the result of developing national capacity in the "context of market-orientated globalization"to leapfrogthe country into a developed one. However, there is a lack of ICT policy directive in respect of a uniform curriculum that was mandatory for all educational institutions(Bajwa, 2003b; Mallik, 2009).India faced a lack of policy implementation strategies to streamline its education system with respect to ICT.

Like India, the ICT in education policy of Indonesia lacks policy implementation directives. The ICT policy in education focuses on infrastructure, connectivity and capacity building issues (Belawati, 2003). The National Ministry of Education set aside a number of policy initiatives, most pilot project based, for the use of ICT in primary and secondary schools.However, the stark deficit of a policy for implementing ICT into education, combined with unsustainable initiatives, culminated in the slow uptake of ICT in education. Political instability and financial difficulty, which are typical issues in developing countries, delayed the advent of ICT in education in Indonesia.

The Nigerian experience of ICT in education policy demonstrates a major disparity between policy formulation and policy implementation (Jegede and Owolabi, 2003, p. 8). Nigeria's current ICT policies are outdated and "obsolete" and have not been updated to cater for the dynamic changes encountered with new ICT technologies. There is a necessity for new policy that needs to be current and deliverable to teachers, in order to implement the policy philosophy and objectives (Jegede & Owolabi, 2003). There seems to be a clear distinction between those countries that have ICT in education policies which are progressing and working, countries that have ICT policies that are dysfunctional and countries that lack ICT policies directives altogether.

2.3.2.4 Centralised versus decentralised centres of control

In many first world countries governments exercise either centralisedor decentralised control in ICT policy in education issues. In Australia the decentralization of education as a state responsibility created challenges for state schools with respect to ICT in education. However, decentralisation has been a boon to private schools hat benefit from government's subsidy (Cranston, Kimber, Mulford, Reid, & Keating, 2010). Fluck (2001, p. 146) suggests that there is a "possibility of divergence of philosophy and practice". Each state and territory implemented its own strategic plan for using computers to improve education, administration and to enhance ICT infrastructure in schools. Thus, Australia displays a variety of government policy

positions towards the integration of ICT into classroom practice. States place different emphasis on ICT use in classroom practice(Naidu &Jasen, 2003). Hence, it would seem that Australia seems to follow a more decentralised approach to ICT policy implementation.

In contrast, France as a developed country experienced centralised centres of control. ICT policy in education decision making is mainly in the hands of central government. Rigid hierarchical structures exist with prescriptive policy and educational processes that are communicated via designated pathways from national administration to school. School district and school inspectorate mediate with schools to monitor compliance of national policy initiatives.The process of implementing ICT into primary schools through French national state initiatives had been "neither smooth nor really continuous" (Baron& Harrari, 2005, p.148). Regnier (2009) suggests that the development of ICT policy in education in France is still incomplete and has not culminated in much change in ICT integration into education system. Although France introduced ICT into schools almost two decades ago, the implementation of ICT in schools has remained a challenge.One indicator of ICT implementation difficulty was the national "informatics for all" plan which met with disillusionment only a few years after its inception (Baron& Harrari, 2005). As a first world country, France still encounters huge ICT policy implementation concerns.

Sweden has a successful decentralized education system, with responsibility for implementing and defining the use of ICT shared between central government and local education authorities (municipalities). Central government functions to promote ICT in education, provide in-service professional development to teachers and support school improvement. Municipalities are tasked with equipping schools with ICT and training teachers in the use of ICT as a pedagogical tool. A new national ICT policy (2005) identified several goals for a "sustainable information society" (Karlberg, 2009). The level of ICT penetration in schools for teaching and learning is significantly high, and most schools have ICT-based objectives for access to ICT, teacher and learner ICT-based competencies and ICT integration into curriculum. Even though Sweden is a leading ICT in education country, it still lacks policy initiatives on the use of ICT in education (Karlberg, 2009).

From the above it would seem that there is no single approach to ICT policy implementation and that the implementation of ICT policy is dependent on the social, cultural, historical, political and educational climate of a country.

2.3.3 Summary of macro level findings

Most developed countries have pursued trends in their phases of policy implementation at the macro level.However, none of the countries has reached the stage of transforming teaching and learning. There is a need for new approaches that will meet the conditions and challenges of the dynamically changing information age. A number of research studies in this field, indicate that ICT in schools is unfolding at a disappointingly slow pace of change. Furthermore, it has been was argued that policy implementation should have a multidimensional approach that focusses on material issues such as infrastructure, funding, teacher training and changed management at school level. Systemic change for the successful integration of ICT in education is advocated.

Not all countries have prioritized ICT in education as an area of concern and competing priorities outweigh the implementation of ICT in education. Furthermore, in developing countries ICT policy in education has followed a rather simplistic design that does not meet the needs of learners. Most developed and developing countries are changing their National Curriculum policy to accommodate the integration of ICT in teaching and learning. Singapore stands above all other countries, developed and developing, in respect of ICT policy in education implementation and ICT integration.

Responses to ICT policy in educationare fourfold, namely varied ICT policy focus, an inclusive approach to the formulation of policy, policy deficits and centralised versus decentralised centres of control. Evidently ICT policy implementation is dependent on the social, cultural, historical, political and educational climate of the country.

2.4 International landscape: Meso and micro level –

Areclassroom practices changing?

Policy in practice takes place at the classroom level and it is this level that sets limits to implementation of government policy. The literature review of meso and micro policy in practice focuses on ICT policy issues that influence ICT take-up at school level and ICT practice at classroom level. In particular this review identifies meso and micro level policy issues that impact on ICT policy implementation in schools. The issues of policy burden, curriculum policy, meso level policy understanding, institutional ethos and school leaderships, institutional support, teacher pedagogy, teacher competence and training is presented in the current international debates.

At a meso-micro level the focus shifts to determine what motivates schools to implement ICT.In a studyon the impact of ICT on learning and teaching,Newhouse (2002)identifies three factors that determine the implementation of ICT in schools. Firstly, in response to the huge financial investment schools make for access to ICT,was the belief that ICT would improve learner achievement of curricula outcomes. Secondly, computers would provide adequate ICT literacy skills for teachers and learners. And thirdly, ICT would increase the efficiency and effectiveness of schools as organizations. These factors exist as common goals in the national ICT policy of most countries and in ICT objectives of most schools.

In an attempt to explain how schools espouse government policy, DiMaggio and Powell (1983) posit the concept that schools change by virtue of isomorphism, a process which leads schools to adapt in similar ways to similar changes in external conditions. DiMaggio and Powell (1983) define three isomorphic changes that occur in institutional change. First, they suggest that some schools may exhibit “mimic isomorphism” in which they copy or imitate proper or appropriate practice due to their level of uncertainty of conditions, thus legitimising their response to policy. Second, “normative isomorphism” occurs when schools as institutions adhere to norms or educational experiences, through networking or the act of socialization. In this way normative isomorphism is the learned norm experience that guides the school to react to new policy. Third DiMaggio and Powell (1983) posit “coercion isomorphism” as that process in which the school reacts to external pressure due to state regulation or

policy. DiMaggio and Powell (1983) found that mimic isomorphism is the dominant isomorphism that is prevalent in most schools, simply because they tend to opt to follow examples of appropriate practice. It would seem that schools adopt different implementation strategies to accommodate policy imperatives. The unique isomorphic stance that schools assume is of particular interest to my study, as it has a direct bearing and influence on the way in which ICT policy is appropriated in schools.

2.4.1 Social context of ICT policy implementation

2.4.1.1 Systemic support, capacity and competence

Policy in practice is influenced by the support or lack of support schools receive from system level structures in particular district offices. Sustainable systemic support to schools is an important factor for the successful implementation of government policy in schools. In a case study of two districts in China, Hawkridge (1990) noted that districts translate provincial policy to meet district objectives. These policy objectives would then be refined to develop learner and teacher competences. Li (2003), however found that policy mandates without resource support and application methods culminated in a failure of ICT integration into the traditional education setting.

Younie (2006) identified areas of concern at district level that needed to be addressed in the implementation of government ICT policy in the United Kingdom. First, Local Educational Authorities (LEA) lacked professional expertise to make informed decisions and often failed to adequately consult with schools. Second, leadership and management in ICT expertise was absent at LEA, schools and at various government initiative levels. Third, schools lacked ICT expertise from within the school and guidance from external systemic structures to move the national ICT agenda forward. Fourth, unequal funding of ICT provisioning at schools yielded disparities between schools with respect to resources and procurement. Fifth, teachers were still unconfident in the use of ICT and claimed that training was inconsistent, over prescriptive and lacked local context.

Similar issues of the lack of systemic support and capacity of local districts emerged in the United States prior to 1997. The Panel on Educational Technology (1997) found that the introduction of technology in schools will not by itself improve the quality of education. Their findings revealed numerous ICT policy implementation concerns: First, teachers received little technical, pedagogical or administrative support from local districts. Second, school districts focussed most of their funding on the acquisition of hardware and software with little or no funds for the development of teacher ICT competence. And third, a lack of in-depth and sustained assistance to teachers in the use of ICT. The combination of the above factors culminated in a lack of district educational support to schools.However, in 1999 the United States Department of Education funded the Regional Technology in Education Consortia (RTEC) to assist and support teacher professional development and promote the effective use of ICT in education. Many federal states within the United States also set up systems (such as workshops) to provide information and support services for teachers and school districts (Kearns, 2002).

Significantly different, in Chile, schools received appropriate and regular information from districts about ICT policy and how it fitted into the general education plans (Hepp, 2003). In addition the Chilean ICT "Enlaces" project provided support and training to teachers at classroom level, to gradually transform their teaching by adapting ICT as a tool to enhance teaching and learning.Similarly in Hong Kong, ICT in education achievements were not only due to the readiness of schools to embrace the new technology and teacher involvement but underscored the impact of policy initiatives of the Hong Kong Department of Education (Law, Yuen, Ki, Lee & Chow, 2000). In both Chile and Hong Kong it would seem that national ICT policy in education that fostered ongoing support to schools culminated in successful ICT policy implementation.

2.4.1.2 Institutional culture and practice

Schools that are progressive in using ICT for educational and administrative purpose seem to enhance their level of functioning. The most significant benefit of ICT in

school tends to be focussed on meeting the challenges of transforming the institutional culture and practice. The most applicable ICT policy in practice takes place at the school's administrative functioning level (O'Dwyer et al., 2004). In most developed countries as illustrated by the USEIT study conducted by O'Dwyer et al. (2004, p. 4)"teachers are influenced by the level of structure of the system in which they work". Furthermore,teachers were using ICT for non-instructional purposes based on their day-to-day professional needs. Similarly the SITES module-1 study (Doornekamp, 2002)based on developed countries found that most schools progressed to using ICT to monitor learner progress.The administrative use of ICT was one objective of national ICT policy that has been well promoted in most schools across the international spectrum. ICT offers affordances for improved administrative functioning of the school for both teachers and administrators, particularly in reporting to parents and thereby improving parental involvement (Dale et al., 2004; Pelgrum & Plomp, 1993; Becta, 2006).

Singapore seemed to have made the transition from using ICT merely for administrative purposes to effectively integrating ICT to influence teaching and learning. Pedersen et al. (2006, p. 252) note that the implementation of ICT only succeeds when the school organization is able to restructure itself, and "doesn't just overlay ICT on the old organizational structure". Singapore schools were recommended to support the uptake of ICT by teachers, and teachers were required to use ICT as a tool in the teaching and learning environment (Lim& Tay, 2003, p. 22).The ICT policy of the MoE of Singapore was mindful not to prescribe to schools how ICT should be used in the curriculum, but offered guidelines to encourage teachers to be innovative in applying the national policy to their teaching strategies. In this regard, Lim and Tay (2003) posits that Singapore's ICT policy provided schools with significant freedom to implement the national ICT policy. The ICT policy of Singapore allowed schools to make their own internal policy decisions on how to integrate computers in schools,thus creating a supportive institutional culture to promote the effective implementation of ICT.

This decentralised approach gave schools the mandate to implement ICT within its own contextual situation based on school culture, change dynamics, ICT staff

competencies and administrative readiness of the school. Government acknowledged that schools are structurally different and schools were given autonomy to design their own ICT resources needs and computer layout. Singapore schools had only one principal national policy obligation, and that was to adopt ICT to meet the needs of the national policy standards. In this regard ICT practice in Singaporean schools ICT took the following policy provisions into consideration: First, the ICT priorities of staff, learners and curriculum had to be considered. Second, ICT national evaluation standards and benchmarks were observed to identify successful integration. Third, responsible support authorities within the school (ICT committees, administration, teachers and technical support) needed to be established for successful ICT implementation. And, fourth financial resources and time frames for ICT integration had to be considered.

In contrast, in developing country contexts such as Indonesia, ICT use in education was still in its initial stages with computersbeing used mostly for school administrative purposes. In Malaysia, school leaders are expected to role model the use of ICT through administrative processes and thereby encourage teachers to use ICT in their administrative and teaching repertoire (Lim& Tay, 2003). Although these findings are consistent with the International study in Education Achievement (IEA), most schools used ICT for administrative purposes and did not follow through to curriculum delivery (Pelgrum & Plomp, 1993).

2.4.1.3 School leadership

A pertinent factor that impedes the implementation of government ICT policy is the volume of policy that schools have to implement (Cuban, 2001). Constant policy changes in terms of new curricula and new teaching strategies are imposed on school systems in an attempt to overcome ineffective teaching practices, poor parent involvement, new educational philosophies and now educational technology policy (Cuban, 2001; Dale et al., 2004). Schools are hard pressed to implement policy directives and principals and teachers are challenged to transform “multi-purpose policy” into educational experiences within policy frameworks (Dale et al., 2004). Hence, institutional culture to embrace ICT as a teaching-learning innovation and

institutional leadership are inextricably linked as crucial factors in the successful implementation of government ICT policies at micro level (Moyle, 2006; Mulkeen, 2003a; Pedersen et .al, 2006). A study of educational leaders across all states in Australia, found that a "whole school" approach to introducing ICT into teaching and learning and organization improvement requires good leadership (Moyle, 2006, p. 2). These findings also indicate that principals are curriculum and pedagogical leaders, and they support and lead ICT integration into teaching and learning. Evidence from a study conducted in Irish schools found that the "ethos of schools" and the "thinking and beliefs" of principals and "collaborative planning" are likely to yield positive results (Mulkeen, 2003a).

The implementation of ICT in schools brought forth new experiences for principals. Harrison et al. (2002) ImpaCT2 study of school principals, found that ICT in schools presented a very different set of problems forprincipals.Similarly, Karagiorgi (2005) and Pedersen et al. (2006) found that most principals lacked the experience and expertise to manage the new technology in school. A study conducted by Pedersen et al. (2006) indicate that ICTimplementation often occurred in schools in which principals did not have "clear criteria for success and no monitoring of the benefits"(p. 13).In contrast Law et al. (2000) found that some schools in Hong Kong made remarkable ICT implementation progressprior to the government's announcement of the IT in education (ITEd) strategy. In this regard, principals were instrumental in planning and exploring ICT implementation and indicated the schools' readiness to encompass the new innovation and change accordingly. School leaders contribute significantly to the success of ICT in schools and therefore they should employ strategies to enhance ICT use in school (Lim& Tay, 2003; Doornekamp, 2002).

School leadership is central to identifying the level of ICT penetration into the teaching learning situation at school (Elmore, 2005; Harrison et al., 2002). The response of principals to the implementation of ICT was threefold in nature. Some principals supported ICT in school and had the "hope" that ICT would produce positive benefits at some time in the future. Other principals were of the view that ICT in education was a necessary investment to make and would have a wider significance

for the ICT in school initiative. Some principalsfelt trapped by policy, decision makers and external authorities who made decisions for the school irrespective of whether the school had more pressing issues to contend with or not. In each of the three cases, however, principals were dubious whether ICT will really impact positively on teaching and learning (Harrison et al., 2002). Furthermore, it was found that principals of schools had a very simplistic understanding of national and local ICT policy. Evidence indicates that most principals could not explicitly or implicitly identify "policy drivers" at nationalor local levels (Harrison et al., 2002). However, although school principals were oblivious of the specific targets and objectives of national and local policy documents, they were nevertheless aware of the broad aims and targets of policy initiatives.

2.4.1.4 Teacher professionalism

Teachers are significantly positioned at the crossroads of policy and practice. In this regard teacher professionalism is key to whether ICT is integrated in their teaching and learning repertoire. Reynolds et al. (2003) argue that teachers need to revisit their teaching methodologies to encompass an environment that is conducive to e-learning and to the use of ICT. Fullan's (1992) case study of ICT implementation in Canadian schools found that ICT is an innovation that presents a major challenge for the professional growth of teachers. In this regard Fullan (1992, p.3)claims that the implementation of ICT in schools is a phenomenon that is uniquely different to minor changes in curriculum content and is not simply a question of re-organising the knowledge base of educators but essentially getting "teachers to start from base zero".

Elliot (2004) and Pelgrum (2001) suggestthat teachers are generally requesting more ICT professional development with a particular focus on the use of ICT in the curriculum. Cuban (2001), Conlon and Simpson (2003) and Baron and Harrari (2005) concur that teachers can and do use computers for their own use. They are not techno-phobic, however they do not know *how* to use computers in their teaching and learning practice. Beastall (2006), Tearle (2003), (Younie, 2006) and Becker (2000) argue that the introduction of ICT in education in United Kingdom schoolsdid not have a complementary effect of increasing the professional development of teachers.

Furthermore, they claim that changing teachers' classroom practice to embrace the new technology did not unfold naturally as expected by policymakers, even in countries with the most developed ICT in education policies. Similarly, findings from experiences of teacher training in Irish schools illustrate that once teachers are taught how to use technology it would not necessarily translate to teachers' using ICT in their pedagogy (Mulkeen, 2003a, p. 292). In the Flemish school experience, Tondeur et al. (2006, p. 13) affirm that ICT teacher competence "does not automatically result in changes in classroom practices". Government should change to a more individualised method of training, such as peer-to-peer training of teachers according to individual needs, as opposed to a "blanket approach" of compulsory training which tends to alienate teachers (Beastall, 2006, p. 108).

Despite the proactive effort of the Malaysian government to positively influence school and learner achievement through the use of ICT in education, one of the major barriers of this initiative was teacher professionalism. The Malaysian ministry of education realised that teacher training was crucial to the successful implementation of ICT in schools and used a successful "cascade model" of training the trainers (Chan, 2002). Pelgrum (2001) argues that teacher training is often neglected by governments in large-scale innovations, and for such innovation to succeed teachers must be equipped with the required skills and knowledge (Pelgrum, 2001).

Although numerous ICT initiatives and policy intentions had been established and supported through government interventions, "the impact of it on the actual practice of teaching and learning has not been significant" (Belawati, 2003, p. 110). According to Chan (2002) there is a need for support from all stakeholders in the education system, a need for teacher capacity building and a need for establishing ICT policy and guidelines that is necessary to promote ICT use in schools. Harrison et al. (2002) found that although learners developed positive attitudes and good skills towards the ICT curriculum use, teachers failed to seize the opportunity to follow through to appreciate the potential of ICT by merely using it as a teaching tool.Dale et al.(2004) concur that no other technology advancement has created the current gap between learners and teachers understanding of the affordances that ICT offers as a teaching method. Watson (2001) and Dale et al. (2004) suggest that teachers' professional

control over their teaching methodology seemed to be threatened with the introduction of ICT.

Practising teachers' failure to embrace ICT and the opportunities it presents may be attributed to their lack of confidence in using the new technology or the inherent technical problems that technology presents in the classroom situation (Condie et al., 2002;Dale et al., 2004; Cuban, 2001). ICT policy implementation in schools was often hampered due to frequent inherent technical faults of technology and the expectation of technical faults that significantly impacts on teachers' confidence within the teaching-learning situation (Becker, 2000; Dale et al., 2004; Cuban, 2001; Hennessy, Ruthven & Brindley, 2005; Fluck, 2003; Condie et al., 2002). Teachers did not use ICT because of factors beyond their control and not because of personal resistance, as one teacher indicates that "the fact is that machines do not deliver what they promise…but we want to use this stuff" (Hennessy et al., 2005, p. 168).

With the advent of ICT as a new innovation to teaching, there is now certainty that teachers are now more important in the teaching learning situation than ever before. The need for ICT competent teachers stems from the need for ICT competent learners and for ICT-rich learning environments that enhance learners' learning across the curriculum. In mandating teacher competence standards for ICT, the United States adopted a policy approach to preparing pre-service teachers with ICT skills as a requirement for teacher certification and licensure (Kearns, 2002).Policy directives in France demanded that new teacher recruits must be certified as competent in ICT before being tenured into the teaching profession. The policy expectation that "new" teachers with ICT training would be more adept to ICT use in classrooms did not materialise as "they do this without bringing dramatic change to the learning process" (Baron & Harrari, 2005, p. 153).

International initiatives on improving teacher professionalism for the successful implementation of ICT in the classroom are varied. Australia's ICT policy has legislated much towards teacher capacity. Teacher qualifications are embedded within "ICT in Education" postgraduate courses at higher education. New educator recruits are equipped with ICT skills before actual employment into teaching. However, the

older cohort of teachers are reluctant to venture into adopting or adapting ICT into education (Naidu & Jasen, 2003, p. 153). In respect of professional capacity building, the Malaysian government requires all teachers to take a basic informatics course at teacher colleges. School principals, administrators and support staff are also targeted for ICT training in management information systems and information literacy.

2.4.1.5 ICT curriculum integration

The introduction of ICT into schools has created the need by most governments to revisit their national curriculum to integrate ICT into teaching and learning. The Becta-Impact 2007 study recognises ICT as a useful tool to enhance teaching and learning. However there is a lack of a common vision between policymakers, school managers, staff and learners in their understanding of what integration of ICT for learning really means in practice (Underwood et al., 2007). Although ICT in schools in the United Kingdom was intensely supported by various government policy interventions and ICT directives, an identifiable gap existed between what policy legislation required and what was actually happening in school classroom (Younie, 2006). “Personalization” as used in the Impact 2007 study implies the tailoring of pedagogy, curriculum and learning support to meet the needs of every learner(Underwood et al., 2007, p. 54). In this regard the Impact 2007 study suggests that the national curriculum tends to constrain personalised ICT learning.Becta(Underwood et al., 2007) suggests that although government should not be the creator of educational learning content for ICT, it should nevertheless extend policies to support the development and use of quality content.

The introduction of ICT is impacting on the development of the new curriculum for education in most developed and developing countries (Tondeur, Braak & Valck, 2006). The Flemish government had identified and designed a framework for learnercompetencies and expected outcomes that learners should acquire by the end of primary school. These schools were highly autonomous to develop their own policies and to organise their own teaching and learning, as well as tocompile quality control policies in response to national curriculum policy requirements. Tondeur et al. (2006) indicate that teachers in Flemish schools focused on the development of ICT technical

skills, whereas the curriculum policy expected teachers to integrate ICT within the teaching learning situation. This gap between the proposed ICT-curriculum policy requirements and the implemented curriculum suggests that there had been little inclusion of ICT into the 'modern' curriculum learning areas as a means to improve learning. In Ireland however, Mulkeen (2004) found that ICT was gradually seeping into schools'curricula learning areas, but not uniformly. These finding are relevant to my proposed study as it tests the waters to determine whether national policy is translated as intended at school and classroom levels.

In Scotland, there was a need for clear and adequate guidance from national and local government for ICT implementation at curricular level (Robertson, 2003). Furthermore, there were limited examples of ICT being used consistently and effectively in teaching and learning to promote learnerattainment across the curriculum. Another issue at play in Scotlandis the debate as to whether ICT should be a subject in its own right or should be integrated across the curriculum (Condie et al., 2002).Similarly in France, curriculum changes to accommodate for ICT culminated in the inclusion of a stand alone subject namely, "informatics tool"into the school curriculum (Baron & Harari, 2005). Peck, Cuban and Kirkpatrick (2002) suggest that ICT has had little impact on teaching and learning in the United States because of subject compartmentalising within the school curriculum. Many governments have taken the policy initiative to integrate ICT into teaching and learning, it would seem that these initiatives have not translated into practice on the classroom floor. The implementation of ICT still favours a technocentric approach with ICT being viewed as an isolated subject with little understanding of what integration of ICT for learning really means in practice.

2.4.1.6 The influence of ICT policy on learning

The extent, to which ICT in education has improved learning and learner achievement, is a hugely debated issue among techno-promoters, techno-cynics and academic researchers in the field of ICT in education (Peck et al., 2002; Fluck,

2003;Lemke & Coughlin, 1998). The role of ICT in educational attainment had been the focus of researchers and policymakers. For government, ICT implementation in schools that leads to improved learner achievement would vindicate the huge fiscal budgets that have been spent on the new innovation.

Much research has been conducted in first world countries, in particular the United States and the United Kingdom to ascertain the influence of ICT on learner attainment (Reynolds et al.,2003; Harrison et al., 2002; Cox et al., 2003; Becta, 2006; Plomp et al., 2009). Schacter (1999) findingssuggest that learners learn more in less time, learners develop positive attitudes towards learning and some achievement was evident. Furthermore, his findings indicate that ICT did not have positive effects in every area in which they studied. Harrison et al. (2002) found that greater ICT experience and use in curriculum could be associated with improved performance in examinations. Extending this debate further, Cox et al. (2003) suggest that there exists a strong relationship between the pedagogical expertise of the teacher, the way in which ICT is used and learnerachievement. A longitudinal study conducted by Harrison et al. (2002) on the impact of ICT on learner achievement found that ICT had a positive relationship onlearners' learning of mathematical skills, however the results varied in relation to the amount and type of ICT used in the curriculum.

Conversely, many researchers argue that there is insufficient evidence to conclusively prove that ICT improves learning (Becta, 2006; Reynolds et al., 2003;Condie, et al., 2002; Conlon & Simpson, 2003). ICT represents only one factor in the multitude of factors in the learning environment (Newhouse, 2002). Similarly, Harrison et al. (2002, p. 320)found that "it is somewhere between difficult and impossible to relate improvements in school achievement to a single cause". A study conducted by Cuban(2001) revealed that even in the most perfect conditions, ICT access did not contribute to improve learner achievement.

Kozma (2005) draws on a wide range of research evidence to illustrate that placing computers in classrooms is not enough to influence student learning. Numerous studies (Cuban, 2001; Condie et al., 2002; Conlon & Simpson, 2003; Kozma, 2005; Becta, 2006; Sutherland et al., 2004) indicate that there is no consistent and direct relationship between access (and use) of computers and student learning. Although

research evidence indicates a positive relationship, it cannot be concluded that one (computer access and use) causes the other (learner attainment). Most research studies that explore the impact of ICT on learner attainment tend to be mere snap-shots of case studies and do not translate into formidable evidence to entrench the belief that ICT will impact on learner attainment. Therefore research methodology and instruments of design have yet to isolate ICT as an innovation factor that does (or does not) impact on learner attainment.

Although the primary focus of ICT in education policy is on improving learner achievement, the advent of ICT in education resulted in unexpected outcomes.The introduction of ICT in schools has culminated in some benefits that were not intended as educational outcomes by policymakers (Reynolds et al., 2003).These serendipitous outcomes took the form of: motivational factors that technology brings to the classroom particularly for underachievers and "problem"learners(Pelgrum, 2001; Becta, 2006; Kozma, 2005; Pittard, 2004); reduction of the number of school drop-outs (Kearns, 2002) and an increase inthe motivation and self esteem of diverse learners(for example: gender, disabled, language, socio-economic status) (Harrison et al., 2002; Kerns, 2002; Becta, 2006).

2.4.2 Summary of meso-micro level findings

A review of the voluminous literature revealed a number of pertinent meso-micro level findings regarding the implementation of ICT. ICT policy implementation unfolded within a particular socio-cultural context. Depending on this context, schools adopted one of three isomorphic implementation strategies to accommodate policy imperatives, namely mimic, normative and coercion isomorphism.

Effective implementation of the ICT policy in education at school level is essentially dependent on three factors. First, schools should foster a supportive and nurturing institutional culture and climate.Second, school leadership is crucial for the successful implementation of national ICT policies at micro level. The implementation of ICT in schools brought forth new experiences for principals who responded to this challenge in nuanced ways. It was also found that some principals had a very simplistic

understanding of national and local ICT policy. Third, teacher professionalism is key to whether ICT is integrated in teaching and learning. Fourth, schools have little understanding of what integration of ICT for learning really means in practice. In instances where ICT was successfully integrated into teaching and learning, ICT seemed to influence learning in a positive way. And fifth, policy in practice is influenced by the support or lack of support schools receive from system level structures in particular district offices.

2.5 The South African scenario

Since the introduction of ICT into the South African education arena in 1996, ICT has become commonplace in most schools and in particular public schools (Howie, Muller & Paterson, 2005). ICT in education is a relatively new field of study in schools. It was previously exclusively lodged within the curriculum domain of some privileged secondary schools (as Computer Science) and further only accessible to schools that had access to ICT infrastructure.

This new teaching technology has made its entry into schools, without schools being ready to exploit its usefulness to improve the quality of teaching and learning. Today, political rhetoric and government policy advocate for teachers to use computers regardless of the context within which they find themselves (Surty, 2007; Cronje, 2007; Pandor, 2007; Department of Education, 2002; Department of Education, 2004). Currently, schools are in a state of organizational turbulence in their attempt to implement the White Paper on e-education ICT policy. In most developed and developing countries, schools over the past few years have been subject to an onslaught of legislation and policy that has meant changes in curriculum, assessment, governance and school fiscal control. South Africa as a new democracy has had more policy reforms within a short period than most other countries, beginning from the post apartheid “Curriculum 2005” (1997) to the current “National Curriculum Statement” (2004).

National policymakers have been quite adept in producing policy (White Paper on e-education ICT policy) from a centralized education department that had to be

implemented at provincial education departments (Department of Education, 2004). The use of ICT in schools, its integration into the curriculum and the impact it has on teaching and learning have and continue to enjoy wide political, educational and scholarly attention. Day by day, more and more countries are apportioning larger education fiscal budgets to the acquisition of ICT for schools (Plomp et al., 2009), and South Africa is no exception. The principal question to ask is whether this surge of ICT into schools has resulted in a corresponding return on investment? To date virtually no single study has conclusively determined that ICT in schools has resulted in a significant improvement in learning (Kozma, 2005). Accordingly, this study asks how, whether and to what extent have schools transformed their teaching-learning practice to encompass government policy in ICT?

The review now focuses on research studies of the landscape of the South African ICT in education policy from a macro to micro perspective.

2.5.1 South African scenario: Macro level – Are policies implemented asplanned?

National policy has progressed in leaps and bounds in the understanding of the role of ICT in education.The White Paper on Education and Training (1995) and the South African Schools Act (1996) are the two main policy documents that define and shape the policy environment for the provision and use of ICT in schools. However, analysis of policy trends from 1997 to 2003 indicates that theICT policy landscape of South Africa lacks policy, legislation and strategic planning (Van Audenhove, 2003). In this context South Africa does not differ significantly from other developing countries in Africa.

In a national survey on the use of ICT in schools, the following findings emerged (Lundall & Howell, 2000): First, there are comprehensive education policies that support the progressive development of ICT in schools, yet there are no specific ICT policies, guidelines or action plans that are particularly structured or developed for ICT implementation in schools. This finding is supported by Van Audenhove (2003, p. 2) who claims that South Africa lacks an “integrated policy or policy document” that would drive the information society forward. Second, policy formulation

initiatives are not assigned to any particular government department. There is a joint responsibility by the Department of Education (DoE) and Provincial Departments of Education for the integration of technology into schools. The National Educational Policy Act (Act 27 of 1996) mandates the DoE to develop policy and lay down norms and standards, whilst Provincial Education Departments are tasked (among others) with the provisioning of education, provincial legislation, funding, information and infrastructure, provision of books and computer services.Lundall and Howell (2000) argue that the translation of national policy to provincial policy needs to be determined. However, provincial governments experienced difficulty in managing rapid changes and policy overload. Similarly the study conducted by Van Audenhove (2003) cites many incidences that identify a strong political will in South Africa to foster ICT within all spheres of government particularly for socio-economic and educational benefit.Third, there were huge inequities in education, namely resource provisioning, infrastructure, funding and teacher capacity and these negatively impacted on the implementation of ICT in schools (Lundall & Howell, 2000).

Czerniewicz and Hodgkinson-Williams (2005) indicate that prior to 2003, South Africa differed from other countries in their top-down approach to ICT policy formulation. In the South African context, the e-education policy was made available for public comment (Czerniewicz & Hodgkinson-Williams, 2005). Although the e-education policy was opened for public comment, it fell short of an inclusive policy formulation process. The policy climate based on political rhetoric, speeches and debates, however, favoured ICT for educational benefit (Surty, 2007; Cronje, 2007; Pandor 2007). South African political leaders were in unison in their belief that ICT will overcome the legacies of apartheid (Van Audenhove, 2003, p. 10). Howie et al. (2005, p. 12) in the SITES (module-2) national survey also found that provincial budgets are under-resourced to supply all public schools with ICT, furthermore basic needs such as water supply, sanitation, electricity, coupled with poor access to computers, are competing priorities that impede the implementation of e-education policy.

In 2004, the white paper on e-education was developed by the department of education (DoE, 2004). Important issues of the e-education policy that are relevant to

my study are: the main principle of the policy, the definition of e-education, e-education policy framework for teaching and learning, the policy framework on teacher capacity building, some policy implementation strategiesand phases of policy implementation.

The e-education policy places e-learning within an outcomes based education (OBE) paradigm and further defines it as a learning process that takes teachers and learners through "*learning about ICT*", "*learning with ICT*" and "*learning through the use of ICT*" (DoE, 2004, p. 19). The main principle of the e-education policy is the achievement of national education goals by "providing modern technologies to schools in order to enhance the quality of learning and teaching" (DoE, 2004, p. 6). ICT should be used as a resource for whole school developmentto improve productivity, management and administration; curriculum integration and delivery, communication and teacher and learner collaboration.Furthermore, this principle identifies ICT as a resource to accommodate different learning styles, apply and produce knowledge for the "real world", promote achievement for learners, remove learning barriers for learners with special educational needs, provide "expanded opportunities and individualized learning experience" (DoE, 2004, p. 16).

The e-education policy framework acknowledges the importance of ICT as integral to teaching and learning. The policy promotes an OBE philosophy focussing on learner centred learning. Central to the successful implementation of the e-education policy is the issue of teacher competence and the need for teacher development at both in-service and pre-service levels. The policy advocates for a programme to address the lack of teacher ICT competencies to use ICT in their administrative and classroom practice.

In response to this need for teacher development and support, the national department of education (DoE)developed a national framework for teacher development as advocated in the policy "Guidelines for Teacher Training and Professional Development in ICT" (DoE, 2007). This policy outlines an approach to teacher development in ICT; e-education and the implementation of the national curriculum statement (NCS) and teacher ICT knowledge, skills, attitudes and values. Of particular relevance of the DoE policy on "Guidelines for Teacher Training and

Professional Development in ICT" is the reference to ICT literacy, ICT curriculum integration, e-education policy implementation principles and teacher developmental levels (entry, adoption, adaptation, appropriation and innovation).

Implementation strategies of the e-education policy includea system-wide approach, co-ordination and collaboration, monitoring and evaluation of the implementation process and planning cycles. This system-wide approach suggests numerous national initiatives (not described)of the education system; universal excellence for teachers, learners and managers of institutions; and a multi-pronged strategy for the integration of ICT at all levels of the education system.Furthermore, co-ordination and collaboration within and between government departments, provincial and other government departments, NGO's, business and industry, higher education, general and further education institutions and the involvement of local communities is advocated in the e-education policy.

To monitor the implementation of the e-education policy, the policy advocates for regular reviews and periodic evaluations. Significantly the policy requires districts, provinces and national DoE to collect planned monitoring and evaluation data. The e-education policy identifies three phases of policy implementation: Phase one (2004 to 2007): focuses on institutional *readiness* to use ICT for teaching, learning and administrative purposes. Phase two (2007 to 2010):*integration* of ICT into teaching and learning. And, phase three (2010 to 2013): ICT integrated at all levels of the education system (teaching, learning, management and administration).

Drawing on the debates in the field, it would seem that South Africa has a rich and thorough policy base from which to draw, although the contextual issues and realities at micro level impact negatively on ICT policy implementation in classrooms.According to Czerniewicz and Hodgkinson-Williams (2005, p. vii) the "uneven policy terrain" in South Africa did not stop the advent of ICT in schools, but impeded the introduction and integration of ICT in schools. The uptake of ICT in schools continued regardless of the lack of policy support on ICT. There is however, limited research on ICT integration in teaching and learning in South African schools

and even less on how ICT policy influences teaching and learning in South African schools.

2.5.2 South African scenario: Meso and micro level – Are classroom practices changing?

The SITES (module-2) international survey set out to compare developments in ICT in educationof 27 countries(Howie et al., 2005; Muller, 2003). A number of findings emerged with regard to the South African experience: First, a fair number of schools had ICT policies in place, but in many cases these were not being implemented. Second, principals indicated that the lack of teacher ICT competency poses a major obstacle to implementation of ICT in schools. Third, teachers experienced insufficient preparation time and excessive workloadsthat contributed to inhibiting ICT integration in schools. Fourth, inadequate and insufficient teacher training regarding the integration of ICT into different learning areas and the absence of a properly developed curriculum for teaching computer skills exacerbated the huge list of ICT policy implementation issues. Fifth, most schools in South Africa used ICT extensively for administrative purposes and as a tool to monitor learner progress. And sixth, the reluctance of teachers to use technology to enhance their teaching resulted in the lack of exposure of learners to ICT.

The research concurred with international data that 'other' contextual issues impacted on ICT policy implementation at schools (Howie et al., 2005; Muller, 2003). Firstly, time exigencies discouraged teachers in the use of ICT. The use of technology required much preparation time, and teachers felt that they were already burdened by the routine of lesson planning, assessment of large number of learners and their extra and co-curricular duties. Consequently, teachers resorted to traditional teaching methods that served them well in the past. Second, technology faults also dissuaded teachers from utilising ICT. Teachers claimed that technological glitches resulted in foiled lessons and thus they often had to resort to backup plans.

2.5.3 Summary of findings - South African scenario

A number of ICT initiatives (Blignaut & Howie, 2009) are currently being implemented across South Africa. However, many of these initiatives do not directly align with the e-education policy and have not yet reached every school and district (Holcroft, 2003; Howie et al., 2005). In a developing country like South Africa, emphasis is placed on access to ICT and capacity building initiatives. The integration of ICT into the curriculum and effective management strategies for the successful implementation of ICT in all schools have yet to occur.

The policy document on "Guidelines for teacher training and professional development in ICT" is one of the initiatives by the DoE to implement the e-education policy (DoE, 2007). This policy document identifies the need for ICT integration into curriculum delivery,with specific ICT guidelines and goals particularly structured for ICT implementation in schools (DoE, 2007).However, the translation of national policies to provincial policy still needs to be determined.In contrast with the international top down policy approach, South Africa attempted to develop an inclusive (participation by all stakeholders) ICT policy. It would seem that South Africa has a healthy policy base from which to draw, but the contextual issues and realities at micro level impact negatively on ICT policy implementation in classrooms.

Academic research into ICT policy in education from a South African perspective has escaped the focus of researchers. Czerniewicz and Hodgkinson-Williams (2005, p. ix) argue that within the South African context local research in ICT is "undertheorised" and acknowledge that there is a "paucity of research regarding relevant ICT policy", particularly how schools have taken up this challenge remains scarce. The apparent silence in the literature in South Africa, coupled with a dire lack of research on how schools appropriate education policy on ICT establishes a justification and relevance for this study (Mulkeen, 2003b; Tondeur etal., 2006; Plowman & Stephen, 2003; Thomson, Nixon & Comber, 2006).

2.6 Comparison of findings between international and South African landscapes

This section attempts to draw a comparison of findings between the international perspective and the South African scenario toICT policy in education. Fig 2.1 illustrates macro level findings and Fig 2.2illustrates meso-micro level findings. The concept maps draws attention to literature similarities, differences and silences within South Africa and internationally.

Findings from the literature at macro level (Fig 2.1) indicate there is a dearth of literature on: bottom-up policy implementation studies, research on ICT policy guidelines to schools and research on ICT pedagogical guidelines. There are significant differences in the nature of ICT policies between South Africa and the international communities, for example; in South Africa the policies are defined by simplistic goals while international ICT policies have achievable goals; internationally curriculum was revised to include ICT, while in South Africa ICT integration is only superficially mentioned. The concept map also reveals numerous similarities (policy deficits, overloaded curricular, focus on infrastructure, lack of systemic support etc.) on ICT policy implementation between South Africa and other countries.

At the meso-micro level (Figure 2.2), there are silences in the South African context with respect to the manner in which schools take up national ICT policy particularly according to DiMaggio and Powell's (1983) isomorphic changes that occur in institutions.Silences in the literature at the international level are also evident with respect to bottom-up implementation of policy. The concept map illustrates significant differences between schools in South Africa and other countries. Internationally schools are supported by specific guidelines and encouraged to implement ICT policy and encouraged to become autonomous. Literature similarities suggest that South African schools experience the same inhibiting issues that impede ICT policy implementation such as: the huge volume of policies, the lack of systemic support and lack of enabling policies.Also evident from the literature is the lack of bottom-up ICT policy studies in the international arena at the meso-micro level.

2.7 Conclusion

A review of the extant literature in the field yielded numerous findings. From the foregoing literature it is evident that there is huge interest to explore the use of ICT by teachers in classrooms. There is also plenty of research based on the top-down approach to policy implementation. However, there is a death of literature that explores how teachers take up education policy on ICT in their teaching practice. It is in this regard that my study is positioned to fill this gap in the literature which is apparently lacking at both national and international levels, with a view to discovering how teachers appropriate education ICT policy in their teaching and learning repertoire. I positioned my study and designed research methods to determine the day-to-day classroom experiences of teachers as they negotiate policy.

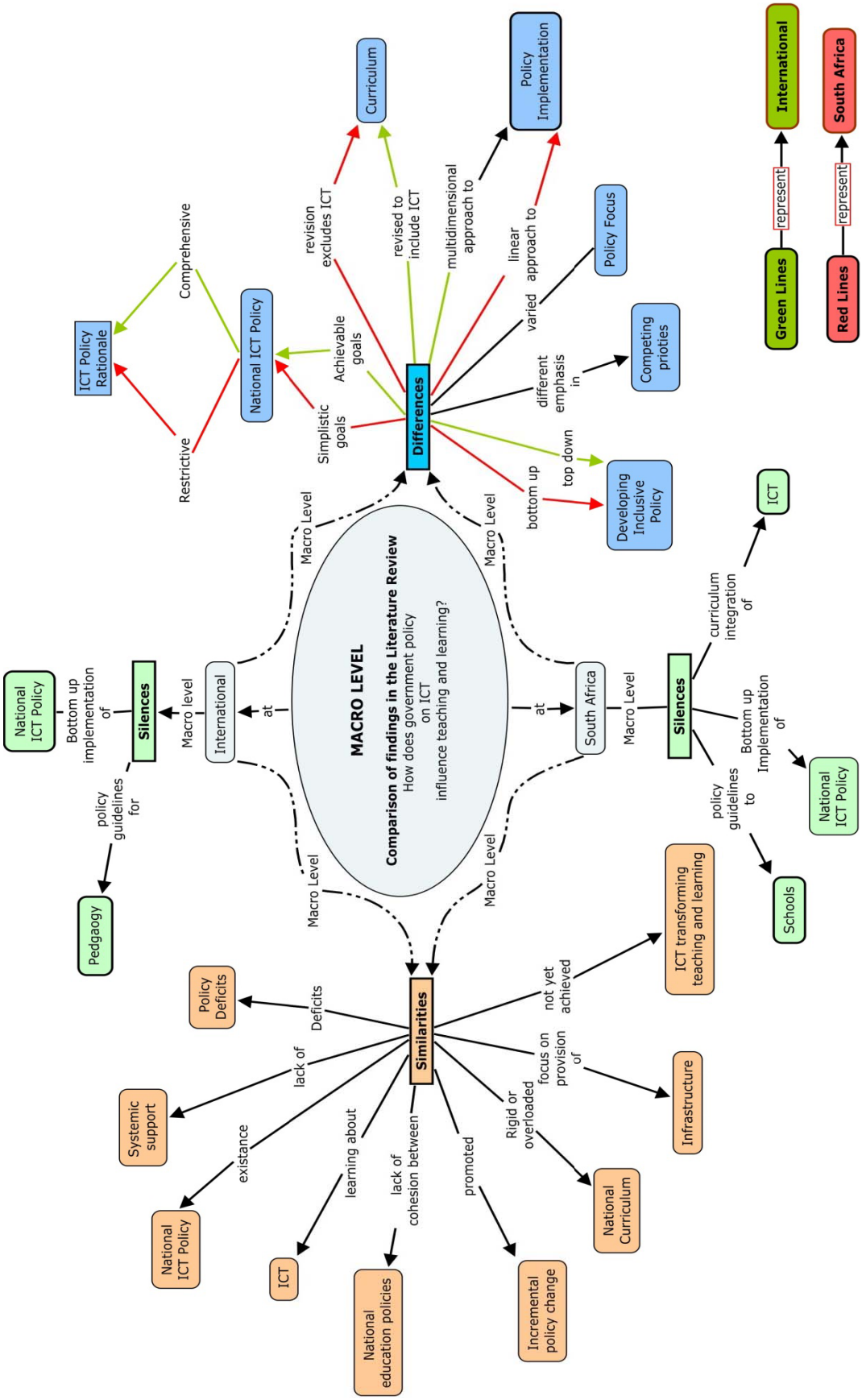


Fig 2.1: Macro level findings
Comparison of the literature in the international andSouth African landscape

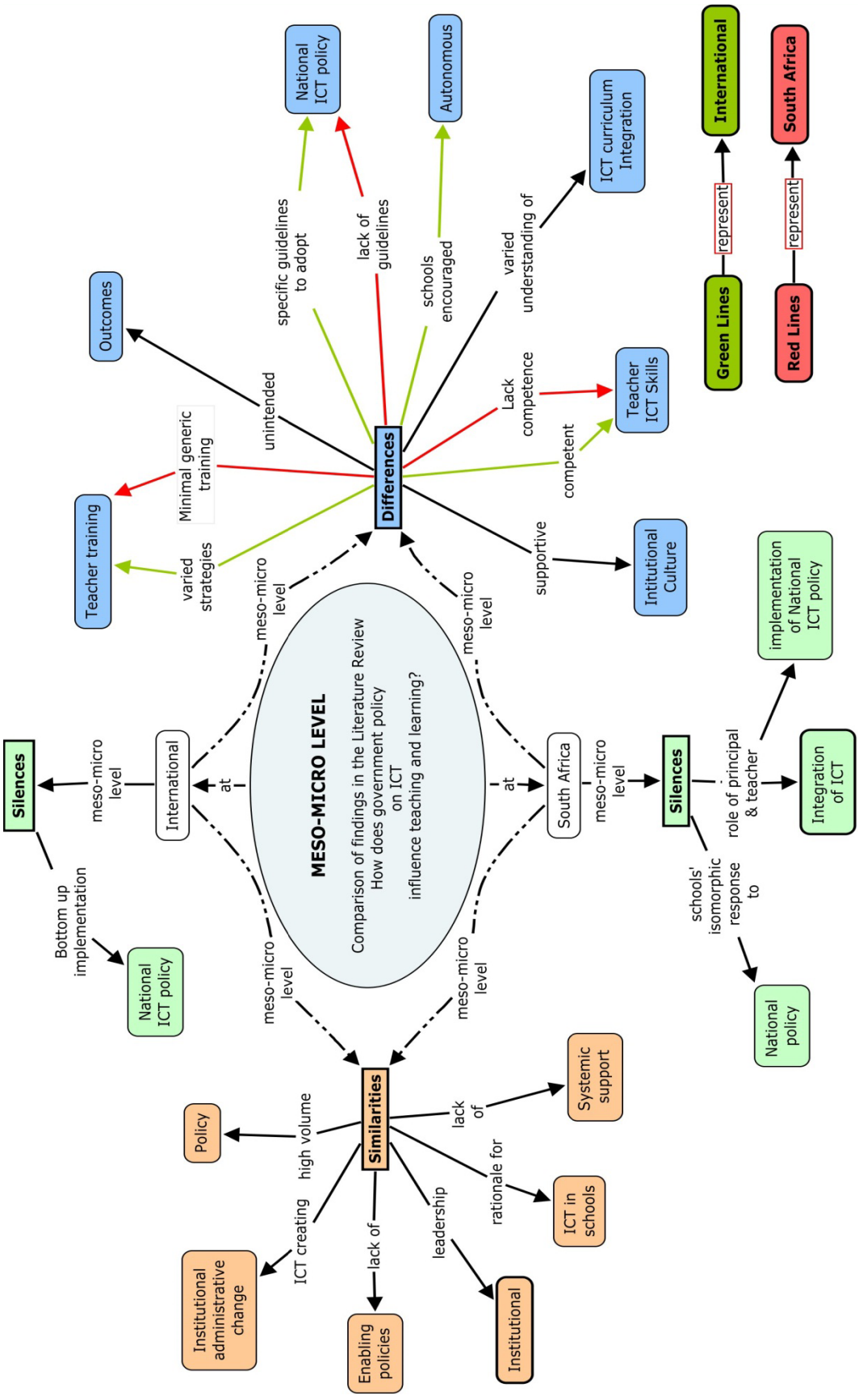


Fig 2.2: Meso-micro level findings
Comparison of the literature in the international andSouth African landscape

Chapter 3

Research design and methodology

3.1 Introduction

The main focus of this chapter is to present a systematic flow of the entire design of the research process. I present a case study of the experiences of teachers as they conduct their daily pedagogic routine of using ICT to teach particular learning areas of the national curriculum. Simply stated, this study is an attempt to understand how teachers experience and respond to national ICT policy in their classrooms to improve teaching and learning.This chapter therefore seeks to clarify the research design, justify the methods selected for data collection and describe the manner in which the data was analyzed.

I begin by justifying my idiosyncratic theoretical affiliation to the social constructivism paradigm and the research methodology that will guide and underpin this bounded case study. Proceeding from my philosophical worldview, I provide an overview of the initial stages of the research and finally inform the reader of the more formal stages in which I describe the research strategies, design of the instruments for data capturing and how the data was be analyzed. I conclude the chapter with a description of the methods I employed to enhance the trustworthiness of the study, my autobiographical role as researcher and the limitations of the research.

3.2 Paradigmatical assumptions

3.2.1 Meta-theoretical paradigm

Bounded by my experience as a teacher, who over time adopted constructivist teaching methods, and as an academic using qualitative emphasis in my research programmes, my philosophical path and methodology for this study was predetermined. I have come to realise that developing expertise in various qualitative approaches and to become conscious of a particular philosophy of science take time,

often through a number of years of study. The idea that reality is socially constructed and "the dynamic interaction between the researcher and participant is central to capturing and describing the 'lived experience' (*Erlebnis*) of the participant" appeals to me as a "would be knower" (Ponterotto, 2005, p. 131). According to Guba and Lincoln (1994), issues of research methods are secondary to questions of paradigms, in that the paradigm (which is the worldview) guides the investigator in the choice of methods. Thus I focus the discussion on the epistemology that I affiliate to, which in turn provides the conceptual roots and underpins my study.

Many years of experience in the teaching fraternity (most in senior management positions) gave me the opportunity to observe teachers in my school as they attempted to make sense of government policy ranging over a variety of educational issues. The social constructivist paradigm supports my years of tacit observation that the teacher's experience is an active process of interpretation and teachers are not mere passive recipients of policy. In adopting the social constructivist epistemology, I acknowledge that actors are not mere describers of events, they also actively engaged in broader policy discourse and conflict (Jacobs & Manzi, 2000; Morgan& Smircich, 1980; Neimeyer, 1998). According to Burr (2003, p. 9), social inquiry is lodged in the "consideration of how certain phenomena or forms of knowledge are achieved by people in action".

My choice of social constructivism as a meta-theoretical paradigm in this study is based on the notion that it characterises knowledge as a set of beliefs or mental models people use to interpret actions and events in the world (Jackson & Klobas, 2008). In other words, social constructivists are concerned with the ways in which people construct knowledge. In social constructivism, it is the individual who imposes meaning on the world rather than the meaning being imposed on the individual (Karagiorgi& Symeou, 2005). In this regard the social constructivist research paradigm caters for an investigation into the constructions and broad meanings about how teachers appropriate policy. I observed the realities of lives of teachers as participants during the study and constructed ideas and meaning out of their voices in the field (Denzin & Lincoln, 2005). Hence, this study is an attempt to understand multiple realities constructed by participants in their natural setting (Creswell, 2003).

In this study teachers did not construct their interpretations in isolation but against an environment of shared understandings, practices and language(Denzin& Lincoln, 2000). According to Karagiorgi and Symeou (2005), meaning or knowledge is always a human construction and categories of knowledge and reality are actively created by social relationships and interactions. Using social constructivism as a theoretical paradigm in my study, I argue that teachers' appropriation of ICT policy on education is socially constructed. According to social constructivism, norms and shared beliefs comprise actors' identities and interests, for example the way people conceive themselves in relation to others.

I acknowledge that the social constructivist paradigm has some inherent limitations. First, I accepted that I would not be able to exclusively study the teacher because all individuals are always members of a greater society (Guba & Lincoln, 1994). In other words, as a researcher I could not (and did not intend to) isolate an individual from the environment in which he or she lives, but would still be able to interpret the findings within the social context of the teacher's world.I believed this limitation would have a minimal affect on the outcome since the study places the teacher's experience within a socio-cultural context and recognises the teacher as an integral part of that context. Another disadvantage of social constructivism is that it denies the existence of objective knowledge (Au, 1998, p. 299). That is, researchers are no longer researchers once they become involved in the research process because their deeper understanding of the research topic may distort the research results (Guba & Lincoln, 2000). In order to reduce this limitation, I applied self reflexivity, i.e. constantly acknowledging my subjectivity and bias. I constantly reminded myself that I may influence or be influenced by the research process.

In the systematic quest to push the boundaries of new knowledge, it is my philosophy of science that provides the 'conceptual' roots that underpins and guides this desire for knowledge. According to Filsted (1979), the research paradigm is the "set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organised study of that world". The choice of social constructivism as a philosophical paradigm may explicitly guide my research assumptions, general research methodology and in particular the selection of the tools,

instruments, participants, and methods used in the research study (Denzin & Lincoln, 2000; Willig, 2001). The main data collection methods underpinning this social constructivism paradigm were the active processes of observations and interviews as an important means in trying to understand how actors perceive and make sense of the social world. It is primarily by "letting research participants speak for themselves" that we become conscious of their realities through the text created (Denzin & Lincoln, 2005, p. 209).Social constructivism also endorses the particular analysis methodologies that I applied to the garnered data, namely a grounded theory approach and narrative analysis (Ljungberg, Yendol-Hoppey, Smith& Hayes, 2009, p. 690).

3.2.2 Methodological paradigm

Researchers Robertson (2003) and Hoepfl (1997) support the notion that there is an over reliance on quantitative methods by researchers working with technology in education.It is not my intention to add to the academic debate that promotes one research methodology over the other, but rather to give credence to the fact that the research methods of choice are inextricably linked to my worldview as a researcher. A qualitative research methodology may offer another perspective on the meaning that ICT policy on education experience has for teachers, thus enabling thick and detailed descriptive analysis. By using a qualitative research lens in this study, I attempted to accurately represent the socially constructed realities of the participants as they perceive it to be (Creswell & Miller, 2000). Thus, a qualitative methodological approach allowed me to design empirical procedures, describe and interpret teachers' experiences as they implement education policy on ICT in their classrooms (Denzin & Lincoln, 1994; Pickard & Dixon, 2004). It was also my intention to use a variety of qualitative approaches reviewed in the literature to enhance my own development as a researcher.

The benefit of a qualitative approach to this study is that the research focuses on teachers' experiences and the meanings they attach to events, processes and structures in their schools as social settings (Berg, 2007; Skinner, Tagg & Halloway, 2000). Using a qualitative approach necessitates a prolonged and intense contact with teachers in their everyday situations, and in this way provides a holistic view, through

the participants' own words and perceptions of how they understand, account for and act within these situations (Miles & Huberman, 1994). A qualitative approach captures the essence of my research, to understand the real life experiences of teachers in their natural settings as they implementation the e-education policy in practice (Marshall & Rossman, 1999). A qualitative research methodology adds value to this study by offering a way of thinking about studying social reality (Straus & Corbin, 1990).

Qualitative research methodology is sometimes criticised for lacking scientific rigour (Mays& Pope, 1995). Numerous claims are made against qualitative research methods. The first is that qualitative research merely represents a collection of anecdotes and personal impressions of participants, with strong researcher bias. Secondly there is a lack of reproducibility because of researcher personal interest, suggesting that there is no guarantee that a different researcher would come to the same conclusions. Thirdly, qualitative research is criticised for lacking generalizability. Fourthly, qualitative research generates voluminous information about a small number of research settings (Mays& Pope, 1995). I address all these criticisms in this study and particularly in the section on touchstones of trustworthiness (3.7).

3.3 Research purpose

I selected a qualitative exploratory research design (Keaveney, 1995; Bowen, 2005) as I sought to gain new insights about how teachers construct meaning in their lives, which among other things is informed by their experiences,as they negotiate ICT policy on education in their teaching practice. An exploratory study, as in this research design, was promoted by making use of an open, flexible and inductive approach to understanding the actors' constructions of their experience. The principle of an exploratory approach is to add to the existing knowledge base, academic debates, understanding and perceptions of the implementation of ICT policy on education.

The ultimate goal of this exploratory inquiry was to gain new insights from which new assumptions can be developed (Gaeger & Halliday, 1998). In this exploratory study I did not try to confirm any relationships prior to analysis but instead allowed the methodology and the data to define the nature of the relationships (Boudreau, Gefen &Straub, 2001). This notion is supported by Lincoln and Guba (1985) who posit that in exploratory research, social phenomena are investigated with minimal *a priori* expectations in order to develop explanations of these phenomena. An exploratory approach is an attempt to investigate the "little-understood"(Marshall & Rossman, 1999, p. 33) phenomenon of ICT policy appropriation by teachers, a topic that has not been explored in the research literature.As an academic, I undertake this study primarily to inform knowledge on ICT policy and practice. My expectation is that insights can inform policy makers in their efforts to resolve ICT policy implementation problems within the education context.

3.4 Strategy of inquiry: A case study approach based on backwardmapping principles

According to Denzin and Lincoln (2005), a strategy of inquiry depicts the skills, assumptions and material practices that researchers-as-methodological developers use when they transfer from a paradigm to the gathering of empirical materials. Emerging from a qualitative methodological paradigm I positioned the investigations as a backward-mapping case study by implication relying on specific methodological practices. The strategy of inquiry in this study (case study design) made it possible for me to use specific approaches and methods to collect and analyse empirical data. In this case study, I relied mainly on interviewing, observing and document analysis as primary methodological approaches. I also planned to combine observation with asking questions by employing ethnographical research principles of 'non-obtrusive interviewing' (Lofland & Lofland, 1984).

I selected an instrumental case study approach (Stake, 2005). In this study the case is defined by schools with teachers implementing ICT in their teaching and learning practice. I elicited the experiences of the teachers as actors as well as other stakeholders (principals and district officials) through an instrumental case study. I

captured, analyzed and conveyed the experiential knowledge of the actors through situational descriptions (see reflections in Appendix C) and largely through thick and rich narratives. In instrumental case studies the case is of secondary interest (Berg, 2007). In this regard this case study is bounded (Stake, 1995) by its specificity to teachers and focuses particular attention on how teachers appropriate education policy on ICT to influence their teaching. I purposefully selected multiple cases (collective cases) as an approach to extend the instrumental case study (Stake, 2005) which yielded similar, variety and redundant findings which were all important in their own way. According to Merriam (1998, p. 19), case studies involving the study of a process have significant value for research and 'insights gleaned from case studies can directly influence policy, practice, and future research". Thus a case study approach is particularly significant for my study which sought to understand how teachers, who are critically positioned at the point where policy meets practice, appropriate education policy on ICT in their classroom practice.

The significant benefit of a case study method lies in its ability to open the way for discovery, in that it creates a platform for further inquiry that may be pursued in subsequent studies (Silverman, 2006). However, case studies also bring along scientific challenges of issues of objectivity and generalizability (Berg, 2007).I acknowledge some limitations of the research design in that it was an exploratory case study which employed subjective measures and limited generalization. First, is the criterion of objectivity, which is closely associated with the construct of reproducibility of the study. In this inquiry I attempted to reduce the effect of subjectivity and simultaneously enhance replication of the study by offering a detailed articulation of the procedures of the study so that other researchers may repeat the research if they so desire (Berg, 2007). Second, I approached this study with the intention of understanding the single phenomenon of how teachers appropriate education policy on ICT in their classroom practice. Although the results of this study may have important implications for both policy and practice, I did not purposefully intend to draw any generalizations from this inquiry. I thus reiterate that this inquiry is an instrumental case study to provide insight into teachers implementing policy.

In terms of my design choice I was able to elicit the experience of every-day life of the local actors (teachers) and try to "make sense from the point of view of another"

(Agar, 1986, p. 12). I infused the instrumental case study with Charmaz's (2001) constructivist approach to grounded theory as a systematic guideline for collecting, analysing and explaining the garnered empirical material. This decision is supported by Denzin and Lincoln (2005, p. 382), who posit that grounded theory "may be the most widely employed interpretive strategy in social science today".

3.4.1 Backward mapping principles

Elmore (1980, p. 601) challenges researchers to write case studies that focus on a "particular sequence of events and a specific set of causes and consequences" in such a manner to offer guidance to policymakers on how to anticipate policy implementation problems. I designed my research strategy for this study by drawing on the work of Elmore's (1980) policy implementation research. I firstly explain forward mapping and backward mapping as two contradictory policy analysis approaches, and then I follow through to explain how and why I opted for a backward mapping strategy of inquiry in this research study.

In order to understand Elmore's (1980) "backward mapping" approach it is necessary to differentiate it from the traditional "forward mapping" approach. Forward mapping is the strategy that policy makers attempt to pursue in order to affect the implementation process from a top-down approach. This strategy is initiated at the highest level in the policy making process. The implementation process begins with the statement of the policy maker's intent and then cascades down through the hierarchical structures of the provinces and districts and eventually to schools. At each level the policy intent is translated into more specific implementation steps to define what is expected (such as regulations, responsibilities, administrative actions and mission statements consistent with the policy intent) of the implementers. Finally the forward mapping process elicits an observable effect in the form of an outcome on the actor who is the target of the policy. The level of achievement of the outcome is measured to determine the success or failure of the implementation process. Elmore (1980) suggests that forward mapping is a classical "textbook approach" to policy implementation studies. However, there are major flaws and limitations associated with forward mapping as an analytical approach to policy implementation. Most

important is the notion that in the forward mapping approach, policy makers have control of the "organizational, political and technological processes that affect implementation". This assumption is substantiated by acknowledging that administrators at each hierarchical level exercise a delegated authority which is controlled by the policy maker. In other words the assumption is that policy implementation is controlled from the top. Another weakness of forward mapping as an analytic strategy is that it offers a limited range of implementation explanations for policy implementation failures.

I turned my attention to the "backward mapping" approach as proposed by Elmore (1980). Backward mapping and forward mapping share the same notion that the focus of policy makers is on affecting the implementation process and in so doing hope to positively influence the outcomes of policy intent and decisions. However, backward mapping challenges the assumption that policy makers have control over what happens at the point of policy implementation. Backward mapping also disputes the assumption that "explicit policy directives, clear statements of administrative responsibilities and well-defined outcomes" will necessarily foster successful policy implementation. Backward mapping is firmly grounded in assumptions that are contrary to forward mapping. First, backward mapping does not take for granted that policy is the only or major driver on the behaviour of the target of the policy. Second, backward mapping does not rely on compliance with the intent of policy makersas the standard of success or failure, but rather on the ability of actors at one level of the implementation process to influence actors at other levels in the system (Elmore, 1980). Third, in backward mapping the assumption is that if one is close to the source of the problem, the greater is one's ability to influence it. This is where I chose to focus my research, at the smallest unit in the system where change is expected, namely the teacher.

Backward mapping describes a significantly different approach by analysing policy implementation at the point where policy meets practice. Elmore (1980, p. 604) explains that backward mapping is an analytic approach that is positioned to observe specific behaviour at the "point at which administrative actions intersect private choices". Contrary to forward mapping which begins with the policy makers' intent,

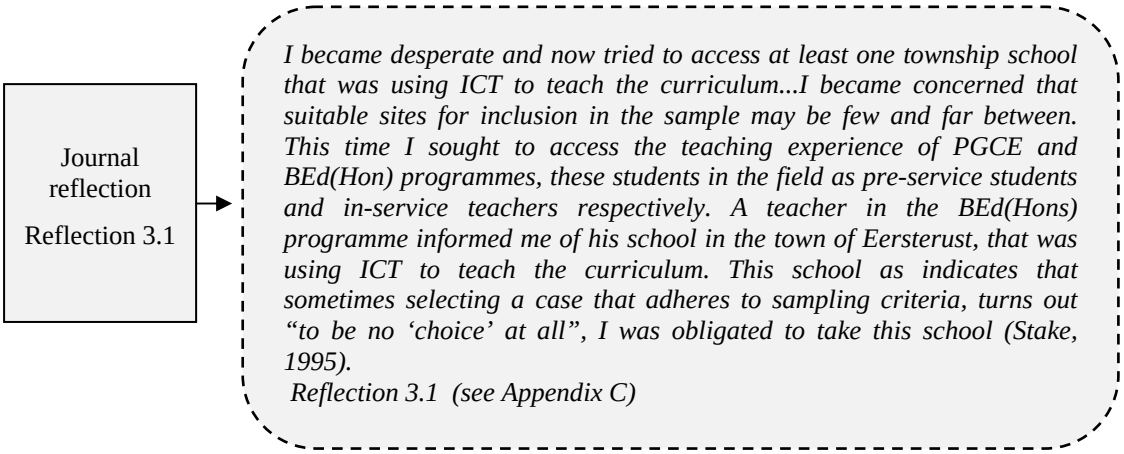
backward mapping begins to describe specific behaviour of the policy implementer at the "lowest level of the implementation process that generates the need for policy". Once the exact target of the policy at the lowest level of the system is established and the behaviour is described as a set of effects, the backward mapping analysis back-tracks through the structure of the "implementing agencies"posing at each level two questions; What is the ability of this unit to affect the behaviour that is the target of the policy? and what resources does this unit require in order to have that effect?

In this study the target of the ICT policy on education are the teachers who are positioned at the intersection of policy and practice, who thus constitute the main focus of this inquiry. Once the behaviour of the teacher that is the target of the policy was described (through observations and interviews), the inquiry backed-up through the implementing agencies of the school, to the local education district and then to the provincial education department. The experiential knowledge of the actors was captured, analyzed, interpreted and conveyed through situational descriptions (see reflections in Appendix C1) and largely through thick and rich narratives of the case study. I now give a detailed account of the data collection strategies.

3.4.2 Selection of cases

The selection of information-rich research sites occurred prior to determining the participants as units of analysis. My expectation of finding suitable sites to conduct the field work waned from the selection of typical sites to selecting exemplary sites (Glesne, 2006). I assumed that the practice of using ICT to teach national curriculum exists to varying extents in all schools (typical sites), ranging from highly affluent independent schools to township schools in the heart of impoverished communities. However the reality of accessing data-rich sites to conduct research led to identifying exemplary schools across various socio-cultural contexts rather than typical schools. Stake (2005) suggests that sometimes atypical cases offer greater opportunities to learn as compared to typical sites. In this regard the search for information-rich research sites compelled me to engage purposeful sampling (Stake, 1995). The process of purposeful selection yielded an opportunity for an in-depth study to understanding and gaining insight on issues of central importance to this study. I

reflect on my experience of trying to access information rich research sites that at the onset I assumed would be an easy task.



In order to achieve significant understanding of the phenomena under study, I had to choose cases according to particular criteria that may yield information rich cases. For instrumental and multiple case study design a formal method of sampling was required that may yield a representative selection of cases (Stake, 2005). I wanted to select three urban primary schools from different socio-cultural settings in an attempt to make use of maximum variation sampling (Patton, 1990; Lincoln & Guba, 1985). The rationale for using maximum variation sampling was that it would enhance the value of this study by capturing common patterns from great variation that may emerge from diverse socio-cultural contexts. I selected cases that cut across varied socio-cultural and socio-economic situations (see table 3.1), in order to identify shared patterns and yield detailed descriptions of each case. At this point in time, I acknowledge that a limitation of maximum variation sampling as a method for small samples is that high heterogeneity can be a problem because individual cases may be significantly different from each other.

I also note that while balance and variety in a case study approach is important, 'opportunity to learn is often more important' (Stake, 2005, p. 451). Accordingly, I identified three research sites based on the socio-cultural contexts of these schools. A well resourced former model C[7]public primary school, a poorly resourced

[7] Former model C schools were public schools (classified prior to 1994) catering mainly for white learners

township[8]public primary school and an independent[9] school were selected according to preformed and particular criteria (See Appendix C1 to C4 for journal reflections). I excluded rural schools from the sampling criteria based on my assumption that rural schools have many other significant challenges to basic educational needs. These challenges range from the lack of basic services such as water and electricity supply to substandard classroom infrastructure (Roodt & Conradie, 2003; Mbelle, 2008). I assume that the use of ICT in teaching and learning would be far removed from the agenda of schools thus disadvantaged.

I used Stake's (2005, p. 451) view that the selection of cases should offer 'opportunity to learn', and proceeded to select cases from which I could learn the most. I based the purposeful selection (Berg, 2007) of possible information-rich research sites on numerous criteria. Some criteria were formulated with reference to the framework of the international study (Kozma, 2005), while others were determined and modified to accommodate local circumstances within the context of this study.

- First, I wanted to select schools with stable ICT infrastructure. I qualify the meaning of 'stable' in that computers must be functional for effective teaching and learning to occur. ICT technical problems should not compromise day-to-day curriculum delivery.
- Second, schools had to have effective administrative management of ICT computer laboratories. Good management implies that the computer facilities and equipment should be functional and effectively maintained for optimum use of the technology resources.
- Third, and to my mind most important, schools had to integrate ICT in the curriculum as an accepted practice in teaching and learning. This criterion became evident through a scrutiny of the prospective school's timetable and by observing whether the use of the computer labs or ICT centres was indicated as a dedicated curriculum delivery activity (Kozma, 2000).
- Fourth, the schools had to be sufficiently well resourced in order to facilitate and sustain the use of ICT in teaching and learning (Kozma, 2000). In this

[8] Township schools are schools that are currently situated within 'black' communities
[9] Independent schools are autonomous private schools that receive minimal state subsidy and target affluent communities.

regard the school should have the means (financial or externally supported) to be able to maintain the use of ICT laboratories or equipment for teaching and learning to take place.

- Fifth, sites were selected by identifying ICT-enabled practices (for example participation in e-learning seminars, community involvement, competitions, etc.) that each school values and wanted to hold up to others in their community and within the school's district (Kozma, 2000).
- Sixth, selected schools had to adhere to and implement education policy on the National Curriculum Statement (NCS) (Kozma, 2000).
- Seventh, in addition I selected schools that had at least two of the main phases (foundation phase, intermediate phase and senior phase) in the General Education and Training (GET) band within the South African schooling system. The rationale for selecting primary schools as research sites was two-fold. First, primary schools have been in the process of implementing the revised National Curriculum Statement (NCS) (Department of Education, 2004) fundamental policy for more than four years (from 2004) and thus may have overcome curriculum implementation milestones.

Secondary schools, however, have only initiated the new curriculum policy from 2007, and then only in grade seven. My assumption was that secondary schools were still in the throes of negotiating changes required by the new national curriculum policy statement (Department of Education, 2003). Second, unlike secondary schools, primary schools are not compelled to use ICT because of the national NCS curriculum policy statement (Department of Education, 2003). In this way, secondary schools use ICT in teaching and learning because of the curriculum policy requirement for subjects like Technology and Computer Assisted Technology (CAT) (Department of Education, 2003). My assumption was that primary schools using ICT in their curriculum would be doing so by virtue of their own intention, whether driven by the e-education policy (Department of Education, 2004) or not. This method of sampling would elicit a more realistic understanding of the appropriation of education policy on ICT by teachers.

Journal reflection 3.2 →

Based on my perception and experience of primary schools within educational district in which I taught and the fact that the provincial government has been active in the roll out of computer centres through the Gauteng-On-Line (GOL) project since 2004, I assumed that obtaining information-rich township school, that satisfied the selection criteria as a research site would be fairly easy and uncomplicated. But in reality this did not unfold as expected.
Reflection 3.2 (See Appendix C)

3.4.3 Identification and selection of participants

As stated previously, the case constituted schools with teachers implementing ICT in their teaching and learning practice. I purposefully (Glesne, 2006; Berg, 2007) selected the teachers at the schools according to preset criteria. First, the teachers had to be professionally qualified. I qualify this criterion because many schools tend to appoint ICT qualified persons as teachers without any formal teacher training. This information was determined from my initial introductory interview with the principals. Second, the identified teachers were selected by their willingness to participate in the study and not by their level of ICT competence, qualification or experience. Third, the participant teachers had to be teaching the national curriculum using ICT. I did not expect that every curriculum delivered lesson to be an ICT infused lesson, but that the teachers were using ICT as part of their daily teaching practice. Fourth, I excluded those teachers that taught ICT as a standalone learning area without curriculum integration. Fifth, I selected teachers from the junior, intermediate and senior phases without any restriction on the choice of the learning area. I preferred teachers from the intermediate or senior phases with the hope to include teachers from various learning areas. Sixth, selection of participants was not based on language of instruction, race, gender or age as these criteria were irrelevant to the study.

I had initially decided on one teacher at each research site as my unit of analysis. Drawing on my personal experience, most members of school management did not use their mainstream curriculum deliverers to teach ICT, but relied on a separate dedicated teacher to do this (often employed by the school governing body). Thus I expected to find at most one teacher at each school that may be identified as the ‘ICT

integration' teacher. However at both public schools a different scenario played out, contrary to my expectations as reflected in the following excerpt from my diary:

Journal reflection 3.3 →

I subsequently, requested if both of them would be willing to be interviewed and observed in their daily routine of teaching. My observation was that the technology teacher was reluctant to be part of the study, although he did not say this openly, he referred to me as an 'inspekteur"[8] *in his casual talk to other teachers in my presence. His utterance gave me an opportunity to allay his concerns about the object of the research.*
Reflection 3.3 (See Appendix C)

At the township school (school A), a school from a low socio-economic suburb of Eersterust[10] east of Pretoria[11], two teachers (teacher 1 and teacher 2) were actively engaged with ICT in their delivery of the national curriculum. The first teacher readily agreed to participate in the study, while the second teacher had some reservations but eventually agreed to participate in the study (see Journal reflection 3.3). At the second research site, a former model C school (school B) which is situated in a middle socio-economic sector of the city centre, both teachers (teacher 1 and teacher 2) were identified by the principal and enthusiastically agreed to participate in the study. At both public schools, School A and School B these teachers (teacher 1 and teacher 2) were the only two teachers using ICT to teach the curriculum. However at the independent school (school C), a school within a high socio-economic community, many teachers were using ICT in their classroom practice. However, only two teachers (teacher 1 and teacher 2) were using ICT more often than other teachers and thus selected as units of analysis (Refer to Appendix C5for journal reflections). Table 3.1 gives a detailed summary of the research sites, the socio-economic status of schools, the demographics of the participants and the research question that is being investigated.

[10] Eesterust – a township previously designated for people classified as coloured.
[11]Pretoria – capital city of Gauteng Province (one of nine provinces in South Africa).
[12]Inspekteur – Afrikaans term for inspector (of schools).

Table 3.1: Summary of participants – Schools and teachers

System Hierarchy Level	Institution	Unit of Analysis	Participants	Profile of participants	Research Question
School A	**'Township' Public School Low socio-economic sector**	**Teachers**	**2**	**Teacher 1**: Coloured male. Age: mid 40, married**Designation**: Head of Department- Natural Science**Currently teaching**: general science grade 6 **Qualification**: Teacher Diploma, Bed(Hons) **Teaching experience**: 23 years	**RQ1**
				Teacher 2: Coloured male. Age: 43, married **Designation**: Teacher **Currently teaching: T**echnology grade 6&7, grade 7 – computer literacy **Qualification**: Teacher Diploma **Teaching experience**: 18 years	
		Principal	**1**	**Principal**. Coloured, male age 55. Married **Designation**: Principal for past 10 years **Qualification**: Teacher Diploma **Teaching Experience**: 30 years	**RQ2** **RQ3**
School B	**Former model C school. Medium Socio-economic sector**	**Teachers**	**2**	**Teacher 1**: White male. Age 40, Married **Designation**: Deputy Principal **Currently teaching**: EMS and Afrikaans 5&7 **Qualification**: Teachers Diploma **Teaching experience**: 20 years	**RQ1**
				Teacher 2: White female. Age 28.Unmarried **Designation**: Teacher **Currently teaching:** Maths and EMS Grade 6&7 **Qualification**: BA, PGCE **Teaching Experience**: 6 years	
		Principal	**1**	**Principal**: White Male. Age 58. Married **Designation**: Principal for the past 5 years **Qualification:** Teacher diploma, BA **Teaching experience**: 33 years	**RQ2** **RQ3**
School C	**Independent School. High socio-economic sector**	**Teachers**	**2**	**Teacher 1**: White male. Age 35. Married **Designation**: Head of Department for Afrikaans **Currently teaching**: Afrikaans grade 6&7 **Qualification**: Teacher Diploma, BA, Bed(Hons) **Teaching Experience**: 18 years	**RQ1**
				Teacher 2: White male. Age 27 **Designation**: Teacher **Qualification**: BEd Teaching experience: 6 years	
		Principal	**1**	**Principal**: Male. Age 45 **Designation**: Acting Principal **Qualification:** BEd **Teaching experience:** 23 years	**RQ2** **RQ3**

Applying a backward mapping (Elmore, 1980) approach I had to select participants at various systemic levels as I backtracked through the system. At school level the principal is apparently the gatekeeper of policy implementation and was conveniently selected (Berg, 2007). At each of the research sites principals voluntarily agreed to participate in the study. Beyond the schools' boundaries, I purposefully (Berg, 2007; Glesne, 2006) selected participants at various system levels namely, district and provincial e-learning officials. The schools that were identified determined the selection of the relevant hierarchy district systemic unit. At district level, the e-learning chief education specialist (CES) was identified as a participant based on the function of this unit with respect to e-education policy implementation. This district office is situated within the Gauteng[13] Province. I selected the head of the e-learning directorate at the provincial education department to be a participant in this study. However on the day of my planned interview with her I was informed that two other e-learning officials within this directorate will participate in the interview, namely the deputy chief education specialist (DCES) and the chief education specialist (CES). All officials at both district and provincial levels were keen to participate by virtue of their interest in the study. Table 3.2 illustrates the demographics of the systemic participants.

Table 3.2: Summary of participants – Systemic

System Hierarchy Level	Institution	Unit of Analysis	Participants	Profile of participants	Research Question
Local Education Authority	**District E-learning directorate**	**District E-Learning Official**	**1**	**District Official**: Black, female. Married, Age 43. **Designation:** Chief Education Specialist: E-learning **Qualification:** Teachers diploma + Currently studying Bed(Hons)	**RQ2** **RQ3**
Provincial Education Department	**Province E-learning Directorate**	**Province E-Learning Official**	**2**	**Official 1:** Black male, Age 36. **Designation:** Deputy Chief Education Officer **Qualification:** BSc + Teachers Diploma	**RQ2** **RQ3**
				Official 2: Black female, Age 43. **Designation:** Chief Education Specialist **Qualification:** BA + Hed	

[13] Gauteng province - one of nine geographical regions in South African

3.5 The research process

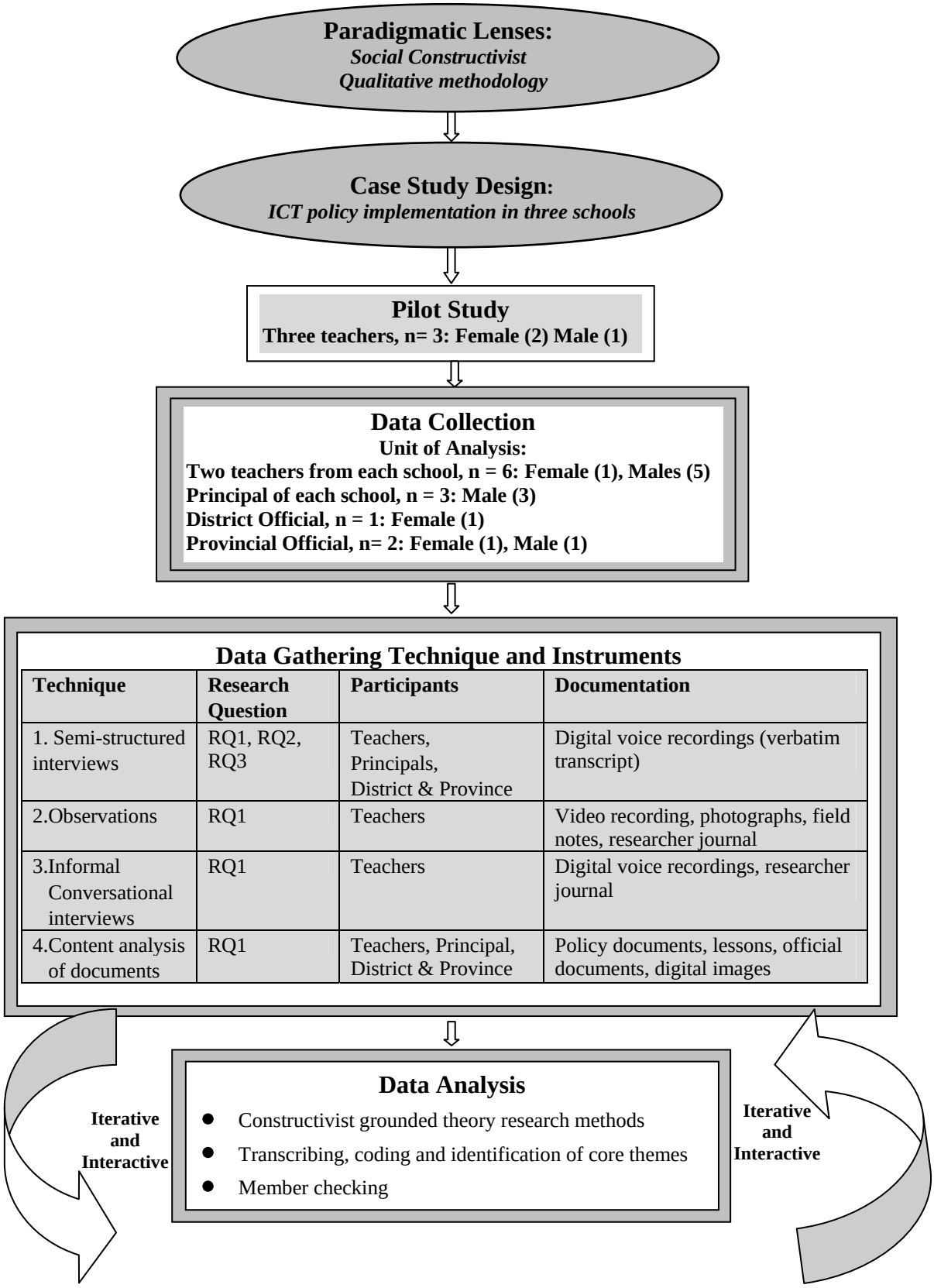


Figure 3.1: Research process

The flow chart above (Figure 3.1) gives a schematic representation of the research process that unfolded in this study.In this section I give a detailed account of the data collection instruments and methods.

3.5.1 Phases of inquiry: Data collection methods andinstrumentation

3.5.1.1 The pilot study[14]

Social researchers Teijlingen and Hundley (2001, p. 1), suggest that pilot studies are crucial elements of a good study design. Teijlingen and Hundley (2001) list numerous reasons for conducting a pilot study. Of primary importance to this study is their notion that a pilot study may assist in the development and testing of research instruments, designing a research protocol, assessing whether the research protocol is realistic and workable and collecting preliminary data. In this study I used a pilot study to pre-test (Berg, 2007) the semi structured face-to-face interview protocol with three teachers. This data gathering instrument had to elicit appropriate responses from participants in my target population. Glesne (2006), suggests that pilot studies should be as close as possible to the realities of your actual study, not merely for the sake of data collection but with the idea to learn about the research process.

In this study, I used the principles of pilot studies as espoused by Teijlingen and Hundley (2001) and Lancaster, Dodd, Williamson and Pract (2004) to test the interview protocol schedule in a pilot study. After several iterations of critically designing and redesigning the interview protocol with my supervisor, I tested the interview protocol (Berg, 2007; Glesne, 2006) with three teachers in three primary schools in Laudium[15], a western suburb of the capital city of Pretoria. I piloted the interview protocol with the teachers of the three primary schools, as this sample represented the general target population of my sample (Glesne, 2006). The schools were easily accessible and thus convenient (Berg, 2007), through my level of collegiality as a teacher and my previous position as a principal of a public school in this suburb. Two of the teachers were Indian female, one of which was from the

[14] See Appendix B16 (Exemplar of pilot study transcripts view protocol)
[15] Laudium - a suburb previously (prior to 1994) designated for people of Indian decent.

foundation phase teaching literacy, numeracy and life-skills and the other from the intersen phase[16] (***inter***mediate and ***sen***ior) teaching languages and social science. The third teacher was a male teacher also from the intersen phase that taught mainly mathematics and natural science. All teachers were conveniently selected based on their level of expertise in using ICT and the fact that they knew me as a teacher and ex-principal. The interview lasted at least forty five minutes and was conducted immediately after the teachers completed their scheduled lessons for the day. The table (Table 3.3) below gives the demographics of the pilot study sample:

Table 3.3: Summary of participants - Pilot study

School	Type of School	Gender	Age	Teaching phase	Learning areas
School 1	Public primary school	Female	42	Foundation phase	Literacy, numeracy and life skills
School 2	Public primary school	Male	34	Intersen phase	Mathematics and Natural science
School 3	Public primary school	Female	40	Intersen phase	Afrikaans

Teijlingen and Hundley (2001), raise concerns that certain limitations of pilot studies may lead to 'contamination' of the study. One important issue raised was the tendency of making inaccurate predictions or assumptions on the basis of the pilot data. The experience I gained from the pilot study was that my own preformed assumptions would be more easily challenged in settings that are not familiar and thus open to new understandings. I reflect on my experience of piloting the interview protocol below:

Journal reflection 3.4 →

The findings from the pilot study made me feel very uncertain for a number of reasons. First, although the teachers responded to my questions very openly and honest, the teachers used the opportunity to use me a 'sounding board' for their general grievances about their real experiences and frustrations with regard to ICT use in the school. Issues such as the lack of training, denial by management to use the computer centre, lack of software and numerous other issues surfaced. I wondered 'Is this a worthwhile study?'
Reflection 3.4 (See Appendix C)

[16] Intersen phase is a combination of two phases , the intermediate and the senior phase that are positioned within the primary schools in the South African school system.

Working from the findings of the pilot study, I reflected on my sample of schools and on the questions in the interview protocol. I reconsidered whether questions in my interview protocol were structured to elicit the appropriate responses, and began to fine tune some of the questions. For example, I reduced the total number of questions to twenty focussed questions, added more prompts to certain questions that required responsesand minimised simple 'yes' and 'no' responses. (See Appendix A9 for pilot study interview protocol). The main experience gained also compelled me to reflect on the manner in which I selected my sample of schools and the units of analysis for the study. In this regard I identified specific criteria for purposeful sampling that would yield information rich participants. According to Glesne (2006, p. 31);

> "*When studying in your own backyard, you often already have a role-as teacher or principal or case worker or friend. When you add on the researcher role, both you and those around you may experience confusion at times over which role you are or should be playing"*

Additional limitations of pilot studies suggested by Teijlingen and Hundley (2001) are that the data from the pilot study should not be included in the main findings. I avoided this obvious concern based on the fact that since the interview protocol was moderately modified after the pilot study, any data used from the pilot study would be inaccurately represented in the main study. Kvale (2005, p. 155) suggests that the wording of a question 'inadvertently shapes the content of an answer'. Although the interview protocol was tested in the target population, I precluded all participants from the main study to limit the effect of 'contamination' of data. In so doing I prevented participants in the main study that were already exposed to the interview protocol and the novelty lost through familiarity with the instrument culminating in compromising data integrity.

The pilot study also made me aware that my own preconceived views on certain issues could influence the behaviour of the participants and thus the integrity of the data through my own body language, tone of voice, expression and utterances. Though difficult to implement in reality, I attempted to make minimal use of these verbal and non-verbal cues, except to indicate to the participant that what he or she had to say was important to me.

Most data collection methods and instruments were formal and rigid whilst others were less formal in nature but integrated into the data gathering process. I used six instruments to collate data (See Table 3.4), with the intention that each may inform the research question in a particular manner and crystallize (Settlage, Southerland, Johnston & Sowell, 2005) the data collection method. The instruments ranged from interviews, observations, researcher journal, field notes, document reviews, informal conversational interviews and participant diaries.

Table 3.4: Research questions in relation to data sources and interview questions

Research questions		Source of Data					
		Observation	Field Notes	Participant Diaries	Document reviews	Informal conversational Interviews	Interview Questions Relative to research questions
How do teachers Appropriate educationpolicy on ICT in schools?	△Triangulation	△	△	△	△	△	△
	Instrument	Digital video recording + Observation sheets	Reflective Journal and Field notes	Transcripts	Policy documents; Schemes, Preparation, Websites	Digital Voice Recording	E1,E2,E3,E4,E5, E6,E7,E8,E9,E10, E11,E12,E13,E14, E15,E16,E17,E18, E19,E20, P1,P2,P3,P4,P5, P6,P7,P8,P10,P13
	Trust-worthiness	Prolonged observation, Pilot study, Member checking, Multi-site, Multiple participants					
	Conducted by?	Researcher					
	When conducted?	July '08 to September 09		After transcribed	July'09 to September '09	July '08 to September 09	August '09 to July '09
What is the ability of the hierarchical unit (principal, district and province) within the education system to affect the behaviour of the teacher that is the target of the policy?	After teacher interviews			△	△		△
							Teacher Responses + P15 D4,D6,D7,D8, D10,D14,D15, D16,D19, Pr4,Pr6,Pr7,Pr8, Pr10,Pr14,Pr15,Pr 16,Pr19
What resources does this unit (principal, district and province) require in order to have that effect?	After teacher interviews			△	△		△
							Teacher Responses + P16 D7,D11,D20, Pr7,Pr11,Pr20
Key to Codes		E=Teacher ; P=Principal; D=District official; Pr=Provincial official					

3.5.1.2 Semi-structured face-to-face interviews[17]

Interviews are important in situations when we cannot observe behaviour or when we do not know how participants experience their world (Merriam, 1998). Face-to-face semi-structured interviews afforded me an opportunity to explore the meaning participants attach to their experiences "*erlebnis*" (Ponterotto, 2005, p. 131). Face-to-face allowed me to observe non-verbal cues and appropriately react or modify my inquiry in response to non-verbal cues (Holbrook, Green & Krosnick, 2003; Lee 2003) of participants particularly when they elicit confusion, uncertainty, or waning motivation. In this regard I was able to constructively react to these cues by reducing task difficulty and reinforce interest by skipping selected questions which I felt were adequately answered previously. The process of personally conducting the face-to-face interviews was crucial as I could modify my line of inquiry by probing into unanticipated, interesting or unique participant responses (Lee, 2003; Suchman & Jordan, 1990).

Although I designed the interview protocols[18] as a set of open-ended questions, I was free to modify and change the sequence of the questions according to the manner, appropriateness and context in which conversation flowed (Fontana & Frey, 2005). The design of the interview protocol ensured that I make effective use of the limited interview time, interview multiple participants in the same systematic and comprehensive manner, and keep focus. In designing the interview protocol, I created an opportunity to change the way the questions were worded, gave the interviewee additional prompts or rephrased the question(s) when the need arose (often evident when interviewees are silent after a question is posed). Furthermore, I kept a resource of planned prompts and additional questions that could be included as follow-up to probe into particular responses or to supplement the interview (McCracken, 1988). The pilot study I conducted alerted me to be cautious of creating interviewee fatigue through prolonged interviews and being sensitive to this phenomenon I remained focussed on observing any cues of fatigue and offered participants an opportunity to rest or continue with the interview at some other time. In the process of data

[17] See Appendix B for verbatim transcripts of interviews
[18] See Appendix A6 to A9- Interview protocols

collection I also attempted to be reflexive by reporting on exactly what transpired. Thus I employed 'bracketing' (Ahern, 1999) in an effort to set aside my researcher assumptions and influence in order to elicit the reflected experiences of respondents.

Four waves of formal face-to-face semi-structured interviews (Fontana & Frey, 2005; Glesne, 2006) were planned. The interviews were conducted with teachers, school principals, e-learning district official and provincial e-learning directorate leaders. Interviews were scheduled for a period of approximately 45 to 60 minutes and the interview data sets were classified as follows:

First wave of interviews

The first wave of inquiry was to gather data by conducting face-to-face semi-structured interviews with the teacher participants. Since the schools in the sample did not occur concurrently I began to conduct interviews from July 2008 at the three selected schools, as and when schools came onboard in this research study. In planning and preparation to conduct the interviews, I had to consider various aspects and conditions for data collection such as the identification of the participants, pre-meetings with participants, permission to conduct the interview, duration, location and the constant scheduling and re-scheduling for each interview (McKinnon, 1988). I conducted semi-structured interviews with each of the six teachers at their respective schools and during the course of their normal professional activity. Since this study was exploratory in nature, an open-ended interview protocol was deemed appropriate (Devers & Frankel, 2000; Fontana & Frey, 2005). I designed all the interview protocols (Leece, 2002) with the first section briefly probing for establishing background context of the participant, and in so doing rich and thick data pertaining to the participant's life history was captured. The second section of the teacher interview protocol probed into teachers' experiences with regard to ICT for teaching the curriculum, student learning, administrative task, official documents for planningand, institutional and system support. Central to the design of the interview protocol was to avoid the pitfall made by McLaughlin (1987) in pursuing a top down strategy in designing the categories for the interview protocol. In this study a backward mapping approach sought to reflect the realities of teachers' classroom practices and not the policy system (Research question 1).

Second wave of interviews

The second wave of semi-structured face-to-face interviews was directed at the principals at each research site. The interviews with the principals occurred only after teacher interviews and lesson observations were completed. To garner data of each case with the goal of seeking the particular and the common, I designed the principal's interview protocol according to Stake's (2005, p. 447) six criteria for probing each school's particularity (see Appendix A7). The interview protocol design focussed on three sections namely, history and background context of the school, principal's vision of the role of ICT in education, implementing policy and institutionalising the use of ICT in the school (Research question 2 and 3).

Third and fourth waves of interviews

The third and fourth waves of semi-structured face-to-face interviews were conducted with district and provincial officials tasked with e-education policy implementation at schools. The interview was designed to probe the district and province's level of understanding of ICT policy and their role in facilitating the take up of education ICT policy in schools. The interview protocol was designed (Leece, 2002) based on four sections namely, leadership and background context, policy planning and implementation with the system, capacity building and effective practice, and professional development (Research question 2 and 3).

Data capturing and recording

I relied on digital recording equipment to preserve the answers of the interviewees, which proved to be useful during the subsequent categorising and data analysis(see Refection 3.5). Patton (1990, p. 348) suggests that a tape recorder is an 'indispensable' tool for capturing data, while Lincoln and Guba (1985, p. 241) do not recommend it because of intrusiveness and technical failure reasons. Immediately after the interviews, I downloaded each voice recording and converted it to particular file formats for ease of playback during transcription. These interviews were transcribed and the transcriptions became the data source for analysis.

Journal reflection 3.5

I am a traditionally a 'technology junky' and could not imagine doing research on ICT without a using technology affordances such as a digital voice recorder: Also, I prefer to keep eye contact with the interviewee to show that I am interested in what s/he says: Thirdly, I do not write fast enough to be able to transcribe and make notes of the participant's body language as well.

Ref: Reflection 3.5 (see Appendix C)

Limitation of face-to-face interviews

A possible limitation of this method of data collection is that participants may tend to provide responses that they presume the researcher wants to hear (Glesne, 2006), as indicated in the excerpt below:

Journal reflection 3.6

This is evident as one of my participants indicated "you know Mr Vandeyar, I am not very good at interviews." I gathered that he felt that the purpose of the interview was to determine correct or incorrect responses from him.

Ref: Reflection 3.6 (See Appendix C)

In an attempt to reduce the Hawthorn effect, I made regular visits to the schools to mingle with the participants in their natural setting, in order to gain their trust and confidence before formal interviews began. I also maintained various communication channels such as e-mails, sms's, and telephonic means to develop a relationship of trust with the participants, before scheduling the interview meeting.

The semi-structured interviews allowed for generated data to be used to compare and obtain common issues and experiences of the teachers which could lead to codes and themes for data analysis (Merriam, 1998). The semi-structured interviews were used as one of the principal data collection instruments as a means to cross check my observations, journal reflections and field-notes.

3.5.1.3 Informal conversational interview[19]

The informal conversational interview, as the name implies, is relaxed in nature, and the generation of questions is spontaneous arising from the natural flow of

[19] See Appendix D8 (Example of an informal conversational interview)

conversational (Peräkylä, 2005). In this study informal conversational interviews were conducted with teachers on many different occasions and in various contexts. I had the advantage of exercising maximum flexibility and modified questions depending on the context of the investigation.The main advantage of the use of an informal interview approach is the depth of information gathered compared with the more structured approach. One disadvantage of this approach however is that data collection tends to be less systematic and analysis may prove problematic. To overcome this limitation I made notes of pertinent issues discussed to initiate further discussion or gain clarity on the issue.Another limitation was that informal conversational interviews were often conducted in the field and digital audio taping was not practical or convenient, thus it was necessary to resort to taking field notes.

In order to capture relevant data related to my observations I often resorted to conducting casual conversations with the participants (Peräkylä, 2005, p. 869). Although I carried the digital recorder, I chose not to record the informal conversational interviews (Patton, 1990, p. 113) as this could spoil the spontaneous 'moments' of conversations as they occurred in corridors, staff room and between lessons. I documented informal conversations as field notes, which were later used as a source for data analysis. I reflect on my experience of being unable to recall exact conversations:

Journal reflection 3.7 →

During one of my initial visits to a school I lost valuable data in the form of narratives of teachers in their informal discussions with me, my reflection of these spontaneous discussions could not capture the exact words of the participants. In order not to make the same mistake again,I attempted to make effective use of my reflective journal or voice record the information.

Reflection 3.7 (see Appendix C)

3.5.1.4 Classroom observations[20]

Emerging from a constructivist paradigm, I used unstructured observation to foreground the importance of 'context and the co-construction of knowledge between

[20] See Appendix F (CD Videos, path = D:\Videos\)

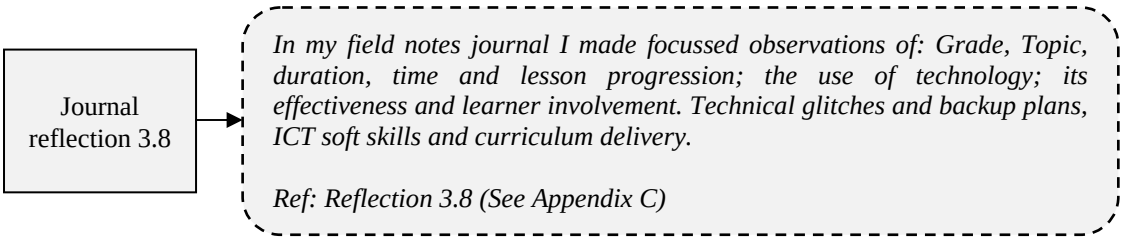
the researcher and the researched' (Mulhall, 2003, p. 306). The reason for using classroom observational methods in this study was to determine whether what participants' say they do is the same as what they actually do in practice. Unstructured observation (Mulhall, 2003) allowed me to capture not only the process of policy implementation but also the context. In using unstructured observation I adopted a role as a reactive observer (Angrosino, 2005, p. 732). I acknowledged that in my role as a reactive observer I was part of the social setting under study (Giacomini & Cook, 2000). Reactive observations are controlled settings and assume that participants are mindful of being observed and are 'amenable to interacting with the researcher only in response to the elements in the research design' (Angrosino, 2005, p. 732). I purposefully chose this role as a researcher because of the useful source of data that this approach may yield. As I was positioned as a reactive observer (Angrosino, 2005, p. 733), some teachers would engage in communication with me during the lesson (whilst students were occupied), giving me a window of opportunity to ask questions about 'what is really going on in' their lessons. After observation, I noted the discussions in field notes so that I could later reflect on what was said.

I am however, not oblivious to the potential source of bias that may surface due to my presence in the research setting. While a dual reactive observer role creates opportunities for observation, it also brings along challenges as to whether the observed social interactions among other participants are natural. In order to capture more detail, I pursued more than one mode of documenting my observations[21]. In this regard I used field notes, reflective journal (discussed in a following section), video recording and digital photographs. Angrosino (2005, p. 74) suggests that 'technology makes it possible for the ethnographer to record and analyse people and events with a degree of particularity that would have been impossible a decade ago'.

I structured my observations by using three procedures as delineated by Angrosino (2005, p. 733) inherent in observational research. In terms of descriptive observation (Angrosino, 2005) I tried to eliminate preconceptions and noted (field notes) detailed descriptions of everything that was taking place. Then, I employed focused observation (Angrosino, 2005) in which I chronologically documented field notes on

[21]See Appendix D – D1(Field Note - Classroom Observations)

the observations[22] and materials that were significant to the study, focussing on well defined categories of pedagogy, policy, student involvement, ICT skills, time management and specific ICT use in the classroom. Lastly I performed selective observation (Angrosino, 2005) of a general nature recording field notes on classroom layout, discipline, teacher control and classroom management issues. The reflection below indicates some aspects relative to the design of the observation field notes.



I commenced with classroom observations at each school as soon as the interviews with the respective teachers were concluded. The period of observations at the schools began in July 2008 and ended in October 2009. However, there are periods whenpublic schools were not accessible to researchers(by regulation), especially during the first and fourth school terms and when independent schools were closed for vacation. I refrained from data collection during these periods and did not impose on the hectic schedule of public school teachers during these periods. The observational data gleaned was for the purpose of giving a description of the socio-cultural settings, classroom activities, teaching and learning, and most important the meaning of what is observed from the perspective of the participants (Silverman, 2006). Classroom observations not only afforded me an opportunity for deeper understanding of the interviews (particularly to observe issues that participants are not willing to discuss or participants themselves are not aware of), but also provided knowledge of the context in which policy implementation unfolds.

Though several observational strategies to reactive observation (Angrosino, 2005) are available, I chose to locate myself within the classroom to engage in limited interaction and intervening only when further clarification of actions was needed (Schatzman &Strauss, 1973). Where and when possible, provision was made to setup the equipment prior to children entering the class, allowing me to record all

[22]See Appendix D – D1 (Classroom observation)

observations from the commencement of the lesson. I usually positioned myself at the back of the classroom so that I could be as unobtrusive as possible, yet observe the full effect of the technology being used for teaching but viewed from the same angle as the children. This observation position also presented the opportunity to collect data that satisfied ethical issues of data collection, as I could capture the images of children without compromising their identity. Armed with the curriculum time-table of each school I composed a composite roster to track schools, teachers and lessons for observations. During school visits for lesson observation I relied heavily on a composite lesson schedule of all the school research sites, which prevented double booking on any particular day (See Appendix B14 for a schedule of class visits).

Observation as a data collection technique provides a lens to view the 'experiences' of classroom life over a period of time. Observation as one of the main data gathering techniques used in this study, posed some challenges. Observational data is subject to interpretation by the researcher (Mulhall, 2003). In an attempt to minimize investigator bias and 'maximize observational efficacy' I used standardized observational procedures as outlined above (Angrosino, 2005, p. 732).I also attempted to reduce observer bias by eliciting feedback from participants whose behaviours were being reported. This process brought forth two distinct benefits, firstly by showing the participants my observation notes I could establish a 'self correcting investigative process' (Angrisino, 2005, p. 733). Secondly, the disclosure of my observational notes to the participants improved 'rapport' (Glesne, 2006, p. 110) as a 'distance-reducing', 'anxiety-quieting' and 'trust-building' mechanism. Another limitation of intensive observations at a small number of schools is that it could be seen as instructive and illustrative, and not as representative of all schools.

Documenting observations: Field notes, audiovisual data and reflections

I utilized field notes in accordance with Bodgan and Taylor's (1998) view that field notes are a primary source of recording conversations and observations. Using their suggestions for writing up field notes, I addressed two significant issues that had implications for the credibility of the study. First, I had to make certain that my note-taking was thorough and detailed in describing the situated context. Second, I had to

reflect and differentiate between what was actually said or observed as opposed to my interpretations of what was said or observed. This difference is evident from an excerpt from my reflective journal (see Appendix C14).

Journal reflection 3.9

The deputy principal, in his enthusiasm to assist me in my research, suggested 'why don't you prepare the curriculum lessons using ICT, and I will get my teachers to deliver the lessons'. I informed him that it is my intention to observe the way ICT is integration in the curriculum in its natural process and not through my facilitation or influence. It was evident that ICT was not used to deliver the curriculum. He agreed to contact me when the computer centres would be functional, and that was the last I saw or heard of this school.
Ref: Reflection 3.9 See Appendix C

I used the two basic approaches to field observation as espoused by Giacomini and Cook (2004) namely, direct and indirect observations. I spent sufficient time (See Table 3.4) in the context of the social milieu under study for direct observation and to record direct observations in the form of detailed field notes or journal entries. During indirect observation I used audiotape, video recording and still photography to capture data.

I relied on the use of mental notes while interacting with participants and when the situation did not allow for full note taking (Glesne, 2006), later I transformed these mental notes into jotted notes (Glesne, 2006; Berg, 2007) as a reminder to write more complete field notes. The rationale for jotted or cryptic notes was to capture events as they unfolded during in-classroom and out-of-classroom activities, serving as a memory aid for constructing more substantial field notes (Glesne, 2006). Often on leaving the research site, I also digitally audio-recorded my own reflections of observation and events; this lapse in time allowed me a different gloss on the actual events. I transcribed these recordings into my reflective journal as detailed descriptions (Berg, 2007), attempting not to engage in discussion with anyone before this was done. I also pursued my personal subjective reflections and comments by writing emerging thoughts on a notepad for future use and data analysis (Berg, 2007).

To record classroom lesson observations, I used a pre-designed observation sheet (Mulhall, 2003, p. 311) to make notes and record my observations of both verbal and non-verbal cues (See Appendix D1 to D6). I also used the observation sheet as a formal structure to record field notes *in situ* during classroom observations of anything that was noteworthy, interesting unusual, or 'most telling' (Wolfinger, 2002, p. 89). I made temporal notes to track the teaching processes of: introduction, content, time on technology, assessment and conclusion of lesson. Where an opportunity arose I took note of indicators of best practice in respect of using ICT in the teaching learning situation. Angrosino (2005) posits that true objectivity emerges from observational research when there is agreement between the participant and the observer 'as to what is really going on in a given situation'. In order to achieve this I made detailed notes on discussions with teachers immediately after each lesson to validate my observations and perceptions.

3.5.1.5 Reflective journal[23]

I drew on my ownexperience of keeping a research journal during this studyto deepen my understanding of the research processes (Janesick, 1998). In this regard the use of a reflective journal was twofold; first as a benefit to me as a writer, and second to make my work more public (from a reader's perspective). By reflecting and documenting my experience, I invited an enhanced awareness of myself as a person and made for more informed decisionmaking during the research experience (Holly, 1989). From a reader's perspective, access to my reflective writing provides insight into my perspective on some professional activity. Initially I did not think of a reflective journal as a methodological tool to generate data, (as compared to the way I requested participants to do in their participant diaries) but rather as a form of reflective writing which I engagedin during the research study. However, as the research progressed and the value of keeping a reflective journal became evident, I began to realize that itwas in fact another source of data about my research(Thomas, 1995).

[23] See Appendix C – Reflective journal

From the outset, I documentedmy behaviour and thoughts in a journal which by the end of the research included writtenreflections about many aspects of the research from inception tocompletion. I incorporated excerpts from my journal into the writing of the research report, by identifying extracts that are salient in some way (to me and the reader). I made significant reflective notes, especially when I struggled with a difficult problem, for example in gaining access to research sites, or some aspect of field work (for example the pilot study). Such extracts conveyed personal significance which the research process has had for me, and also allowed me to share a personal–professional experience and an awareness that my ownjournal had made some relevant contribution to my work (Yinger & Clark, 1981). A reflective journal allowed me to engage in a form of self-inquiry, grounded by my own experienceas a researcher, through which I could identify and understandspecific ways in which I benefited through the journal. Janesick (1998, p. 24), views journal writing as "*a type of connoisseurship by which individuals become connoisseurs of their own thinking and reflection patterns and indeed their own understanding of their work"*and argues that journal writing is *"a tangible way to evaluate our experience, improve and clarify one's thinking, and finally become a better . . . scholar*"(p. 3).

I used Borg's (2001) "process benefits" to document my reflection in the journal by noting that each extract was prefaced by a short description of the contextin which it occurred, and has a title which identifies the key aspectof the research process it highlights.

3.5.1.6 Researcher participant diaries[24]

Bolger, Davies and Rafaeli (2003, p. 579) put forward the view that participant diaries give the researcher an opportunity to capture the events and experiences of the participant (teacher), that in essence it "captures life as it is lived". The basic benefit derived from participant diaries is that they promote the examination of reported events and experiences as they occur in their natural and spontaneous context (Julien & Michels, 2004). The advantage of this method of data collection was the reduction of distortion that may occur when reflecting on past events or experiences (Clayton

[24] See appendix D7 (Example of participant diary format)

&Thorne, 2000). This method of data capturing also provides complementary information to the research study. Bolger, Davies and Rafaeli (2003) propose various diary designs and numerous formats that may be used in research studies. I opted to use a "paper and pencil" participant diary format, because it is simple and effective, but also because I did not want to burden the teachers with additional tasks. I requested that teachers note their reflective experiences on the ICT-integrated lessons that they delivered. Teachers had to record in their diaries the date, curriculum learning area, topic, ICT tools used, whether they perceived ICT enhanced teaching and learning, the problems they experienced (if any) and the nature of support (if any) they received from school management (Charmaz, 2001).

Although diaries are an excellent source of data, some limitations occurred during the course of this research study. First, from a practical application participants required training on the use of this protocol and its value, I assumed that teachers will naturally "know how to do this" (Charmaz, 2001). Secondly, keeping a diary by its very nature is a demanding task that requires participant discipline, commitment and dedication. Although I designed a very simple diary format, I realise that teachers are overburdened with paper-work and did not document this data. Hence, researcher participant diaries were envisaged, but did not realise, as data source.

3.5.1.7 Document analysis[25]

The final phase of inquiry was to use document analysis to supplement other data gathered. The goal of document analysis was twofold, first to determine whether elements of the e-education policy could be traced in these documents and second, as an additional source of data. According to Giacomini and Cook (2000), the analyses of documents are particularlyuseful in policy, history and organizational studies. I employed the method of interpreting text in artefacts with the particular notion of seeking meaning and context relevance for qualitative interpretative analysis (Charmaz, 2001; Glesne, 2006). The table (Table 3.5) below gives an indication of artefacts that were sought for data capturing, namely policy documents, curriculum documents, lesson plans, learner outputs and web-sites.

[25] See Appendix E (Snap shots of documents: National and school policies, learners work etc.)

Table 3.5: Document analysis

Policy Documents	School ICT policy; National Curriculum Policy (Department of Education, 2002); White Paper on e-education (Department of Education, 2004); District and Province ICT circulars, policies, mission and vision statements. (See Appendix E7)
Curriculum Documents	School's meso and macro planning/ Worksheets/School syllabi and schemes of work
Lesson Plans	Teacher lesson plans
Learner's outputs	Learners written notebooks/Assessment/ICT work
Web-sites	School websites/teacher's resources and websites
School artefacts	Newspapers/portfolios/ICT presentations/photographs

The documents that were collated from the various schools were mostly ICT syllabi, school portfolios, school ICT policy, newspaper information and learners work. Documentation about ICT integration or teacher ICT-integrated lesson plans was almost non-existent or teachers were not required to illustrate this in their planning (See Appendix B, CD[26], B6 - school C Teacher 2 interview transcript). At school level, very little reference was made to the national e-education policy, while district and province levels only mentioned the e-education policy. In some cases there was sufficient detail of a school's ICT policy (as in the case of the independent school), whilst in other instances documents were virtually scarce or non-existent (as in the case of the two public schools).

Over and above documents collected at school sites, I used content analysis of school policy documents, national policy documents, circulars, photographs, newspaper accounts, web-sites, while brochures and official education policy on ICT for were used to supplement data. According to Silverman (2006), documents represent social constructions and need to be treated seriously. Document analysis is also unobtrusive, and interaction errors between researcher and participant are avoided (Mouton, 2001). Although documents cannot be used to report on what actually took place, I used document analysisto identify its intended purpose of use (Giacomini & Cook, 2000).

[26] Refer to CD (Path=interviews\schoolC-Teacher2\teacher2.txt)

Chamaz (2001, p. 37) notes that the researcher does not affect the construction of extant text (organizational documents, government and school policy etc.) and that though extant text 'may mirror reality' there are limitations. For example, school management may develop their policy documents for the sake of compliance with education regulations but may not exhibit the practices defined in the document. However, documents of extant texts often complemented interview and observation data garnered in this study.

3.6 Data analysis: from research questions to findings

This section profiles analytic methods employed to make sense of the mass of qualitative data that was collected over a period of time. I attempted to provide in-depth explanation of the analysis process in order to bring meaning, structure and order to the data. The main focus of data analysis will be to yield congruency between the reality of the phenomena studied and the emergent themes. This study is situated within a qualitative paradigm which entrenches the concept that the form of data capture, is ultimately in the form of text. Most data was converted into text, and the text was the primary model for the object of interpretation (Schwandt, 1999).

As indicated in a previous section, the data was collected through a variety of methods (face-to-face semi-structured interviews, classroom observation, informal conversational interviews, field notes and researcher journals and document reviews). In the final analysis, the data sources for analysis included interview transcripts (Appendix B), digital video (Appendix F), my research diary (reflections and field notes) (Appendix C), field notes of informal conversational interviews (Appendix D), document reviews and observation schedules (Appendix E). However, photographs and participant journals were not used for analysis. As indicated previously (see 3.5.1.6), participants did not submit diary data. Photographs were also not used as data sources since the audiovisual data capture sufficed. Each of these data sources were analyzed separately and then integrated according to the emergent themes.These forms of data formed part of 'a procedure involving the simultaneous andsequential collection and analysis of data' (Creswell, 2002, p.449). I now expand on the data analysis methods employed for each of the abovementioned documented data sources.

3.6.1 Data analysis: Interview data

All the empirical data garnered through semi-structured interviews were coded and analyzed through techniques adapted from grounded theory methods as espoused by Charmaz (2005). The goal was *not* to develop grounded theory but to present a viable interpretation of the findings collected. The following sections describe the detail phases involved in the analyses of this data. (Refer to Appendix G, for data analysis phases for various data sources).

3.6.1.1 Data reduction: Bringing meaning, structure and order

The garnered digital interview data needed to be processed before analysis could begin and this was achieved through typing, editing and transcription so that the data would emerge as words or text. I used the method of data preparation and transcription as explicated by McLellan, MacQueen and Neidig (2003). I also followed their guidelines and instructions on how to prepare a transcript as well as track and store the digital audio recordings. Eleven interviews were conducted in total; six with teachers, three with principals and two with education department officials. A total of 350 pages of interviews were transcribed.

By personally transcribing each interview I could reflect on my experience of the interview as I listened again to the voice of the participant, and I could immediately reflect on the conversation and make contextual notes in the transcription. This allowed me to place text emphasis on the experiences of the participant (Fontana & Frey, 2005). Another advantage of transcribing the interviews personally was that as I progressed through the transcription, I immediately took note of possible codes that emerged as units of meaning (Miles & Huberman, 1994). On completion of each interview transcript I cleaned the document in terms of anonymity, printed it and hand delivered it to the participant for member checking(Creswell & Miller, 2000). The participant was requested to make amendments to the text if the interview transcript was not correctly captured, or make additions to the text if they felt that their ideas were not appropriately captured.

I utilized Miles and Huberman's (1994) data-reduction methodology as a means to reduce the mass of raw data into a manageable form ready for analysis. Drawing on their "components of data analysis" (p. 23), I subjected raw text data to refinement as a distinct process in the data analysis process. During the data reduction phase the qualitative data was reduced by selection, summary and paraphrasing of text. The main purpose of data reduction was to reduce the data into a form that could be examined for patterns and relationships.

3.6.1.2 Qualitative data analysis

As a novice researcher, I found the welter of garnered data overwhelming and realised that a manual analysis of the mass of data may not suit my needs. The use of a Computer Assisted/Aided Qualitative Data Analysis Software(CAQDAS) appealed to me as a tool for transcription analysis, coding, text interpretation and content analysis (Stemler, 2001; Silverman, 2006; Pope, Ziebland& Mays, 2000). I chose to use Atlas.ti™ which appealed to me for a number of reasons. Other than having the ability to perform qualitative analysis on text, graphic and audio data and being able to perform multiple coding on multiple cases, it has a user friendly interface for open-coding, searching, retrieving and network-building features (Weitzman, 1999). I took note of the fact that using software for data analysis may elicit the effect of distancing me from my data, by focusing on small chunks of text or text locations thus opposing the 'Gestalt' principal of 'keeping the whole picture'. Fortunately, Atlas.ti™ reduces this effect by keeping you in touch with all your data files on screen, and codes can be assigned within the context of the interview. The software appeared to elicit the same effect as manually flipping through pages of the transcripts, thus keeping you constantly immersed in the data.

Before importing all text files (transcriptions) into an Atlas.ti™ project, a number of steps required to clean the data for consistency had to be performed. This was achieved by firstly changing all actual participant names and school names to pseudonyms (for ethical reasons). Second, a document naming protocol (refer to Appendix B12) had to be devised that would indicate the pseudonym of the school or participant (for example, School A or Teacher 1). The document naming protocol had

to be simple enough to provide a means of identifying the participant or school by means of the file name. On establishing a research project in Atlas.ti™ the program creates a 'hermeneutic unit' which Muir (1997, p. 8) refers to as an 'idea container', in which all associated material of a research study is placed. Thus all garnered interview data such as text are treated as a single project, which I named as 'PhD Data'. This method ensured that did not strip the data at hand from the context in which they occurred. Addendum B15 is screen snapshots of the hermeneutic unit created for this research study.

3.6.1.3 Coding and categorization of data

I adopted the two main phases of a grounded theory approach (Charmaz, 2001, p. 46) for coding and categorising the data, namely initial and focussed coding. The initial phase involved the coding of the data. According to Charmaz (2001) coding is the first step of progressing beyond the interview transcripts and towards making analytical interpretations. The coding scheme was accomplished through a combination (Weitzman, 1999) of *a priori* and open coding. The three main themes (theoretical categories) were determined *a priori*guided by the three research questions, while subsequent analysis was guided and modified through interaction with the data and developed inductivelythroughopen-coding (Freeman& Richards, 1996). Coding was done by labelling segments of the data in order to simultaneously categorise, summarise and account for each piece of data (Charmaz, 2001).

According to Merriam (1998), Glesne (2006) and Patton (1990), categorization of the data begins with the first transcript of the first set of transcribed data; interview transcript, field notes, document analysis or informal interview transcripts. Through several reading iterations of each transcript I began with open coding of the data and simultaneously created a cumulative working electronic (word document) copy 'running list' of all open codes for quick access and to facilitate the open coding process for the CAQDAS software (Merriam, 1998, p. 181).

During the *first iteration* of the data, initial coding was done by gradually progressing through all the interview data, reading the entire transcript. I constantly checked

whether the codes that appeared in the first transcript were also present in the second and so on. New codes were added by open coding. This method of constant comparing of transcripts was strictly adhered to, in order to yield a master list of all codes reflecting 'recurring regularities' Merriam (1998, p. 181). These patterns of recurring codes emerged as conceptual categories that were created defining what we see in the data (Charmaz, 2001; Glesne, 2006; Patton, 1990).

The culmination of the first iteration through a process of surface content analysis (Silverman, 2006) was that 43 codes were generated. Table (3.4) indicates how the raw data was coded during the first iteration. In the *second iteration*of the data, focus coding was done to synthesize and refine the data, by comparing the data within categories and between categories. In other words "constant comparative analysis"as espoused by grounded theory proponents (such as Glaser and Strauss) was utilized in this study to compare data with data, to identify similarities and differences and categorise findings (Charmaz, 2005). In this process some categories were merged, while others were collapsed or eliminated because of irrelevance in response to the research question. According to Peräkylä (2005, p. 870), analysis of text takes place through a number of reading iterations of the empirical data and then "try to pin down their key themes and, thereby, to draw a picture of the presuppositions and meanings that constitute the cultural world of which textual material is the specimen."

During the *third iteration* of the data, axial coding was done to relate categories to subcategories, and specify the properties and dimensions of a category. This process (see Table 3.4), brought the data analysis to a level of interpretation. The categories that emerged had some congruence with the reality of the phenomenon under study. Underlying patterns that form theoretical constructs about how teachers appropriate education policy could now be investigated. In order to maintain conceptual congruence (Merriam, 1998) and to make sense of the emergent categories, I subjected the emergent codes and culminating themes to a hierarchy scheme as indicated in Table 3.6.

Table 3.6: Code Mapping: Three iterations of analysis

(*to be read from the bottom up*)

Code Mapping for appropriation of educationpolicy on ICT

(Research sub-questions 1, 2 and 3)

RQ#1:	**RQ#2:**	**RQ#3:**
How do teachers appropriate education policy on ICT in schools?	What is the ability of the hierarchical unit (principal, district and province) within the education system to affect the behaviour of the teacher that is the target of the policy?	What resources does this unit (principal, district and province) require in order to have that effect?

(Third Iteration: Application to data set)

The appropriation of education policy on ICT in South African Schools

(Second Iteration: Pattern Variables)

Themes by de-contextualization and re-contextualization

Code	**Code**	**Code**
1A. Teachers Interpreting Policy	2A School capacity	3A School resources
1B. Teachers implementing Policy	2B District and province capacity	3B District and province resources
1C Teachers practice		

(First Iteration: Initial Codes/Surface Content Analysis)

Code	**Code**	**Code**
1a Policy readerly teachers	2a Institutional Practice	3a ICT curriculum resources
1a Policy writerly teachers	2a Institutional Leadership	3a ICT competent teachers
	2a Transforming the institution	3a ICT policy and implementation guidelines
1b Teacher beliefs and attitudes	2b ICT Administrative directives	3b ICT policy institution policy, guidelines, and communication
1b Emerging pedagogies		3b ICT Curriculum integration guidelines and ICT standards
1b Teachers as innovators		3b Systemic capacity and competence
1b Collaborative learners		3b Common vision and strategy
1b Drivers of implementation		3b Lack of directorates cohesion
1b Teachers' will		3b ICT Willing schools
1b Administrative agents		3b ICT Teacher training
1b Developing learners		
1c Multiple learning styles		
1c Learner participation		
1c Integrative and interdisciplinary learning		
1c Learning with and about ICT		
Raw Data	**Raw Data**	**Raw Data**

3.6.2 Data analysis: Informal conversational interviews

The analysis of data captured from information conversational interviews was coded in the same manner as that of the interview data. The audio recordings of informal conversations (where this was done) and the field notes of the conversations were transcribed and subjected to the same analysis process as the data of the face-to-face semi-structured interviews. However, since this data source did not yield voluminous data, I performed a manual process (Basit, 2003) of coding and categorization of the data. (Refer to Appendix D8)

3.6.3 Data analysis: Classroom observation

In this data collection method, the use of video to document observations ofteachers' ICT-integrated classroom practice in three diverse schools proved helpful in generating data on the implementation of the e-education policy and about teaching methodology. The rich images of the classroomsprovided an opportunity to analyse teaching and learning issues with particular attentionto the manner in which teachers used ICT in their teaching practice and the explicit teaching strategies they adopted in ensuring learning outcomes were achieved (Grossi, 2007; Ebersöhn & Eloff, 2007).

Video data as an information source tends to be relatively unaltered through the eyes of the researcher and has a number of distinct advantagesover other types of data(Pirie, 1996; Jacobs, Kawanaka & Stigler, 1999). Video data as observational datacan more easily be brought back from the research sites and analyzed thought 'new lenses'. I was interested in understanding how teachers use ICT in their classroom practice and thereby illustrate how they appropriate the e-education policy. In this study video was used to capture the teaching pedagogy, learning activity, ICT-integrated curriculum content, classroom events and activity including visual (such as the writing on the blackboard, smartboard) as wellas verbal communication and content.

The analysis of video materialthat was collected in this study included watching, analysing and coding it. As Jacobs, Kawanaka and Stigler(1999) suggest a major

advantage of a qualitative approach to video recordings is that it more easily allows for thediscovery of new ideas and unanticipated occurrences. I applied Jacobs, Kawanaka and Stigler's (1999) qualitative video analysis approach to my observation data. The first step of the analysis began as the video data werewatched, critiqued, analyzed and then recorded as supplementary observational notes that were made *in situ*. In this kind of controlled setting, I used my classroom observational notes and searched for any additional codes or categories that may have emerged. I then made a second repeated viewing of a particular video and applied the open coding scheme that was developed and applied to the interview transcripts. (Refer to Appendix D1 to D6 for examples of observation analysis.)

3.6.4 Data analysis: Field notes

Spradley (1980) suggests that observations that are only descriptive are both time-consuming and ineffective. In this study documented field notes were immediately followed by a period of analysis that led to more focused fieldwork. According to Mulhall (2003), any writing, both in the field and hereafter, is a representation or a construction of events by the researcher. Field notes often tend to govern where they are constructed, and I often attempted to make notes at the research site before leaving. Many of the jotted phrases or words in the field notes were used to remind me of key events and dialogues. The field notes were then written up in more detail in a private space. Although this technique relies on an accurate memory and a recall of events, it does avoid some of the problems of confidentiality and participants being sceptical about the note-taking in their presence.

I used both field notes and the reflective journal as an analytic approach to re-construct the accounts of participants or salient events within context. Data sources such as field notes and reflective journals enriched and enlighten my writing (Ellis& Phelps, 2002). Although the experience of the researcher in the field is subjective, the field notes and researcher journals were not set aside as irrelevant information (Ellis& Phelps, 2002).

One practical issue of concern was how the data wererecalled and whether the field notes and reflective journal would inform the study. During the writing up of notes specific critical incidents or exchanges were related to other similar or contrasting events. Moreover, I wrote up events as they happened in real time, distinguished between descriptions that portrayed the physical environment, participants, other people and actions which make up a setting. I also noted dialogue (or transcriptions) which werea written representation of what was said (Mulhall, 2003). (Refer to Appendix D for examples of field note analysis.)

3.6.5 Data analysis: Reflective journal

In this study I engaged in reflective writing by presenting and analysing extracts from a research journal, with the purpose of doing research and to develop as a researcher (Borg, 2001).The journal was not just a place where I recorded events or documented existing thoughts, but more importantly, as Maxwell (1996) suggests, a forum for reflection where ideas were generated and explored and discoveries made in and through writing. The analysis below is concerned primarily with these processes. In addition the reflective journal is viewed as an“evidential store” (Thomas, 1995, p. 5) or “educational archive” (Holly, 1989, p. 71) which provides a record of the researcher’s experiences during a project and which can be retrospectively analyzed. An analysis of my journal identifies several ways in which I benefited by periodically returning to entries I had previously made.

As I explained earlier, myfocus was on providing an account of my personal experiences of the research process. I applied content analysis (Glesne, 2006)to the research journal as an analytic method that is commonly applied to narrative data(Miles& Huberman, 1994, p. 9). The analytical process involved reading the journal, identifying and labelling reflective processes occurring in the data, identifying relationships between these processes, and searching for common sequences amongst them. The examples I present in Appendix C illustrate recurrent patterns of reflection occurring in the research journal that were established as a result of this analysis. I used Borg’s (2001) ‘product benefits’ to analyse the reflective journal. (Refer to Appendix C for examples of reflective journal analysis.)

3.6.6 Data analysis: Document analysis

According to Stemler (2001), content analysis is also useful for examining trends and patterns in documents. Using this research method Stemler (2001) conducted a content analysis of school mission statements to make some inferences about what schools hold as their primary reasons for existence. I used content analysis of schools' ICT policy, teachers' lesson plans, learners'written work, school ICT attainment standards, ICT related policy documents; school newsletters and portfolios, school and teacher web-sites to determine if national policy mandates related to e-education have manifested themselves in school ICT policies. Textual analysis (Charmaz, 2001) allowed me to place the analysis within the social context of the school. Although I used textual evidence to corroborate other evidence, I also used Charmaz's (2001, p. 39) questioning technique as a means for analysing the extant text in order to gain insights into 'perspective, practices, and events not easily obtained through other qualitative methods'. (Refer to Appendix E for example of document analysis)

3.7 Touchstones for trustworthiness

Floden (2007) and Malterud (2001) describe the tenets of quality and rigour as distinct dimensions of the evaluation of quality research. Floden (2007, p. 505) suggests that judgement made on quality focuses on whether the study addresses a "question of broad interest and social significance". In my understanding it determines whether a study addresses an intellectual puzzle that is "important to scholarly knowledge or to policy and practice, or preferably, both". My assumption is that this exploratory study will make a contribution to the body of scholarly knowledge that is significant for policy implementation and significant for practice. Floden (2007, p. 505), explains that issues of rigour are those that the study employs to "guard against many threats of validity". To address touchstones of rigour in my research study I attempted to clarify and provide a clear justification for the methods used and to respond to the trustworthiness of the findings. It is my intention to provide adequate evidence in order to give credence to this study as one that pursued sound methodological rigour and can withstand an analytical defensibility of qualitative research.

3.7.1 Audit trail

The research design also attempted to pursue an audit trail by showing detailed, transparent and reliable methodological processes. I provide extensive access to all processes of documenting this study: raw data, analyzed data, data-collection instruments, research methods, decisions and activities in the relevant appendices (Sandelowski, 2000). Thedetailed audit trail enhances qualitative issues of credibility, transferability, dependability and confirmability and places the study firmly beyond verisimilitude perceptions (Tobin & Begly, 2004).

3.7.2 Case-to-case transferability

The focus on selected sites could raise validity issues with respect to the transferability of the findings. To overcome this threat, I adopted the strategy of selecting different schools from socio-culturally diverse settings for in-depth study. I also made a concerted attempt to use various data collection methods and instruments that would strengthen the notion of triangulation and thus yield findings that would suggest that the study investigated what it was meant to (Multerud, 2001; Berg 2007). In the previous sections I made an in-depth account of the various methods of data collection which, coupled with elaborate and detailed reflections, provides ample description of the context of each site and the description of the units of analysis. This in-depth account, coupled with the advantage of using maximum variation sampling, may facilitate and promote case to case transferability (Yin, 2003).

3.7.3 Credibility

Yin (2003) refers to credibility as the extent to which the researcher captures and represents the reality of how things really are from others' (informants and fellow researchers) standpoints. Credibility through triangulation of the descriptions and interpretations was continuously accomplished throughout the study. Credibility of the findings was also accomplished through in-depth data collection that was sought from a wide range of different, independent and different means; pilot study, interviews, observations, field notes, informal interviews or casual discussions and

document analysis. The prolonged engagement in the research field allowed for data to be captured in the natural settings of the participants, but more important is that valued judgements that are made were due to the level of consistency at the research sites over a period of time. This allowed for observed similarities and differences, and judgements that are made remained the same over time and thus supporting the notion of dependability of findings.

3.7.4 Confirmability

The trustworthiness construct of confirmability was achieved by employing a strategy in which the interview transcripts and the findings were fed back to participants. The process of member checking was to ensure that the findings represent a reasonable account of the participant's experience (Graneheim & Lundman, 2004).

3.7.5 Width and depth of study

Hoepfl (1997) and Patton (1990) state that sampling errors may occur due to distortions caused by insufficient depth, lack of breadth, and changes over time in the data collection process. I attempted to address these issues of distortion (Mouton, 2001), first through the triangulation of various sources of data whereby greater research depth was achieved; second, greater breadth of the research was achieved through a variety of sampling sites and the inclusion of a greater number of participants at each site in the study; third, as participant observer I attempted to prolong my visits to school beyond the intermitted scheduled visits by extending school visits and observing lessons through more than one school term. According to Gerring (2004), "a single unit observed at a single point in time without the addition of within-unit cases offers no evidence whatsoever for causal proposition". I also understand that my observations as a single researcher are limited to my own perceptions and introspection, and my presence in the research field may influence the behaviour and speech of the participant. However the prolonged engagement at each research site may help to reduce this effect (Mays& Pope, 1995).

3.7.6 Retest reliability

To promote retest reliability I meticulously maintained records of interviews, observations, field notes and a detailed explication of the process data analysis (Tobin & Begly, 2004). I also indicated above that my role as a researcher is to produce a plausible and coherent explanation of the phenomenon under focus. The use of qualitative software analytical tools (CAQDAS), digital video and audio recording enhanced the accuracy with which the analysis of data was achieved. More significant is that the electronic transcripts, reports generated by Atlas.ti™, digital formats of video observations and audio recordings are available for subsequent analysis by independent observers.

3.7.7 Researcher reflexivity and researcher role

I turn to the work of Multerud (2001), who describes a criterion for validity as researcher self-disclosing their basic biases, beliefs and assumptions. I also understand that in trying to understand the 'other' we learn about 'ourselves' (Fontana & Frey, 2005). It is the researcher's personal value system that is under scrutiny and that shapes the inquiry. Without having to repeat myself here, I refer to the reflections in the appendix (Appendix C13) in which I acknowledge and describe my beliefs, biases and preconceptions as I enter the research process. I also suggest that where possible I attempt to 'bracket' those biases and preconceptions as the research study proceeds (Ahern, 1999).

My role as a researcher is described most succinctly by Glesne (2006), as that of a researcher as learner. Having this view in the research field culminated in my ability to reflect on all aspects of research procedures and findings. Glesne (2006, p. 46) posits that 'as a learner you are expected to listen'. This is supported by Ponterotto (2005, p. 131) as he refers to the researcher as a "would-be knower". Often there were days in the research field when I was unsure that my reflections of what I was observing or hearing would lead to anything significant. However, there were more days that I felt optimistic of my reflections but not certain of how they would all fit together - (data collection; audio; video; transcripts; coding; reflections; analysis).

Getting mixed messages about my progress from my supervisor and co-supervisor, accompanied by feelings of guilt about family neglect, all created immense anxiety in my role as a researcher (Glesne, 2006). I took solace in understanding that this is "normal" and my supervisor's words that"things do get messy".

3.8 Summary

In this chapter, I describe the meta-theoretical and methodological lenses that guide and underpin this study, namely the social constructivism theory and the qualitative paradigm respectively. I also describe the qualitative methods and instruments that I employed to garner data. Furthermore I explicate why I succumbed to a grounded-theory data method to analyse data content as text in an attempt to explore how teachers respond to ICT policy on education. Finally I proffer criteria that attempt to enhance the trustworthiness of the study.

In chapter four I turn my attention to the findings and interpretation of the data. I also engage with the literature to elucidate my findings in the context of international debates.

Chapter 4

Findings and discussion of results

What are the e-education policy implementation practices in teaching and learning?

4.1 Introduction

In this chapter I present and illustrate the findings that emerged from the data collection process outlined in chapter three. I elaborate on the themes that emerged from data analysis after interviewing teachers. The purpose of interviewing teachers and observing them in their classroom practice was to explore how they appropriate nationale-education policy on ICT in their teaching and learning repertoire. The themes that emerged from the data analysis led me to analyse the findings according to three categories. In the first category, I noted how teachers interpret policy. Second I report on the voices of teachers' experiences as they implement the e-education policy in practice. The third category describes the narratives of teachers' practice on how ICT influences learning in classrooms. Responses of teachers to the e-education policy and their actual classroom experiences represent my primary focus. Although I interviewed teachers at three different schools, the significant themes are presented collectively. I present the utterances of respondents as verbatim quotations in text boxes to underpin the themes and sub-themes. I used inclusion and exclusion criteria to define each category as unique from other categories.

4.2 How do teachers interpret policy?

I approached teachers' interpretation of policy from two different coding dimensions. The coding was done to elucidate responses of teachers when they applied policy in either a "readerly" context or in a "writerly" context (Bathes, 1975). Whether the teacher is "readerly" or "writerly" is not inherent within the policy text, but is vested in the interactions between the policy text and the teacher. In simple terms according to Helsby (1995) the teacher may opt to be unquestioning and accept policy

regulations and thus demonstrate "readerly" texts, or (s)he can resist and attempt to challenge and reinterpret policy and thereby demonstrate a "writerly" characteristic.

4.2.1 National curriculum policy: "readerly" or "writerly"?

"It is prescribed. I cannot, what I can do is collect little bit, and broader little bit, but I have to stick to my, the policy" ; "Putting it on paper and saying you have to do this"

Inclusion Criteria	National Curriculum Policy; Teachers and principals as re-interpreters of policy; Teachers and principals applying policy as mandated.
Exclusion Criteria	National e-education policy.

In the context of this study, principals and teachers applied the National Curriculum policy by adopting a "readerly"or "writerly"position. Teachers responded to implementation of the national curriculum policy unquestioningly and seemed to accept policy as it is intended. This "readerly" stance seems to emerge as a result of focussed support, policy workshops, policy directives and sustained school visits from the district office.

Two teachers, one in a well resourced independent school and the other in a poorly resourced township school, suggested that they do not have much say in the manner in which the National Curriculum policy is applied. Although teachers applied the National Curriculum policy, they saw it as being restrictive and thus it limited the integration of ICT into the curriculum. Both teachers indicated that they were obligated to follow the National Curriculum policy as required, with little or no freedom to interpret it from their own perspective. This township school teacher explained his obligation to work within the confines of the National Curriculum policy.

> *Well with regard to our learning area policy, technology policy, I don't have much say. It is prescribed. I cannot, what I can do is collect little bit, and broader little bit, but I have to stick to my, the policy, the core content they even give us the core content…We don't have freedom because we have set content which is prescribed so youcan't do your own thing. But I'd like to have more freedom because I have a lot of ideas that I want to utilise.*
> *(P 2: School A - Teacher 2.txt - 2:26 (181:183)*

The township school technology teacher narrated how he adheres to the requirement of meeting the learning outcomes as delineated in the National Curriculum policy, before venturing into ICT integration.

> *Well obviously you will be looking at the learning outcomes [referring to the policy document on NCS], it has to meet the expectations of the curriculum. So I try to, and of course you have to do it at their [learners] level. There are some interesting things that you can download that is way above their level and it doesn't benefit the child. Especially looking at the junior phase that we're in and ja through experience. You'll test something, you'll try something it might work it might not work. And then you have to adapt.*
> *P2: School A - Teacher 2.txt - 5:60 (479:485)*

This teacher at the township school voicedhis dissatisfaction with the National Curriculum policy that was prescribed. He seemed to be of the opinion that this prescription of policy did not address local needs and inhibitedICT implementation. He narrated his concerns:

> *Yes... yes I'd like to move away from that 'passed-on' content which is prescribed. It doesn't correlate and neither does it satisfy my needs nor the learners' needs. They need an environment that they can learn more.*
> *P 2: School A - Teacher 2.txt - 2:23 (171:176)*

In the one instance the principal of theformer model C school was unaware of the existence of the national e-education policy. He had an expectation that policy was in the process of being developed by government, and would eventually reach schools. However, this principal appeared to exercise his leadership role to promote the ICT vision of the school in the absence of any guiding policy. The principal also suggested that though the National Curriculum policy was unclear on ICT integration, he interpreted the national curriculum to be more adaptable to ICT integration in teaching and learning situation, hence he demonstrated a 'writerly' stance. He suggested that the National Curriculum policy was subject to his interpretation and thus viewed the policy as being adaptable to the use of ICT in teaching and learning, he explained:

4.2.2 E-education policy: "readerly" or "writerly"?

"We're making it up as we go along. We're using our own stuff"

Inclusion Criteria	The e-education policy. Teachers exercising agency, interpreters and constructors of policy. Teachers as appropriators of policy.
Exclusion Criteria	Policy as prescriptive and less open to interpretation.

Most teachers in this study were aware that a national e-education policy existed, however, they were ignorant of the contents of the policy. Consequently teachers did not interpret the policy and thus, it was difficult to conclude whether they were "readerly' or "writerly" in their approach to policy interpretation. A maths teacher at the former model C school expressed the view of most teachers in this study with regard to her knowledge of the e-education policy:

> *I haven't seen it [e-Education policy] [laughs], I haven't seen it haven't been through it but know about it that there's a white paper on e-learning, that's at National [level]. At district level, I don't think there's any, I haven't seen it.*
> *P3: School B, teacher 2.txt*

Another teacher at the township school claimed that he heard about the e-educationpolicy at a workshop "Yes, the White Paper isn't familiar to all educators. I heard of the White Paper when I went to e-learning exhibition station", however, he too was unaware of the contents of the e-education policy.Most teachers seemed to desire some policy implementation support and expressed the need to be guided by policy requirements. Hence, they adopteda "readerly" stance. The concern expressed by a teacher at the former model C school was that he would like to have had access to more structured guidelines on how to implement the e-education policy.

> *Look we've got that White paper [e-education policy], but something more better and more…that explains it better and more structured.*
> *P 3: School B - Teacher 1.txt - 3:59 (714:722)*

A maths teacher at the former model C school responded to policy implementation by suggesting that she preferred to apply policy as it was intended and thus represented a policy "readerly" stance. This teacher also suggested that the district office should be

forthcoming in mandating how the policy should be implemented, with appropriate guidelines to schools in general and teachers in particular.

> *Putting it on paper and saying you have to do this. Ja, just like the way they do with textbooks. Or give a list of open source websites that's accessible to the teachers, that they[district]actually went through and say we've put our stamp of approval on it.*
> *P 4: School B - Teacher 2.txt - 4:126 (1039:1041)*

In the absence of their knowledge of the e-education policy it would seem that teachers still integrated ICT into their teaching practice. Teachers were instrumental in developing and designing their schemes, curriculum or policy documents to suit their own pedagogy, institutional needs and local ICT context. Although there was an expressed desire to have access to more tangible policy, teachers nevertheless relied on their own professionalism in developing an unwritten policy that integrated ICT into their teaching and learning practice. Whilst the national curriculum policy seemed to be "cast in stone", teachers appeared to be developing a school e-education policy according to their own understanding and professional experience.

All teachers in this study developed their own learning programmes (schemes of work) to incorporate ICT into the curriculum and developed ICT literacy attainment levels for each grade. Of the sample of six teachers, only one teacher at the former model C schoolappeared to be knowledgeable of the content of the e-education policy. He indicated that he "browsed" through the e-education policy. This teacher adopted a "writerly" stance to policy interpretation as evident from the following:

> *We used it [e-Education policy] when we drew up our schemes…We try and fit it [ICT] into the curriculum…er..so that it's got to be part of the curriculum.. ja…ja what they[teachers] busy doing…ja*
> *P 3: School B - Teacher 1.txt - 3:25 (300:301); 3:59 (714:722)*

At all three schools in this study, teachers appeared to prioritise achieving the learning outcomes as prescribed by the National Curriculum policy. However, once this was accomplished these teachers expressed their freedom to incorporate ICT into their teaching practice by virtue of their own understanding. These teachers seem to act

professionally by determining their own teaching methods and strategies for ICT integration. Two teachers, one from the independent school and the other from the inner city school, expressed their views in this regard:

> *100% total freedom [emphatic]. There's no prescription there's no, er I can use anything I want. So it's not er, in our school we focus on just being able to reach the outcomes, but how you get there it's totally up to you.*
> *P 5: School C - Teacher 1.txt - 5:22 (195:197)*

> *Well we don't use text books... so for me I like I said, it is very open I decide...there is no limit here…you have to do it this way you have to do it that way. We have our work schemes we have our lesson plans we have to cover our LO's [learning outcomes] and that's it and oh the assessment standards have to be met and they have certain guidelines…you want to use a PowerPoint presentation…that's up to you.*
> *(P 4: School B - Teacher 2.txt - 4:47 (362:369)*

Some teachers, due to their level of frustration at the lack of policy support and policy directives, initiated their own need to develop policyas is evident from the voice of the maths teacher at the former model C school "We're using our own stuff. They [district] don't give guidelines, I don't think it's fair". Thus, the non-existence of clear policy guidelines seemed to have led teachers to be guided by their professionalism to define their own policy implementation goals. The mathsteacher of theinner city school responded to how the district's policy vision and goals could be appropriated and implemented. The protest by this teacher serves as an exemplar of concern expressed by all teachers in this study.

> *There needs to be a link. We don't know what they [district]want, we're making it up as we go along. We're using our own stuff… It's not like they [district] have it all lined out like the portfolios, you have to have this, this and this in your portfolio. They don't say we want this kind of teaching, and…*
> *P 4: School B - Teacher 2.txt - 4:136 (1075:1080)*

A maths teacher at the independent school suggested that because there appeared to be no specific policy, guidelines or directives on how to integrate ICT into the

curriculum, he had initiated his own approach to integrate ICT into his teaching practice. He had found a way to overcome systemic constraints in the use of ICT in his teaching and learning through his own initiatives and classroom practice.

> *It [ICT use] can't take time away from the schedule [teaching]so experience what I can do. As for the content, I can choose what I want... I have become a renegade I'd rather rush in the week ... so that we can incorporate [ICT] ... it's nice for learning and also fun. It [ICT] helps them understand that maths isn't war. Kids are kids so I make it fun to learn.*
> *P 6: School C - Teacher 2.txt - 6:22 (333:337)*

Principals at the identified research sites, however, were ignorant of the e-education policy and expressed the need for district and provincial guidelines on how ICT should be incorporated into the school's teaching-learning environment. All three principals in this study explicitly indicated that there is no guiding policy. The principal of the inner city school argued that it was the internal policy of the school that determined the extent to which ICT is used in teaching and administration practice.

> *And the usage of it and why this and why that and the training and government policy. Because there's no I don't think there's official GDE [Gauteng Department of Education] policy for that. Schools develop what they have and they usage of that and the why. With your policy[holds his hand in a fist position]you also got a hold on what's happening in the classroom, if the policy says marks must be e-mailed, assessments must be done in the computer centre and things like that.*
> *P 8: School B - Principal.txt - 8:26 (344:346)*

The principal of the independent school echoed the same sentiments as that of the above public school principal in his account of the schools' internal policy that guides the use of ICT in curriculum delivery.

> *Yes, we encourage it. I don't think there's policy that says we must use it but it does make learning more exciting and improves learners' attention. There is a section in the policy [schools' ICT policy] that deals with use of information technology in your classes and teachers can use that as base to ask for ... a projector or whatever may be the case.*
> *P 9: School C - Deputy Principal.txt - 9:17 (98:103)*

In all three schools the principals seemed unaware of the national e-education policy. They made no direct or indirect reference to it, not even when prompted to indicate which policy guides their ICT institutional teaching and learning practice. The principal of the former model C school offered the following account of his understanding of the National Curriculum policy and the role of ICT. He seemed to portray a 'writerly' stance to interpretation of the National Curriculum policy.

> *No it's [how to integrate ICT in the curriculum] not spelled out, it's not there [in policy]. But I think the way we do it and how we use it, when I think back now definitely more than ever before. Ja, the previous things were all referred back to a specific text book, it's [policy] open now. But the answer we get lately is that you must do is right for your school. And do what's best for your learners…You mustn't do it because policy says so. What is the reality, if this is the reality, then policy must change. The reality is we need this [ICT]. So the policy can't say you must work with the text book, then the policy [holds hands in a fist like manner, referring to it as policy] must change, so that is room for us.*
> *P 8: School B - Principal.txt - 8:62 (728:732); 8:47 (573:575*

The independent school did not appear to face the same curriculum implementation policy demands as experienced by public schools. The principal stated his case in this regard "in independent schools we can forge ahead [with] what the government has prescribed as a periphery. We get more leeway in terms of what is best for the learners". Although the independent school principal acknowledged that there is no official e-education policy that guidedhis decisions, he suggestedthat the independent school had the privilege of changing the curriculum policy to suit the best interest of their learners by observing national education policy only at the 'periphery'. The township school, however, seemed to be confined to more stringent policy control. The principal of thetownship school suggestedthat district requirements must first be met in applying the national curriculum policy, after whichteachers took the liberty to incorporate ICT in the way they deemed fit. He explained:

> *What they [teachers] normally do is they get the guidelines [national curriculum] from the facilitator [district official], in terms of what should be in the learning programme and work schedules and do their planning from that. They [teachers] can also change to suite our own specific needs.*
> *P 7: School A - Principal.txt - 7:25 (175:178)*

In the interest of fostering the integration of ICT into the school curriculum, teachers (through the leadership of their principals) apparently initiated and created their own policy by adapting curricula to incorporate ICT. This response was in accordance their contextual experience and their ability to foster the local context in which ICT was integrated into the curriculum. In a bid to challenge policy directives the principal of the inner city school changed policy to suit ICT issues relevant to teaching and learning. This principal portrays a 'writerly' stance and gives an explanation of his well reasoned argument of how the writing policy of the school had changed to accommodate the inclusion of ICT to cater for the socio-cultural context of the school.

> *We just changed our writing policy as well, doing print only. Why cursive? [cursive writing] the juniors [meaning Foundation phase] say ja well it's fine motor skills, gross motor skills all that cursive. The teachers now prefer print. Because they say they spend three months, six months in grade three to four, teaching them to write cursive and then a year later the teacher in grade five says read the writing in print. Theonly thing our children see when they open a magazine, newspaper anything, textbook it's print. When they work now they work here [shows a textbook], its print. So why waste 6 months of a person's life if the print is a neaterprint. And we see a lot of our children, that is again our embassy children, a lot of our embassy children arriving only write print, ja [emphatic].*
> *P 8: School B - Principal.txt - 8:177(996:998)*

4.3 Teachers implementinge-educationpolicy inpractice

Against the background of the former category, I turn my focus to the teachers' narratives on how they knowingly or unknowingly implemented the e-education policy in their actual classroom practice. The analysis of the data results indicates that the whole sample of teachers in this study was implementing the e-education policy in their day-to-day teaching practice unknowingly. These teachers displayed huge interest in the use of ICT in their teaching practice and their voices revealed numerous ways in which they seemed to implement the e-education policy. The data suggests that teachers appear to be acutely in tune with integrating ICT into the curriculum and the numerous pedagogical issues at play. The following eight sub-categories became apparent and form the framework for thediscussion in this section. First, teachers

displayed a teaching philosophy that demonstrated positive attitudes to the use of ICT. Second, teachers established emergent pedagogies. Third, they tended to be innovators and trendsetters in the manner in which they exploited new ICT. Fourth, teachers used ICT to collaborate, learn and share information. Fifth, teachers recognised the important role they played as professional drivers of ICT integration. Sixth, teachers hadthe strong will and determination to improve themselves. Seventh, teachersused ICT for administrative purposes;and eight, teachers developed learners as independent knowledge seekers.

4.3.1 Teachers' beliefs and attitudes on the role of ICT

"And if you don't use or stay up with technology we will miss certain learners"

Inclusion Criteria	Teacher's identity, personal beliefs and attitudes, vision and philosophy of teaching, professional conviction.
Exclusion Criteria	Institutional and policy influences, socio-cultural influences.

At all three schools teachers displayed a positive attitude to the use of ICT in their teaching and learning practice. Participating teachers seemingly realised the value of ICT as a tool to re-invigorate their teaching practice, and acknowledged that ICT could open new opportunities to enhance learning. These teachers also appeared to recognise that the use of ICT as a tool needs to be executed responsibly in the school environment. Above all, these teachers do not want to be coerced by policy to use ICT, they want to use it on their own terms and in their own pedagogical way.

One teacher at the township school reflected on the manner in which ICT could be used to stay abreast of current technology which learners are familiar with. He seemed to suggest that it is imperative for teachers to meet the challenges that technology brings to the classroom, particularly since learners seem to be engaging uninhibited with technology.

> *And if you don't use or stay up with technology we will miss certain learners, there are other learners that are acquainted with technology and they learn through this medium of electronics.*
> *P 1: School A - Teacher 1.txt - 1:12 (149:151)*

> *So for us to grow, for us to give meaning to teaching is very important. Teaching in itself is a tool, so I see ICT computers as a tool for other tools.*
> *P 1: School A - Teacher 1.txt - 1:11 (147:148)*

The same teacher reflected on his attitude as a professional user of ICT and felt that it should be used as a tool for curriculum integration that supports teaching and learning with relevant information and not merely as a novelty tool.

> *You must evaluate your content, how they respond and you must also evaluate your content with regard to your assessment and your policy and your learning outcomes and your assessment standards. I mean you cannot let your ICT run away with you [laughs] and you just fly away with irrelevant information, you know, checks and balances all the time.*
> *P 1: School A - Teacher 1.txt - 1:90 (554:561)*

The participants in this study appeared to desire some form of motivation to teach. They all seemed to suggest that the traditional approach to teaching had lost its lustre. However, with the introduction of ICT into the teaching-learning situation there is an opportunity to redeem their rightful place in the classroom. In both public schools, the voices of the teachers seemed to be in unison and reflected the need for creating new motivational methods and tools for teaching.

> *We need something to boost our energy …yes…ja. And I think it's[ICT] giving fun to teachers if they know how to use it.*
> *P 4: School B - Teacher 2.txt - 4:19 (152:153)*

Participant teachers in this study appeared to reflect sound professional attitudes towards the manner in which ICT could be used to enhance teaching. This township school teacher reflected on his understanding that the use of ICT brings forth a need for professional commitment and thorough preparedness for curriculum delivery. This teacher also seemed to suggest that ICT use could effectively address the need for different learning styles.

> *But you need to be prepared, and you need to be well prepared, when you design your lesson to see how you can cater for all those learning styles into the lesson. You need to be prepared. To know where to find the stuff and to use your tool [ICT].*
> *P 1: School A - Teacher 1.txt - 1:87 (526:533)*

The voice of a teacher from the independent school seemed to explicate his beliefs on the impact of ICT on teaching and learning. He saw the incorporation of ICT into the teaching environment as an eventuality that would occur irrespective of whether teachers accepted it or not. However, he suggested that teachers needed to 'evolve' with the process to give the advantage to the learner who is already adept with using ICT.

> *I think the days of black and white on a text book are limited. I can feel part of the evolution. And we can move to a stage where someone can better ourselves using IT… Just to use it for its potential. If this thing sits here and gathers dust then I'll be doing both myself and the kids a disservice. Perhaps me more than the kidsbecause they go home and play with their internet, play their video games with a pen pal from Germany at the same time while I go home and read a book. It's a goal toincorporate it [ICT] and it's a goal to evolve with it.*
> *P 6: School C - Teacher 2.txt - 6:4 (137:141)*

4.3.2 Teachers' emerging pedagogies

"It's [ICT] actually taken me back to re-evaluate how I teach the subject and material that I use in teaching the subject. Ja, so it has, it's taken me back revisited and re-evaluated, ja."

Inclusion Criteria	Teachers revising their original position on teaching and learning; Teachers subject and pedagogic knowledge; Teachers viewing ICT as integral.
Exclusion Criteria	Teachers using ICT with traditional teaching methods. Reluctance to adopt change.

Most teachers in this study indicated that ICT created an opportunity and a challenge for them to revisit their teaching styles and methodology in order to enhance their teaching practice. These teachers seemed to be enthusiastic about the opportunity that ICT offers to change or modify their teaching from a traditional approach to an ICT based teaching practice. All teachers in this study appeared to support the notion that

an ICT integrated approach has value in catering for different types of learners. Furthermore, the teacher participants in this sample also appeared to demonstrate their professionalism as negotiators and designers of curriculum content and acknowledged that ICT has the potential to bring the real world into the classroom environment. The remarks of a teacher at the township school reflect the sentiments of many participants in this study.

> *But the greatest advantage of ICT is that learners must experience the real world in the class. The class mustn't be a place where it is 'kunsmatig'[artificial] you know…And then from the learner's point of view it makes them see and the first time I tried I showed them bridges, different types of bridges, and there's a nice slide show on bridges you can see the unstable, there's the one hanging bridge that's moving before it finally collapses, the children like to see that. But, it's not animated, it's a film, a real snapshot or something like that. So that I usually show them.*
> *P 1: School A - Teacher 1.txt - 1:37 (248:250), (235:239)*

Jo, a technology teacher at the township school offered various examples of how ICT had changed his teaching pedagogy. He elaborated on numerous specific instances in which ICT had impacted and changed his teaching methods. This was also evident in my classroom observation[27] of his teaching practice. In one instance he effectively increased the font size to cater for learners seated at the back of the class. In his narratives, he described how ICT had impacted on his teaching practice. However, in his teaching practice he immediately requested to illustrate his point by demonstrating the effectiveness of ICT in the presence of his learners, allowing them to interact with him and the smart-board (see Figure 4.1, below).

[27] See Video clip: DVD-School A, lesson 2.mpg

Figure 4.1: Teacher changed pedagogy
A learner demonstrates to the class using the interactive whiteboard, a learner (seated on right) at the teacher's PC loads the appropriate lesson, and the teacher explains to the class.

> *It [ICT] also gives us the opportunity to use different strategies, teaching strategies you know. Learners that are more mathematically orientated, you can quickly take a drawing and put it in a mathematical form that is access that a computer gives you. Also what I love about the Smart board you can very easily go into depth with 3-dimensions, different dimensions with drawings, it give you colour, you can play with colour. It gives you access to different pens, you can draw using a paintbrush, the creative aspect.*
> *P 1: School A - Teacher 1.txt - 1:26 (206:211)*

This teacher also seemed to change his teaching technique in order to realise real value and innovation which he clearly expresses in his narrative of his experience.

> *And what I also like about ICT is the shows motion and sound at the same time. Something that I like to show them is a working, what do you call that?[simulation] I give them a questionnaire on that, the test is also based on the excursion and that is how I bring in the working of the engines and then I show them that slide show, and it has sound and they understand motion, pressure and compression and all that. So that was good…With regard to social science I did the rivers, I did the maps, er, er. Even History is nice, History yes, even the Koi-Koi, music and sounds you can use. The language, I played that for the children.P 1: School A - Teacher 1.txt - 1:52 (332:334);(215:216)*

All teachers in this study seem to be unanimous about new affordances that ICT brings to their teaching practice. One of the teachers at the independent school explained the manner in which ICT made him re-examine his traditional teaching methods. He appeared to have made a radical change from his conventional 'textbook' approach to one that encompasses and embraces ICT.

> *You know, you get in a comfort zone when you get into teaching the same subject area for year after year. Especially, when you do it with textbooks. And by doing that it's actually taken me back to re-evaluate how I teach the subject and material that I use in teaching the subject. Ja, so it has, it's taken me back revisited and re-evaluated, ja.*
> *P 5: School C - Teacher 1.txt - 5:50 (415:419)*

Although most teachers in this sample seemed to accept that the use of ICT in their teaching practice had culminated in a change in teaching methods employed, one teacher in theformer model C school issued a caveat. She believed that developing a sound pedagogy was a prerequisite to using ICT and explained that the use of ICT does not necessarily translate into good pedagogical practice.

> *ICT can't fix bad teaching you know it's not gonna help. If you're a bad teacher its[ICT] not gonna fix it.*
> *P 4: School B - Teacher 2.txt - 4:35 (285:286)*

An experienced grade six participating teacher at the township public schoolacknowledged that although his teaching pedagogy had changed because of his use of ICT, his basic teaching principles remained unaltered "Well the fundamentals remain the same I would say". He substantiatedhis claim by alluding to the need for teachers to be ICT competent as a requirement to apply the fundamental principles of teaching (see Figure 4.2, below).

> *Well the fundamentals remain the same I would say. The fundamentals remained, you move from the known to the unknown. From big to small, dynamic movement for you as a teacher. The fundamentals remain. But funny enough but you can only get to that stage, when you are acquainted with the thing [ICT], with the tool.*
> *P 1: School A - Teacher 1.txt - 1:69 441:445)*

Figure 4.2: Teachers' emerging pedagogies
Teachers change pedagogy to a learner centred approach.

4.3.3 Teachers as innovators and trendsetters in the use of ICT

"You know as soon as we give canned solutions to everybody, we're back at where were ten years ago."

Inclusion Criteria	Teachers as technological leaders; Creative thinkers, futuristic in outlook, initiators, experimenters, designers, risk takers and agents of change.
Exclusion Criteria	Teachers uninspired by ICT; teachers as technophobes and resistant to ICT use. Teachers as uninitiated individuals

The voices of participant teachers seem to suggest that they are eager and willing to experiment with the possibilities that ICT brings to the classroom. Teachers appear to push the boundaries in using ICT in their classroom practice, by employing innovative means to change their teaching practice as reflected by a mathematics teacher in the inner city school.

> *I think in terms of ICT its me…I've trained myself also…I've looked and I got ideas from the internet as well how people are using ICT. And I come and apply it and I do it. There's no such thing as listen this week you must use a web-cam video thing or this week you have to use I pods or whatever or you have to use a pod cast or PowerPoint. The PowerPoint thing I made it myself because I really didn't know how to do it.*
> *P 4: School B - Teacher 2.txt - 4:49 (387:394)*

Here a teacher at the independent school narrates how he employed ICT as a new pedagogical practice in his classroom. Prior to this comment, he tells the story of his

transition from using overhead projectors to ICT and how this new technology has opened new teaching possibilities.

> *And then when I found PowerPoint a whole new world the opened, because now you can do it visually…I used programs, where if I had a student that had fallen behind, instead of wasting other students' time, I would put them on computers to practice and revise.*
> *P5:School C-Teacher 2.txt*

In all three schools participant teachers appeared to exhibit a sense of adventure in trying out different teaching strategies to incorporate ICT in their teaching practice as indicated by the narrative of a teacher at the independent school. He explained how he utilises propriety software to teach second language children, tenses in Afrikaans[28].

> *As a teaching [meaning opportunities for teaching] I use my interactive boards quite comprehensively, and with PowerPoint again to bring over specific concepts to the children visually. And one of the things I'm doing quite [does not complete], I feel is very successful is 'tenses in Afrikaans', especially with the English child that its a bit of a problem, but using PowerPoint and animation in PowerPoint you can actually show them where and how it changes, so they enjoy it. So for your visual learner it makes it more interesting and easier to learn.*
> *P5: School C - Teacher1.txt :*

The same teacher described an open-source software program that allows teachers to develop their own learning objects (lessons) for learning management systems. He protested against schools and teachers that used learning activities designed by other teachers or institutions, and remained steadfast in his belief that it should cater for local context and needs.

> *Ja, but the problem with that is some want it because they [other teachers] don't want to develop it themselves. As eXe-learning [referring to open source software], it's a tool that there but you still have to develop it for your needs and your contexts, and that's the way it should be. You know as soon as we give canned solutions to everybody, we're back at where were ten years ago.P 5: School C - Teacher 1.txt - 5:73 (611:615)*

This teacher also seemed to suggest that teachers have to be ICT pace-setters for the purpose of improving the teaching-learning process. The teacher was of the opinion

[28] Afrikaans is one of eleven official languages in South Africa

that the new technology innovation should be used to facilitate curriculum delivery and promote learner understanding and not be used merely as new a teaching tool without purpose.

> *You know, education when you look from the days when we were at school, we thought that the overhead projector was 'bees knees' and er, but technology is changing and if we don't em …use the technology and give our children the benefit of what is out there we doing them a disfavour. So it's not the sake of just using technology for the sake of using technology, but it must have a further purpose of helping the child understand what is happening out there…, but ja, I really enjoy bringing that into the classroom.*
> *P 5: School C - Teacher 1.txt - 5:19 (163:170)*

The voices of teachers from all three schools seemed to suggest that teachers realise the important role ICT plays in developing learners that are competent for life beyond school. Of significance is the observation that teachers appeared to place high relevance to the use of ICT and the skills that learners will require as they venture into the workplace beyond their school years. A principal of the inner city school seemed quite moved by his commitment to provide optimum opportunity for his learners.

> *So that made us start thinking about the children in the school today what will they do one day? And that just triggered our minds all the time to say we have a school like this, now we go to keep it up. You can't have a school like this and take steps backwards, you've got to take it forward with what you have on the table now.*
> *P 8: School B - Principal.txt - 8:17 (229:233)*

The narratives of both principals and teachers apparently exhibit strong images of their vision of the role that ICT could play in a local context, national and international arena. Both teacher and principal seemed to recognise that ICT in education could also develop learners to be internationally competitive. A principal of one of the public schools(inner city) explained:

> *Principal: Ja, it was not long ago that we spoke about the year 2000, when we got to 2000, we spoke about 2010 it's next year, I mean 10 years [clicks his fingers, for emphasis]. They guys are already talking about 2020 I mean it's there [clicks his fingers again, for emphasis]. But you must move on with the time, because there's different expectations from 2010, there's different expectations from 2020.*
> *P 8: School B - Principal.txt - 8:174 (959:962)*

> *Teacher 1: But the greatest advantage of ICT is that learners must experience the real world in the class…The classroom must be made as real as possible to what the learner's experience home, and eventually greatest is preparing them for the workplace... But to make them realise that this thing will be a part of their working life in a big way. Office, factory, even if you clean floors you know, it's an electronic gadgets.*
> *P2: School A Teacher 1.txt.*

The same principal narrated his concerns that schools need to look to the future and schools need to be proactive to provide an education for the "learner of tomorrow". He talked about teachers and principals seeing the "big picture" and that that "The bigger picture is not the school's premise, we not teaching for today, we teaching for life."

> *So ja, I dare say those children are on old school desk at the moment, and the world is opening it's a global environment. You can't say don't worry we just at the bottom of Africa. Lets solve our problems, for these children it's globalization, they might not even work here they might work in another country. Or they might work here, but they might work world-wide, because they got a cell phone and a laptop, they are preparing for that…Principal:(continued) Like I say children in primary schools now, don't even know what they going to do one day. There will be jobs that do not even exist at the moment that they will be doing. So, who must equip them, we must equip them….And off course is to power and equip the present generation,because the article I read the other day that says that "80% of these children at school today are preparing themselves for jobs that do not yet exist" [phone rings] So what are preparing themselves for? [phone rings again] We need to gear them and give them the tools and equipment and opportunity to do that for later life. Ja to empower them and to equip them for life. Ja, not to teach for today but to teach for life.*
> *P 8: School B - Principal.txt - 8:174 (959:962)*

The township school teacher had the same vision of what is expected of schools and teachers in particular. Here he described his expectations of the goals of teaching ICT.

4.3.4 ICT initiating teachers as collaborative learners

"The other day, the Social Science teacher came to me and wanted to know something about the earth. We went to Google Earth and we found interesting facts about the earth."

Inclusion Criteria	Teachers working together over time; Sharing knowledge, skills, pedagogy, understanding, values, goals; Sustained partnerships and contact; joint activities. Various nuances of teacher collaborations.
Exclusion Criteria	Teachers as independent individuals; self learners. Student learning across disciplines.

In all the schools in which data was collected, diverse collaborative learning experiences were evident. Teachers received capacity and support in respect of ICT integration from numerous self-initiated collaborative learning experiences. Such collaborative learning seemed to exist in a number of forms. First, teacher-teacher collaboration existed between two or more teachers in the same school. Second, teacher-teacher collaboration between teachers from different schools was evident. Third,school-school collaboration occurred between two schools. Fourth, teacher-learner collaborative learning experience manifested. Fifth, schools and teachers did not see the schools' physical location as a limitation to collaboration and had aspirations to collaborate between local, national and international schools. Sixth, teachers expected the local education district to serve as an e-learning resource hub for all schools to collaborate as well as share resources and teaching expertise.

Teachers within the same school seem to find that the use of ICT culminates in the need to collaborate with each other more often in the same learning area fields. Teachers also appeared to interact with each other across curricula fields of specialization, which was different to their previous experience. Through the use of ICT the sharing of experiences, resources and pedagogy seemed to move teachers to new collaborative levels as professionals within the same institution. A science teacher at the former model school narrated how she cooperated with another science teacher in sharing resources and pedagogy.

> *I do collaborate, we are two teachers teaching science she has one class, I have one class. We sharing science. I would go and find information, we did a water cycle, I would say listen you can take your class to the media room you can show it to them. They go in and show it. I've done it when we did the lab, when we had safety rules, I did a PowerPoint presentation about safety rules andworking in the laboratory, each on took our classes there and we showed it to them. Like I said the excel work I got it from another, teacher she showed me how to use that and I trained another teacher. So we passing it on.*
> *P 4: School B - Teacher 2.txt - 4:78 (713:720)*

At the township school, a science teacher explained how the social science teacher sought his help in the teaching of geography.

> *Yes! Each and every learning area, we can actually utilise it. The other day, the social science teacher came to me and wanted to know something about the earth. We went to Google Earth and we found interesting facts about the earth.*
> *P 2: School A - Teacher 2.txt - 2:28 (198:200)*

A newly recruited teacher at the inner city school told his story of how he works in partnership with teachers from other schools. Although the nature of the district cluster meeting is for particular learning areas, informal sharing of ICT teaching ideas and methods would take place between teachers.

> *When we have an EMS [Economic and Management Sciences] meeting we will talk about the computer centre or when we have an athletics meeting I'll know that that guy there runs the computer centre so I'll sit with him and chat to him and say how do you do this and how do you do that. So it is not formal about ICT.*
> P3: School B – Teacher 1.txt

Theprogressive principal of the former model C school narrated how ICT technology can be used to share human resources such as teacher expertise between schools. He explained how the use of the internet could facilitate this collaboration concept.

> *If you come on a Friday or Thursday and you will see a virtual lesson. That's what we are trying to do through KAD is to have a virtual teacher, where my math teacher will teach math one morning for Brooklyn and Waterkloof. While she is doing her lesson in her class via skype she will do the same lesson for Brooklyn Primary and Waterkloof. Next week, that technology in that very school, so when that teacher does structures there, four schools will link up with skype, and that top teacher there on structures will teach that lesson to four other schools as well.*
> *School B – Principal.txt*

The same desire to collaborate with other schools is expressed by a teacher in the township school. This teacher envisions the rich nature of school-school partnership through the use of the ICT technology. The idea of sharing of teacher pedagogical expertise, resources and lessons is a central thread that seems evident from all teachers in this sample.

> *A challenge I would say that I would really love us to take on is to have learners via the internet, via the Smart Board to communicate, to have live lessons. And with internet and with technology available, with a camera, you can have a camera, not a data projector, connected to the lesson , it records and immediately another school can see what we are doing, we can share.*
> *P 1: School A - Teacher 1.txt - 1:62 (392:396)*

In addition, the use of ICT in schools appeared to create opportunities for schools to explore collaboration with other schools across various socio-cultural, socio-economic and geographical boundaries. Principals and teachers seem to identify benefits of sharing resources, skills and expertise between schools. ICT resource scarce schools appear to be open to the idea of using ICT to communicate and share with other schools perceived to have fewer resources then themselves. The independent school teacher talked about his experience and collaboration with a poorly resourced public school.

> *I am involved with Irene Middle School, and we [school] trying toget a computer lab for them, because the Gauteng-on-Linelab is not working. And even the new one they put in is notworking, so they are sitting without those technologies andtheir children are not getting the benefit of being able tousing those technologies.*
> *P 5: School C - Teacher 1.txt - 5:12 (132:136)*

In the township school, the technology teacher elaborated on the collaborative experience of his school with an independent school. Initially the collaboration was based on technical support and eventually developed into curriculum support. This township school exploited many avenues to foster collaboration between other schools. Situated in a low socio-economic environment, the school sought partnerships as a means to uplift and improve its ICT practice.

> *We are in partnership with the German school…Yes, it's a private school. We met once a month to discuss computers as well as ways to move forward but that has stopped. We wanted to know to how to set up a computer centre andhow to manage it. At that time, we had computers but we needed them to tutor us and show us how to get the network running. Later on, they helped us with lessons for the whole syllabus starting from grade 1 to grade 7.*
> *P 2: School A - Teacher 2.txt - 2:39 (284:297)*

A teacher and the principal of the inner city school expressed their desire to take collaboration between schools beyond local, provincial and national boundaries. This maths teacher expresses her envisaged ideas with respect to creating international collaborative experiences.

> *There's so many things if you think about skype, you don't have to go out of this classroom, you can skype someone and say listen I have this problem or did you receive the test? So the first step I thought was getting the school connected and then connecting you know…and I was always thinking outside, like I said at the seminar…and I said about the NEPAD schools in Africa…and how amazing itwould be if you could sit here and you link to a classroom in Uganda or Kenya..we are not connected to schools so we must still get connected to each other, and then go to a higher level and now we connect to other schools and now we go on further and connect to other countries.*
> P 4: School B - Teacher 2.txt - 4:29 (221:228)

The principal of the same former model C school narrated his vision of collaborating with other schools in an attempt to share teacher expertise and best practices. He also envisaged ultimately international collaboration between schools.

> *Using skype, I want to use the best math teacher in Pretoria to present a lesson here in my school, and my excellent technology teacher can do lesson for those children again. And to have communication with other schools nationally and internationally, where we can communicate and share ideas.*
> *P 8: School B - Principal.txt - 8:5 (141:147)*

The general perception from teacher responses in the sample is that teachers are not technophobic, but rather teachers seemed to be invariably concerned with being embarrassed in class due to the lack of confidence in the use of ICT in classroom teaching. However, in this study most teachers indicated that they are comfortable with collaborating with learners. In fact teachers acknowledged learners as resourced individuals, apparently accepting that many learners may be better equipped in the use of ICT than they are. This teacher-learner collaboration has emerged from the use of ICT and has culminated in promoting the teaching-learning process.

A grade six maths teacher at the independent school, indicated that he is comfortable with the collaborative assistance he obtains from his learners. He described his classroom ICT experience as one of mutual learning that enriches both himself and his learners.

> *Sometimes when I am stuck, they [learners] are the ones to help. I think it's exciting for them and they can enjoy maths so I don't see it as a barrier…I can relate to that. Whenever I get stuck, all I hear is, 'Sir! Click on the control panel ...'' and then I am sorted. They empower me and I empower them... itbecomes a good relationship.*
> *P 6: School C - Teacher 2.txt - 6:29 (416:418)*

From the excerpt above it seems as though teachers are comfortable with enlisting ICT technical help from learners. The narratives of both the teacher and principal at the independent school seemed to represent the voices of all teachers in this study. In

the first excerpt below, the deputy principal expressed his collaborative learning experiences with learners in his class.

> *It has opened up a situation whereby you can ask 'who knows how to do this?' and take the opportunity to learn. I have also had to enlist the help of my learners whenever I got stuck using the computer.*
> *P 9: School C - Deputy Principal.txt - 9:41 (207:211)*

4.3.5 Teachers as drivers of ICT implementation

"There's also the fear that it [ICT] might replace teaching, and I'm totally against that, I don't believe that it's ever going to happen. We still need the human factor wherever you go."

Inclusion Criteria	Teachers acknowledging their pivotal role as professionals; Past experience with policy; Teacher as a critical component of the didactic triad; ICT pedagogues; Teacher as an essential component of ICT-curriculum delivery; facilitators and mediators of learning; human and social actors; Blended learning.
Exclusion Criteria	Teachers as technocentric promoters; Teachers promoting online learning or virtual teaching and learning

Participant teachers from all schools in the data collection sample, both public and private schools appeared to be resolute that their roles as professionals will not be compromised nor diminished by the introduction of ICT into the school environment. In fact teachers apparently recognised their importance as professional drivers of ICT, bringing in the 'human element' in the teaching-learning environment. In his narration, this grade six language teacher at the independent school echoed the attitude of all teachers in this study.

> *You know, my problem with ICT, especially coming from that background, some teachers actually see it as something that it should actually take over teaching, it should replace teaching. There's also the fear that it might replace teaching, and I'm totally against that, I don't believe that it's ever going to happen. We still need the human factor wherever you go. I've being seeing that even in home schooling that they have the computer programs, it's not 100% successful because you still need the interaction. Er'm, I see it as something that's going to grow and it has to grow with the teacher wanting to be involved with it and not being forced to be involved with it.*
> *P5: School C – Teacher 1.txt*

Participant teachers reported that with the introduction of ICT into classrooms there seemed to be an enhanced need for teacher intervention and teacher presence. If ICT enriched classrooms are to cater for the personal needs of the diverse range of learners; slow, mediocre, gifted, orlearners with special educational needs, then human intervention to create didactically sound teaching-learning environments is a necessary. A grade six technology teacher at the township school expressed his thoughts on ICT enriched classrooms.

> *So that was a challenge to use it and remind myself that I'm still a teacher, I need to be aware of what's happening in the class. The slow learner and all that, so the human factor you need to blend it in with the tool[ICT], with the tool. But it has definitely enhanced the human aspect.*
> *P 1: School A - Teacher 1.txt - 1:70 (445:452)*

A participant teacher in a private school expressed his concern that student teachers do not seem to be ICT competent and suggested that new teachers entering the teaching profession could be leaders in driving ICT transformation in schools.

> *So that when a student [meaning newly qualified teachers] comes in they should actually be the drivers, and say we want this technology because we know how to use it, that we expect it. And if you have that expectation you will make it work.*
> *P 5: School C - Teacher 1.txt - 5:70 (586:591)*

4.3.6 Teachers' will to develop ICT competence and pedagogical skills

"I've trained myself", "as teachers there's many of us we want more"

Inclusion Criteria	Teacher's willingness to learn and improve; lifelong learners; personal commitment and interest; ICT skills and pedagogic knowledge.
Exclusion Criteria	Teachers improving for personal, monetary gain or promotion. Institutional capacity building; District and province capacity building.

All teachers in the data collection sample seemed to demonstrate a strong inclination to develop themselves so that they can use ICT more effectively in the classroom situation. Teachers appeared to take the initiative (and used their own available resources) to develop their ICT competence. Most teachers in this study, like the

maths teacher at theformer model C school used the internet resources to build personal and professional capacity.

> *I think in terms of ICT it's me. I think how I use it it's by my own discretion. I've trained myself also…I've looked and I got ideas from the internet as well how people are using ICT. And I come and apply it and I do it…(cont)There's nothing from the top [Government]… The PowerPoint thing I made it myself because I really didn't know how to do it…I love going on the internet and finding new things and so I started with that just going using it for worksheet purposes. And then I saw video clips and stuff like that you can use. I went to "teacher tube" and those things. So I saw there are things you can show in class.*
> *P 4: School B - Teacher 2.txt - 4:3 (24:29) ;(387:394)*

In some instances (the independent school and the inner city school), the principal and school governing body created opportunities for teacher development in subsidising training cost.

> *At the moment, nothing much because I haven't learnt something new in terms of learning a course but they are very open to new suggestions. In fact, they [principal and SGB] will sign the necessary forms and pay for you to get training if you request.*
> *P6: School C - Teacher 2.txt - 4:69 (637:641)*

However, in the case of the township school, teachers can improve their ICT competence, provided they do it at their own cost, or wait for the district office to react to the needs of teachers in the school improvement plan. All teachers in this sample seemed to demonstrate a significant enthusiasm to up-skill themselves in ICT. This teacher at the township school has also taught himself through internet resources and collegial support.

> *Since I started using ICT has made me think to myself that I have missed a lot, really! If I knew what I know now- I'd be very far. ICT works wonders for me and I have also shared the knowledge that I gained with my colleagues…Yes, I am also learning more & more... I learn something new about computers each day. It doesn't stop; the learning curve is steep…Yes. It's a progressive learning process from one stage to another stage. I am half way climbing the mountain*
> *P 2: School A - Teacher 2.txt - 2:40 (313:323); (133:134)*

The mathematics teacher at the inner city school articulated her desire to improve her knowledge on ICT. She narrated her story of how she improved her own ICT skills and her need to develop her ICT pedagogical practice.

> *You know work on WORD, as teachers there's many of us we want more. We want to be trained on how to design our own website. One of the things I learned, either through my ICT, that I done in university, and myself on pod-casting and these things I taught myself…I think they underestimate what there is and what teachers can do already…Ja just give us more information about it even. Even if it's offering us how to operate ICTs like multimedia in your class and ideas. But I want even more information…*
> *P 4: School B - Teacher 2.txt - 4:69 (637:641), (649:661)*

A teacher at a well resourced independent school expressed his enthusiasm to develop sound pedagogical skills. He described his eagerness to learn and use ICT in his teaching practice as a natural impulse.

> *I have always been opened minded. It a natural evolution, come next year at a time like this and I'll have discovered something else new. It started in high school as teachers would encourage us to take computer classes to gain the skill. We were just learning how to type. I am very glad, it been a snow balling effect since then.*
> *P 6: School C - Teacher 2.txt - 6:30 (421:427)*

At the same school another teacher explained the interest teachers demonstrate to use ICT in their classroom practice once they are given an opportunity to experience this first hand.

> *What is interesting is if you look at the, our school setup, in our preschool we do not have a turnaround of teachers, minimum turnaround…and when they started using the technology they grab it. And they saw the benefits. I must say to see what they doing in Afrikaans on those interactive boards are wonderful. Math as well, I think it's more suited to mathematics because you can visually stimulate them and show them. And drill and practice is brilliant on them [interactive white boards], one of the lessons you'll see tomorrow is specifically geared towards maths and how they use it in the classroom.*
> *P 5: School C - Teacher 1.txt - 5:46 (374:392)*

4.3.7 ICT defining teachers as administrative agents

"I just thought I could do better because, in the past, I would write my notes and put them in a file and the things got lost. Now, using the computer…"

Inclusion Criteria	Includes teacher's using ICT for administrative practices such as: curriculum planning and design, preparation of work, recording and reporting of assessment, managing of learner databases, tracking learner assessment, communicating, and procurement of learning materials.
Exclusion Criteria	Teachers using ICT for teaching and learning, or using ICT for personal use. Institutional administrative practices.

Teachers appeared to gainfully use ICT to transform their administrative practices. All schools in this maximum variation sample indicate that the initial motivation to use ICT was to alleviate the administrative burden of teachers and the school. Most teachers began using ICT in their administrative tasks to reduce the need for paper based assessment record keeping. Teachers developed skills to use ICT for a range of administrative tasks such as curriculum planning, lesson preparation, record learner assessment marks, creating reports, recording and balancing attendance registers and communicating with parents.

The technology teacher at the township school narrated his transition from a paper-based lesson planning approach to an electronic system. He also explained how using ICT has simplified his filing system that allowed him to simply edit his lessons when he did his planning for teaching.

> *It was something that came into my mind. I just thought I could do better because, in the past, I would write my notes and put them in a file and the things got lost. Now, using the computer and memory stick... I chose to make my life easier. You can easily edit your lessons with ease*
> *P4: School B. Teacher 2.txt*

This mathematics teacher at theformer model C school described various administrative tasks she had to perform with the aid of ICT. Some of the administrative duties that are obligatory are primarily achieved through the use of ICT.

> *Like I said letters that I type to parents, e-mail communications. Obviously all the worksheets I type on the computer, photos I download from the internet, video clips and stuff. For administrative purposes in terms of what we doing inschool, your filing you do all your filing on the computer putting pictures and things for my interleaves. Then also I said the internet, I also do the Arcadian, the school's newspaper. That helps a lot I do it electronically. The school's physical document that we hand out, that I do also on the computer.*
> *P4: School B – Teacher 2.txt*

An experienced language teacher at the independent school narrated his experience in changing his administrative burden by resorting to ICT as a means to modify and reduce the excessive paperwork. The ICT solution also served to reduce time on task.

> *Absolutely.We er, er. When I started at Golden Thread our report [meaning learner progress report] was between 17 and 20 pages long. And it was a lot of work, compiling it, writing it because it was done by hand. So I eventually went to the principal and said 'this is not on'. So I developed an access database that we've been running our reports on now, instead of taking two weeks to do our reports we do our reports in two days.*
> *P5: School C: Teacher 1.txt*

A teacher from theformer model C school offered an account of how he accomplished his administrative tasks through the use of ICT. This teacher was particularly employed because of his ICT competence. He wasalso tasked with managing the official website of the school.

> *Yes we do the extra mural time table and I do my own marks, like you said yesterday I use the excel spreadsheet where it works out the OBE [Outcome Based Assessment] codes for the marks.*
> *P3:School B: Teacher .txt*

Teachers apparently also recognised the benefits of using ICT to reduce their paper based planning. The teacher at the township school explained how the use of ICT has facilitated and reduced his paper work.

> *Using paper work was being a burden; sitting there and piling up papers then my friend who is also a teacher showed up how to use a computer... how to do this and how to do that... even marks schedules.*
> *P 2: School A - Teacher 2.txt - 2:33 (234:236)*

The principal of the same school explained the purpose for which ICT is used by teachers in executing their administrative duties.

> *Well, mainly admin e.g. drawing up work schedules, learning programmes, lessons plans, management plans, assessments and recordings but I had mentioned earlier there are teachers using it in the classroom.*
> *P 7: School A - Principal.txt - 7:15 (122:128)*

4.3.8 ICT developing learners as researchers and independent knowledgeseekers

"It's a very powerful tool and we also teach children how to do research so that it's not just a matter of copying and pasting but utilising the information."

Inclusion Criteria	Constructivist approach to teaching and learning; Teachers as guides to knowledge creation; Teachers as initiators and mediators of learning;Altering traditional paradigms of the teacher providing wisdom; Supporting learners to find their own knowledge needs, search for and evaluate information for themselves.
Exclusion Criteria	Teachers as sole providers of knowledge. Teachers' perceptions as 'Sages';Learners as knowledge consumers.

The use of ICT in their classroom practice, suggestedthat teachers apparently accepted their role as facilitators of learning rather thanthe traditional perception of the teacher as an expert. In allowing learners to perform research using ICT, teachers may change their pedagogical positions from being the 'sage on the stage' and accept being the 'guide on the side.' Furthermore, teachers seemed to acknowledge that ICT offers research opportunities to learners, which leads learners to independent discovery and knowledge construction (See Figure 4.3, below). A science teacher from the township school explained,

> *The opportunities for the learners is- they can you use the computer to do research or they can use the knowledge they have gained to develop themselves even further. Everything is about development. From my point of view, they get a chance to improve their computer skills as well. The learners also give me freedom, I actually see that they use the internet and I can see their weakness and their strengths.*
> *P 2: School A - Teacher 2.txt - 2:10 (84:89*

The deputy principal at the independent school described the use of ICT by learners to conduct research and the introduction of a new subject in the curriculum that enhanced ethical research.

> *It's a very powerful tool and we also teach children how to do research so that it's not just a matter of copying and pasting but utilising the information for their projects. In fact, we have introduced a subject in our curriculum called information skills which teaches them how extract data and avoid plagiarism.*
> *P 9: School C - Deputy Principal.txt - 9:6 (52:56)*

Figure 4.3: **Developing learners as researchers and independent knowledge seekers**
In this lesson, learners had to do research based on their hospital experiences, create online surveys and present their findings using spread sheets and presentation software.

4.4 How does teachers' practice influence learning?

This theme describes the experiences of teachers in relation to their implementation of the school e-education policy. In this theme the focus is on teachers' experiences in relation to how ICT improved learning. Once again various sub categories emerged on how teachers report on the effect that ICT has on learners and learning. The various sub categories range from catering for multiple learning styles, improving learner

participation, integrative and interdisciplinary learning, improved curriculum delivery using ICT and enhancing ICT literacy skills.

4.4.1 ICT catering for multiple learning styles

"But I think that is the challenge to get to the slow learner. And another challenge is to use the tool [ICT] to stimulate the fast learner. And I think in education in broad, those two gaps we fail as teachers"

Inclusion Criteria	Teaching to individual learner needs characterised by their particular learning styles such as visual learners, kinaesthetic learners and auditory learners. I also included slow, gifted and special educational needs learners. Diversity in learning styles.
Exclusion Criteria	Ignoring individual difference between learners. Teachers acknowledging all learners as equal in learning ability.

According to the views expressed by the participant teachers, traditional classroom practice sans ICT had not adequately addressed the needs of learners with learning difficulties. Neither had it catered for advanced or gifted learners. All participant teachers emphasized that an ICT enriched classroom could favourably benefit learners with learning difficulties. Teachers in this sample uniformly reported that ICT offers teachers an opportunity to cater for a spectrum of visually, aurally and kinaesthetically challenged learners. Participant teachers also recognised the pedagogical potential that ICT has for learners with visually or auditory challenges. A technology teacher at thetownship school described how ICT could be used as a tool to cater for learners of differing learning styles.

> *But I think that is the challenge to get to the slow learner. And another challenge is to use the tool to stimulate the fast learner. And I think in education in broad, those two gaps we fail as teachers. There is still a lot of development in us as educators to enter those areas of two extremes. We cater for the average. And the sad thing with OBE the educator does not see the approach of OBE is so broad. Every learner can learn, that is the principle of outcomes based [education]. And we don't see how we can use a variety of tools like ICT as one, to make that learner to understand that he can learn. That he can learn and grow.*
> *P 1: School A - Teacher 1.txt - 1:89 (541:548)*

The same teacher of the township school mentioned that the use of ICT in his teaching repertoire could cater for learners in terms of Gardner's "multiple intelligences" (Gardner, 1995). The use of ICT in the classroom practice of teachers suggests that teachers were also able to appeal to various sensory experiences of learners. Teachers were able to teach using ICT by capturing the attention of a diverse group of learners as delineated by Gardner's 'multiple intelligences theory'. The technology teacher at the township school explained how ICT caters for different learning styles.

> *For example, with children that are more audio orientated, they have the opportunity to play things over and over. The children that are body-kinaesthetically they can play music and form their own triangles with their bodies, so you can incorporate different learning styles. Children that are Rembrandts you can make them draw, come and do their own art and things.*
> *P 1: School A - Teacher 1.txt - 1:84 (522:523)*

A grade six former model C teacher put forward the notion that the use of ICT in her classroom has facilitated the manner in which she conducts her lessons. She now has the means to revisit her lesson presentation in the event that a learner needs additional support, or as a means for revising her lesson.

> *Well For me…When you use ICT. Something like ICT in math the opportunities there for learning is you have your fast worker that em..you know..got the opportunity to go..if you have like a PowerPoint presentation like my fraction presentation is the child can either do it by himself or as an introduction in class. So the fast workers can go and work on their own…For the slow learners you can you can say Ok lets go back to that slide so when you are busy talking in class and busy explaining the worksheet like this [clicks her fingers rapidly], and he says madam I don't understand that concept. Now he says wait I don't understand that slide…go back to that slide. So there's a learning opportunity …You can go back and actually say "there it is".*
> *P 4: School B - Teacher 2.txt - 4:6 (37:46)*

A teacher at the township school reported on his experiences of using ICT in his teaching practice. He comparedlearners' reactions to his current ICT teaching method as compared to his previous 'textbook' approach. He suggested that ICT is the medium of instruction that facilitates learning.

> *Yes, I think so. Making use of ICT, I have noticed that learners tend to learn more. They tend to learn very quickly. The reason why I am saying that is it because it's a different environment. It's a different way of doing things. They were used to textbooks and writing down notes but looking at a computer helps them to visualise the information. They see more colour, they see more shapes. It actually helps them to remember more. They are also very eager to learn more at least that is what I have observed. I hope I am not talking too much.*
> *P 2: School A - Teacher 2.txt - 2:9 (70:77)*

The voices of teachers at two different schools, theformer model C and the independent school, seemed to be in agreement about the manner in which ICT caters for different learning styles. In the two excerpts that follow, teachers explicated how ICT fosters learning. They also supported the above teacher's notion that it is a different learning experience from the traditional "chalk and talk" approach (See Figure 4.4, below).

> *It [ICT] makes it more interesting..It makes it different it's not just the teacher writing on the chalkboard…telling them this and this and these...they write the questions in their books and answer them. Its something they can see it they can hear it…they experience it differently...they excited when they come to the lesson. They do it totally different from the way they do it in the class… and yet they learning without realizing it…they playing games and they don't realize that they learning.*
> *School B – Teacher 2.txt*

> *I think it makes it more interesting for the learners. It is definitely they enjoy it more and they learn better and faster. Because they not just reading now and listening they seeing as well and they experiencing… They taking the one and putting it with another apple and there's two apples there and they…they live it. You know it makes it much better.*
> *School C – Teacher .txt*

Figure 4.4: **ICT catering for multiple learning styles**
In this lesson, the teacher uses various strategies to challenge each learner's learning style. While some learners are engaged with the interactive smartboard, other learners are engrossed in the physical manipulation of 3-D objects.

4.4.2 ICT improvinglearnerattitudes

"There are certain classes in the school where the children will run to get to that class. Because the moment they walk in there, it's a new world. It's a new world."

Inclusion Criteria	Improved learner attitudes;learner enthusiasm;learner motivation to learn; enhanced teacher-learner communication and report; improved learner attendance and discipline; Learners as active participants
Exclusion Criteria	Learners as passive participants/recipients of knowledge. Teacher's motivating learners without ICT intervention.

All teachers in this sample indicated that the use of ICT in their teaching practice culminated in significant improvement in the participation level of learners. A grade five teacher at the inner city school reported that the use of ICT in her classroom improved her relationship with learners. She also suggested that the use of familiar ICT language improved her communication with learners. She tried to engage with her learners through the use of ICT as a common area of interest, yet maintained learner discipline and respect.

> *I think you connect more with the children on a level, different level. I mean when I explain the project to them and I speak about ipods and mp3's you can see they are on a different level in connecting to you. You don't talk about stuff that they are not interested in. And having this project with them in the afternoons I get to know them better and on a different level as well. They more comfortable, and they also share their ideas with me, I learn a lot from them.*
> *P 4: School B - Teacher 2.txt - 4:85 (747:753)*

An innovative mathematics teacher at the independent school reflected on how ICT seemed to elicit enhanced learner enthusiasm in certain areas of mathematics that would appear to be uninteresting under traditional teaching methods. He related his experience of how ICT has contributed to the motivation of a learning disabled learner.

> *Yes, they wanted to do it. What are we doing? Numbers and tables the most boring thing in maths. The building blocks in mathematics so we have to do it and knowit by heart. That Indian boy, for example, who was born weeks prematurely and suffers from various ailments. He's very behind and when we look at his marks on black andwhite, on a book and pen...disastrous! But bring him up on the board [electronic white board], he's so different. You can't even recognise him.*
> *P 6: School C - Teacher 2.txt - 6:8 (156:162)*

Within this sample of participants, principals and teachers seemedimpressed by the change in the attitude of learners to learn. Teachers in this study attributed this experience to various stimuli created by the use of ICT in their classrooms, particularly auditory and visual. A teacher at the township school explained how the use of appropriate technology enhances learner participation.

> *Another girl brought a CD last year so. Mandela's voice there's one clip, on Encarta, the sound they know that voice, it's nice it really stimulates them, really stimulates them.*
> *P 1: School A - Teacher 1.txt - 1:53 (336:338)*

4.4.3 ICT promoting integrative and interdisciplinary learning

"Based on the excursion and that is how I bring in the working of the engines and then I show them that slide show, and it has sound and they understand motion, pressure and compression and all that"

Inclusion Criteria	Cross curricular integration and interdisciplinary learning. Curriculum integrated learning areas and learning. Learning to OBE principles.
Exclusion Criteria	Learning restricted to subject specific criteria. Learning viewed as isolated pockets of knowledge defined exclusively by the subject. Teachers as collaborative learners.

The integration of ICT in the curriculum apparently created opportunities for interdisciplinary learning. In the narrative of a teacher from the township school, he explained the integration of ICT into the teaching of the social science. He also described how ICT is used to integrate other learning areas, in this case Geography and History. Furthermore, he indicated that he used ICT to expose learners to the disciplines of music and indigenous language.

> *With regard to social science I did the rivers, I did themaps, er, er. Even History is nice, History yes, even the Koi-Koi, music and sounds you can use. The language, I played that for the children.*
> *P 1: School A - Teacher 1.txt - 1:52 (332:334)*

A technology teacher at the township school narrated how his technology lesson that integrated ICT was extended to include an out of classroom real-life experience of

anexcursion[29] to a motor manufacturing plant (see Figure 4.5; Appendix D2, School A).

> *I give them a questionnaire on that, the test is also based on the excursion and that is how I bring in the working of the engines and then I show them that slide show, and it has sound and they understand motion, pressure and compression and all that. So that was good.*
> *P 1: School A - Teacher 1.txt - 1:32 (227:230)*

A maths teacher at the inner city school described how an ICT problem based project[30] incorporated the various curriculum learning areas of Language, Economic and Management Science and Social Science (See Appendix D7, School B,Apple project).

> *Ja, This is now in EMS… I linked to this "Apple Mac" project with what I am currently busy with in EMS. So I had to go and design something for the rest of the children, because it's only ten kids that are taking part. I had to make it in such a way that it relates…links, now our kids don't have access to Apple and all those software, so I instead we'll do a PowerPoint, so the kids will have to hand in a PowerPoint and about the 'Development in South Africa', but they will use it like a documentary, make a documentary. Images, their opinions their views, also like the Apple thing so that it aligns.So they will do their, still their PowerPoint, for their marks to submit for their assessment. Then this is something extra they are going top make like a little movie as well.*
> *P 4: School B - Teacher 2.txt - 4:56 (497:509)*

[29] See CD – School A, Video_Lesson 2.mpg; Video_Excursion.mpg
[30] See CD – School B, Video_Project.mpg

Picture 1

Picture 2

Figure 4.5:ICT promoting integrative and interdisciplinary learning

In picture 1 (above), ICT is used to simulate the workings of the motor. In picture 2 (above), learners are on excursion to a motor manufacturing plant, to integrate classroom learning with real life experiences.

4.4.4 Learning about ICT and learning with ICT

"At the moment we still do computer literacy, and then we use [ICT] for teaching"

Inclusion Criteria	ICT as a distinct but informal learning area (learning about ICT); ICT as an instructional and cognitive tool to deliver the curriculum more effectively (learning with ICT).
Exclusion Criteria	Learning without ICT.

All school principals and teachers in this study identified the need to develop the basic ICT literacy skills of learners and teachers, as a crucial baselinefor the successful delivery of an ICT integrated curriculum. School principals structured the curriculum to cater for a dual purpose in the use of ICT. Teachers realised that an ICT literate learner potentially facilitates curriculum delivery and theintegration of ICT into the teaching and learning environment of the school. On the other hand, schools and teachers realised the need to develop the ICT literacy skills of learners for future employment. This dual focus had allowed teachers to integrate[31] ICT into their teaching practice almost seamlesslypending learners'possession of the necessary ICT skills (see Appendix D, D1-D7). In all schools in this sample learners attended scheduled ICT literacy classes as an independent skills development learning area.

In the independent school, learners were formally taught computer literacy at the primary school stage and from grade seven onwards they were expected to complete specific modules of the International Computer Drivers Licence (ICDL) programme (See Appendix E8, Document analysis – ICT literacy standards). Teachers were also encouraged to complete the ICDL course as a subsidised school programme.

> *Oh absolutely. One of our goals is to get all the teachers ICDL standard, the four core modules proficient, because as soon as you do that, it makes it easier for them to do their policies, to do their exam papers. I'm at the point where I am trying to get a teacher not to do cutting and pasting a paper, because some of them still physically cut a page before they go and copy it. So yes, I do believe it has value. Again it's also for their own self esteem. And ja, a lot of them are using it in their own private capacity because they wouldn't have done it before.*
> *P 5: School C - Teacher 1.txt - 5:51 (421:427)*

[31] See CD, School C, Lesson_1.mpg

At both public schools in this study, computer literacy is taught from foundation phase to grade seven(See Appendix E8, School A and School B) ICT literacy standards).Teachers found this dual approach to be imperative to the successful delivery of the curriculum using ICT, since they did not have to teach ICT skills in the delivery of their lessons. The principal of theinner city schools explained how ICT is employed at his school.

> *At the moment we still do computer literacy, and then we use for teaching, weteach mostly English and math…The 'now' generation is computer literate so we move that slightly to the back and we use more e-learning at the moment.*
> *P7:School B – Principal.txt*

A teacher at the inner city school that was tasked with supporting teachers to integrate ICT into the curriculum reported on the way he interacted with other teachers. Using a curriculum content management system he advised teachers on how to use the software based content to integrate ICT the curriculum.

> *They don't normally, they come to me and say we doing this, this…and I see how we can fit it in with doing word or doing a PowerPoint presentation or how can we do an excel spreadsheet on the work that they doing and where will it fit in. So we their things and then I'll say we doing excel now, religion won't work here come back in thefourth term...can you do that work with them in the forth term...or is there something in the forth term that…so we try to incorporate their work into our.*
> *P 3: School B - Teacher 1.txt - 3:23 (232:238)*

4.5 Summary: Main results

The teachers' initiative to use ICT occurred in an environment that was devoid ofthe national e-education policy and absent of any support from the district and provincial systemic structures.The National Curriculum Statement appearedto be stringently pursued by school principals and teachers, while the national e-education policy was absent as a policy to teachers and principals. Teachers in this study indicated their need for greater policy intervention as well as curriculum and pedagogic support as they tried to make sense of how to integrate ICT into their daily teaching practice. The

narratives of teachers in this sample seem to suggest that they are adept at changing their situational conditions to incorporate ICT in their teaching and learning practice.

It is also evident from teachers and principals in this study that the systemic structures (district and province) were not perceived by schools as sources of policy support. Schools sought affiliations with other schools and private sector companies to make sense of the way ICT was to be integrated into the teaching-learning environment. Most school principals indicated that schools appear to be left to their own devices in determining how best to integrate ICT into their institutional practice of teaching and learning. Teachers formed collaborations with other teachers and other schools as a human capital resource for support, knowledge sharing and skills development. Teachers also desireddistrict teacher clusters, not merely as a means for formal meetings, but as a forum to share pedagogic methods and develop their ICT competence. In this regard, schools expected greater involvement from the district office to act as a focal point for linking schools, sharing resources (human and physical) and developing ICT based curriculum content.

4.6 Literature reflection

4.6.1 Introduction

The e-education policy mandate to schools was to develop learners and teachers in the use of ICT (Blignaut & Howie, 2009). The policy is also explicit in its attempt to enhance teaching and learning through curriculum delivery. This study produced findings that are pertinent to such policy implementation outcomes. I attempt to lodge the results of my findings against the literature in the field, with a particular focus to define supporting evidence for existing knowledge on ICT policy in education. I also ground new insights that emerged from the current study against the backdrop of existing knowledge.

A review of the voluminous literature in this field of study revealed how teachers translate national ICT policy intent into classroom practice. In stark contrast,the current study revealed that South African teachers were ignorant of the national e-education policy and had developed their own school based ICT policy that mandated

their classroom practice. Thus for the purpose of this literature control, supportive evidence from the current study emanates from teachers' experiences of their school based ICT policy, while existing knowledge in the field is based on national policy directives.

4.6.2 Echoing existing knowledge on ICT policy in transformingteaching and learning

4.6.2.1 ICT policy transforming teaching

The role of ICT policy in transforming teaching will be discussed under the headings teachers' interpretation of policy; teachers' beliefs and attitudes;emerging pedagogies; teachers as innovators; teachers as collaborative learners;and teachers as drivers of ICT in classroom practice.

Interpretation and implementation of ICT policy

Interpretation and implementation of ICT policyin education was a specific area of interest in the current study. A review of the international literature reveals thatteachers are viewed as implementers of policy(Croll et al., 1994). Findings in the literature (Lasky, 2005; Clune, 1990) particularly in developed and developing countries suggests that teachers tend to be 'readerly' in their mediatory approach to policy implementation. In this regard teachers are thus viewed as conduits for policy implementation by interpreting policy as it was intended. The 'readerly' stance of teachers in developed and developing countries may be attributed to systemic policy that is well articulated at various system hierarchical levels. Findings from the current study are consistent with those of the literature, in that all teachers also applied a 'readerly' stance but only in response to the national curriculum policy. However, one principal exhibited a 'writerly' position. Proudford (1998) argues that a 'readerly' approach to policy text is unlikely to succeed because teacher's prior understandings, experiences, codes, beliefs and knowledge mediate what they make of it.

Teachers' beliefs and attitudes

Teachers' beliefs and attitudes about the role of ICT and education in general are critical to policy mediation (Cuban, 2001). Significant research supports the notion that teachers' beliefs and attitudes towards the use of ICT are crucial to the successful integration of ICT into schools (Stevenson, 2004; Spillane, 2000; McLaughlin, 1987; Fullan, 1996a). These studies also suggest that teachers' knowledge and belief systems act as a filter through which teachers view and interpret their teaching practices. In the current study participant teacher' beliefs, attitudes and professional disposition were central to their appropriation of school policy on the use of ICT in teaching practice. This finding concurs with that of Stevenson (2004) in the United Kingdom with regard to the teachers' attitudes, beliefs and practices relating ICT use in their classrooms. According to McLaughlin (1987), implementation of policy involves a process of sense making. This sense making is associated with the implementer's 'knowledge base, prior understanding and beliefs about the best course of action'.Galloway (2010) claimsthat teachers' beliefs guide their teaching, and thus they do not use ICT in their classrooms for self-gratification but rather for enhancing teaching and learning.

Teachers' emerging pedagogies

Findings in the current study reflecting teachers' emerging pedagogieswere consistent with literature. Research on classroom practices of teachers (Sandholtz, Ringstaff, & Dwyer, 1997; Schofield & Davidson, 2002; Means & Olsen, 1997; Means, Penuel, & Padilla, 2001) found that some teachers had changed their pedagogy because of using ICT. In this study most teachers also experienced a change in their teaching styles because of ICT use. Teachers in this study acknowledge that ICT brought forth new challenges that demanded a change in their teaching pedagogy. One teacher in this study however, (a negative instance in analysis) suggested that his pedagogy did not change, he explained this by stating that the principles of teaching remained the same. This finding is consistent with the literature (Swaminathan & Yelland, 2003; Zhong & Shen, 2002) which indicates that teachers may use ICT with traditional methods of the past.The findings from the current study support the idea that teachers' pedagogy had changed from the teaching methods they employed prior to teaching with ICT.

Teachers as innovators and trendsetters

Teachers in the current study acted as innovators and trendsetters in the use of ICT in their classroom practice. Participant teachers in this study acted as change agents or 'voortrekkers'[32] by experimenting with the use of ICT in their teaching repertoire. Cuban (2001) poses a range of constraints under which teachers work and notes that the essence of teachers as innovators is their ability to take risk in the adoption of ICT in their classrooms.Galloway (2010, p. 4) identifiesvarious pedagogical methods that is associated with using new approaches to the use of ICT and distinguishes these methods from the previous methods of teaching. Similarly, teachers in this study were engaged in new innovative practices that challenged their previous teaching methods.Rogers' (1995) defines innovators as teachersthat are early adopters of ICT, tend to have higher aspirations, have greater empathy, display a better ability to cope with uncertainty and risk, and have a more favourable attitude towards change. Teachers in the current study are consistent with Rogers' (1995) definition as it aptly described teachers in this study as innovators and change agents.Watson and Tinsley (1995) and Watson (2001) found that ICT use as innovationremained with a minority of teachers and was only apparent in practices of teachers who could relate the use of ICT to their pedagogical method for their own subject. Within the context ofthe current study, it was evident that not all teachers in the schools were using ICT. The innovators were a few teachers who were at the heart of determining the success or failure of the e-education policy.

Teachers as collaborative learners

In the current study ICT was the catalyst that fostered teachers as collaborative learners. Numerous types of affiliations were also evident in the literature. According to Schrimshaw's (2004, p. 21) findings teachers acknowledged ICT as an area of constant change and teachers adopted an attitude of 'in it together' and that no one teacher is better than the other. The consequence of this view is that teachers exercised a willingness to learn from each other and to support each other (Smeets, 2005; Scrimshaw, 2004). The findings in the literature concur with the current study, in which teachers shared knowledge, experiences, resources and pedagogical ideas through their own desire to do so. Teachers seemed to develop themselves through interaction with enthusiastic and committed colleagues (Andrew, 1999). Peer support

[32] Voortrekkers – an Afrikaans term for pioneers

and collaboration were also found to be one of the strongest influences on the success of ICT training as just-in-time collaborative learning that occurred allowed for the transference of learned skills to classroom practice (Galanouli et al., 2004). In the current study collaborative learning took place within the context of teachers' immediate curiosity and need-to-know approach to constructing ICT curriculum-integration knowledge. Krumsvik's (2006) findings were concurrent with the current study in that teachers within a school through collaboration efforts created space for staff cohesion and new recruited teachers were able to adopt the school's educational ethos.

Teachers as drivers of ICT

Teachers in the current study were steadfast in their belief that ICT implementation in classrooms required "human" intervention and teachers are the responsible drivers of ICT in classrooms. Studies conducted by Zepp (2005) are similar to my findings in that teachers focussed on their concerns about the importance of human qualities such as 'human touch', 'motivation and care' in an ICT teaching-learning environment.The current study also found that teachers understand that their professional position in the classroom will not be compromised because of ICT.In this regard, research that suggestedthat teachers were techno-phobic, unwilling to venture into the use of ICT in their teaching practice or simply distance themselves from using ICT, did not concur with teachers' experiences in this study.

In foregrounding the current study against the body of literature a number of findings have emerged, which areconsistent with the literature. Evidently, ICT policy transformed the teaching practice of teachers in this study in many significant ways. First, teachers were 'readerly' in their interpretation of the National Curriculum policy, demonstrating practices prescribed in the policy. Second, teachers' beliefs, attitudes and professionalismtowards ICT were crucial drivers in policy implementation. Third, teachers (in the main) modified or changed their teaching methods from a traditional approach to one that encompasses ICT as a teaching-learning tool. Fourth, teachers engaged in experimentation with ICT in their classroom practice, acting as early adopters of ICT and innovative leaders. Fifth, the use of ICT in their classroom practice enhanced collaboration between teachers within

the school context. Sixth, teachers were resolute in their belief that the innovation demanded their presence as human professionals to guide teaching and learning.

4.6.2.2 ICT policy transforming learning

I noted various aspects of ICT policy transforming learning. I discuss each of the following categories that emerged from the study in relation to the existing body of knowledge:ICT catered for multiple learning styles, ICT enhanced learnerparticipation and motivation, ICT promoted integrative and interdisciplinary learning, and learners were engaged in developing ICT skills as well as using ICT for curriculum learning.

ICT catering for multiple learning styles

Teachers in this study acknowledged the use of ICT to cater for multiple learning styles. Teachers clearly emphasized the benefits of ICT to support learners across the spectrum, from learners with special education needs to gifted learners. Individual learning styles differ from person to person, and these individual differences become even more apparent in the classroom teaching-learning situation. Thus, a real challenge in using ICT for learning, is keeping the learners it is designed for in mind (Canavan, 2004). Although participant teachers in this study are convinced that ICT will promote delivery of the curriculum to the individual needs of their learners, their main concern seemed to be that of learners with special educational needs. Smeets and Mooij (2001) and Prain and Hand (2003) argue that ICT may serve as a tool for curriculum differentiation, providing opportunities to teachers for adapting the learning content and task according to the needs and capabilities of each individual learner. Teachers in this study also acknowledged that ICT allows for a shift towards learner-centred learning environments (Department of Education, 2004; Smeets, 2005). This conclusion is consistent with observations made by Pisapia (1994a;1994b). Galanouli (2004, p. 66), suggest that teachers must recognise the different ‘learning styles’ of their learners, and in so doing, understand and challenge their attitudes to ICT.

ICT improving learnerattitudes

Gaining and maintaining attention of learners was key to promoting improved learner participation and in this regard ICT use in classrooms can enhance the quality of education by increasing learner motivation. Although learners developed positive attitudes and good skills towards the ICT curriculum use, teachers failed to seize the opportunity to follow through to appreciate the potential of ICT (Harrison et al., 2002). Many studies(Jonassen, 2000; Webb, 2005; Reynolds, Trehane & Tripp, 2003) suggest that the use of ICT in education improveslearner motivation to learn. The findings in this study were consistent with the literature in that all teachers and principals had no doubt about motivational factor that ICT brings to the teaching-learning situation.

ICT promoted integrative and interdisciplinary learning

Teachers in this study found that ICT promoted integrative and interdisciplinary learning. Teachers also realised that using ICT provides opportunities for access to an abundance of real-life resources for teaching and learning. Similarly, researchers (Bransford, Brown & Cocking, 2004; Roschelle, Pea, Hoadley, Gordin& Means, 2000) suggest that ICT can bring exciting curricula based on real-world issues into the classroom. ICT can also provide scaffolds and tools to enhance learning.

Learning about ICT and learning with ICT

Most schools in this study followed a dual approach in learning about ICT and learning with ICT. First, all schools in this study were teaching ICT as a standalone informal learning area (not a National Curriculum subject) to develop learner's ICT skills. Secondly teachers in schools were also using ICT to teach their specific learning areas of the National Curriculum.Some research (Chalkley & Nicholas, 1997; Richardson, 1997; Smeets & Mooij, 2001; Williams, Coles, Wilson, Richardson & Tuson, 2000) showed that the focus in most schools was on traditional, skills-based ICT use. Loveless (2003) also found that teachers insisted that ICT skills be taught as a prerequisite skill for curriculum integration. The findings in the literature (Reynolds, Trehane & Tripp, 2003; Watson, 2001) were similar to the current study, which indicated that there was a need for a dual purpose for ICT in all schools.

In immersing my findings in existing literature in the field, it was apparent that the similar learning experiences were unfolding with regard to the use of ICT in schools. These learning experiences reflect the classroom practices of teachers as they implement policy.

4.6.2.3 New insights

In foregrounding the findings of the current study against existing knowledge in the field, several pertinent findings emerged that were unique to this study. New insights on the role of ICT policy in transforming teaching and learning are discussed in this section under the following topics: teachers as formulators of policy; teachers changed beliefs; teachers changed pedagogy; teachers innovative practices; teacherscollaborative practices; negotiating learning through ICT; teachers will to learn and develop; improved learner-teacher relationships; motivation to learn;and ICT promoting integrative learning.

Teachers as formulators of policy

Teachers in the current study demonstrated their ability to transcend the notion of being conduits of policy. Schmidt (2000) suggests that with little in the way of training or informed dialogue, teachers may experience frustration.Accordingly Schmidt (2000, p. 831) claims that "when individuals are left to interpret new situations independently confusion can result". Schmidt and Datnow (2005) found that when teachers became frustrated and were uncertain about how the reform fits into the school they withdrew from the implementation of policy. Significantly different, althoughteachers and principals in the current studyhad limited (or no understanding) of the tenets of national e-education policy,they moved beyond uncertainly and developed ICT policy for their school,using their own interpretations of what was necessary for teaching and learning within their context.

Teachers' changed beliefs

Teacher beliefs and attitudes about the role of ICT also played out differently as compared to the literature. In the current study two teachers and a principal seemed to have changed their attitudes to teaching and learning with ICT after their work

experiences in the corporate world. Fullan (1988) indicates that teachers' beliefs sometimes follow from their actions. This was also evident from findings in the current study in which aprincipal and two teachers had some prior corporate ICT experience. Their corporate practice seemingly acted as a catalyst for their belief system and propelled their use of ICT in teaching and learning. These beliefs led them to be more enlightened about the vocational (Hawkridge, 1990) value of ICT to their learners. Schmidt and Datnow (2005) found in their study that teachers are positively biased towards policy interpretations that fit their prior beliefs and values. Furthermore, they found that teachers and principals tend to be reactive and affiliate to policy ideals if policy is convincing. In the current study teachers were apparently not aware of the details of the e-educationpolicy document, and principals were ignorant of the e-education policy. Significantly different to existing knowledge in the literature, teachers in this study were not reacting to national policy regarding ICT in education. Guided by their beliefs, attitudes and professional instinct were driving ICT implementation in their schools.

Teachers' changed pedagogy

According to Kozma (2003a; 2003b) teachers change their pedagogy within the context of school improvement or reform. In contrast, teachers in the current study were changing their pedagogical practice through their own desire to improve teaching and learning coupled with a positive institutional culture and principal support. Thus, teachers in the current study were not responding to policy mandates to change their pedagogy as indicated in the literature (Pelgrum & Anderson, 1999; Kozma, 2003b). Furthermore, the experiences of teachers in the current study suggest that they changed their pedagogy mainly for the purpose of learner improvement.

Teachers' innovative practices

Teachers' innovative classroom practices in this study were found to be different from the literature. Law et al. (2001) found that teachers' use of ICT depended on its usability and perceived usefulness. However, in the current study teachers seemed to be convinced that ICT had value for teaching and learning and they were willing to venture and experiment with the technology.Demetriades et al. (2003) found that teachers ignored innovative practices in order to meet school curriculum delivery

targets. These findings differfrom those of the current studywhere teachers pursued innovative and challenging pedagogic practices in their curriculum delivery despite curriculum demands, and without compromising curriculum policy outcomes.

Teachers' collaborative practices

Collaborative practices emerged as a construct that was pivotal to the experiences of teachers in this study. It was evident that teachers relied on other teachers for ICT skills and curriculum support. Fox and Henri (2005) found in their study that Hong Kong teachers bonded only within subject specific areas or between teachers with similar responsibilities. Furthermore this study found no evidence of a culture of sharing. Kozma (2003a) and Mumtaz (2000) also suggest that teachers' collaborative experiences were within the confines of school boundaries. In the current studyvarious collaboration practices were established including teacher-teacher collaboration within school and across disciplines, teacher-teacher collaborations beyond the boundary of the school, and school-school collaborations (see chapter 5) were actively pursued by teachers as a source of mutual support. This collaborative experience promoted a culture of sharing across teaching disciplines, schools and districts. Furthermore teachers and schools formed collaborative support networks between schools that were socio-culturally and socio-economically diverse. In this way schools seemed to foster their socio-cultural responsibilities to poorer schools.

Negotiating learning through ICT

With the advent of ICT in classrooms, research suggests that teachers tend to experience a sense of concern that ICT in education would culminate in their jobs becoming redundant in the teaching learning situation (Cuban, 2001). In contrast, Fullan (1996b) and Pedretti et al. (1999) support the notion that ICT as a teaching tool has created a demand for good teachers, and teachers in technology driven classrooms are now more important in the teaching learning situation. Evidence from the current study indicate that teachers have positive attitudes and beliefs about the learning possibilities that ICT brings to their classrooms. Teachers were convinced that ICT had entrenched their professional roles more than ever before. Furthermore most of the critical roles of the teacher, (for example pastoral role of teacher, teacher as a life-long learner, teacher as researcher etc.) as delineated by the norms and standards

policy document (Department of Education, 1998) became more significant and relevant, now that teachers were using ICT in their teaching and learning practice. Teachers in this study acknowledged the significant role they play in ICT-curriculum mediated environments, noting the 'human element' as vital in the classroom context. According to Zepp (2005) 'humanistic qualities' refer to those qualities that serve learners' personal needs such as motivation, humour, interaction, explaining and answering questions.

Teachers' will to learn and develop

Policy success is critically dependent on the will and local capacity of teachers as implementers of policy (McLaughlin, 1987; Sutton & Levinson, 2001). McLaughlin (2005) indicates teachers' will, attitude, motivation, and beliefs are central to teacher's response to policy's goals or strategies, and these characteristics of teachers are less influenced by policy intervention. Furthermore McLaughlin (2005) argues that local capacity can be addressed by policy initiatives for teacher training, allocation of financial resources and engaging consultants to provide absent expertise. Evident from the current study is that teachers displayed the will, positive attitudes and determination to try the innovation in integrating ICT into their practice.

A lack of time to learn to work and experiment with technology, to rethink learning and teaching and develop personalized methods and planning are challenges frequently reported in research (Butler & Sellborn, 2002; Earle, 2002; Harasim et al., 1997; Jackson et al., 1999; Pelgrum, 2001). With these and other challenges, Cuban (1986) suggests that we should not expect many teachers to make this effort to change to using ICT in their classrooms. Preston et al. (2000) and Cox et al. (1999) also found teachers in their study were not willing to take the initiative to improve their pedagogy and develop new skills. The teachers in the current study faced the same challenges as those teachers mentioned in the literature (Becker, 2000). However, teachers in the current study were eager to develop their ICT knowledge as well as skills and pedagogic know-how and to apply it within the classroom context.

According to McLaughlin (1987) and Sutton and Levinson (2001) policy success is critically dependent on local capacity and the will of teachers as implementers of

policy. McLaughlin (2001) indicates that local capacity can be addressed by policy initiatives for teacher training, allocation of financial resources and engaging consultants to provide absent expertise. However teachers' will, attitude, motivation, and beliefs are central to teacher's response to policy's goals or strategies, and these characteristics of teachers are less influenced by policy intervention.Evident from the current study is that teachers displayed positive attitudes, will and determination to try the innovation and thus government already has one foot in the door in convincing teachers of the benefits ICT to their teaching practice.

Improved learner-teacher relationship

Learners may lack the motivation to learn if ICT as tool is not integrated into the curriculum, and is used by learners with the expectation that learning would "just happen" (Lim & Chai, 2004). In the current study, observations were based on teachers' use of ICT in curriculum delivery, and in this regard teachers planned their lessons which were mediated through ICT to improve learning. One particular finding which surfaced in the current study, that does not seem evident in the literature, was that the use of ICT led to an improvement in the relationship between teacher and learner. This finding based on a teacher's experience indicated that the use of ICT in her classroom opened new avenues for communication with learners and improved learner confidence. Furthermore, the use of 'ICT language' created means to motivate learners to engage in discussion with her.

ICT promoting integrative learning

Teacher experiences in this study suggest that ICT promoted integrative and interdisciplinary learning. Although all teachers advocated for the use of ICT in curriculum delivery, learners were also learning across subject disciplines. Loveless' (2003) finding is contrary to the argument presented in the current study. Loveless (2003) study found that teachers viewed ICT as a cross curricular tool that could be used in all subjects. Andrews (1999) found that schools in the United Kingdom made very little cross-curricular use of ICT. In the current study the use of ICT in classrooms allowed learners to understand that particular subjects did not exist as isolated compartments but were integrated with other subjects.

4.6.3 Conclusion

Within the context of this study a number of new insights emerged with regard to ICT policy transforming teaching and learning. Firstly teachers' beliefs, attitudes and professional instinct catalyzed them to become activators of local policy formulation and policy implementation. Teachers (though ignorant of the e-education policy mandates) were initiators of school ICT policy. Teachers changed their pedagogy not in response to policy directives, but guided by their beliefs and attitudes that ICT can enhance teaching and learning. Despite curriculum demands and curriculum overload, teachers engaged in innovative practices in their classrooms, demonstrating their professional calling. Teachers' will to learn and develop culminated in their engagement in professional collaborative communities of practice. Weaving all the threads from this summary, it is evident that teacher beliefs, attitudes and professional identity are the core tenets that determine the success or failure policy implementation at classroom level.

Chapter 5

Findings and discussion of results

How do systemic structuresrespond to e-education policy to influence teaching and learning?

5.1 Introduction

In the previous chapter I reported teachers' narratives of how they responded and experienced the implementation of the e-education policy in their classroom practice. In this chapter I present and illustrate the results that emanated from the data collected at various systemic levels, beginning with the school and its institutional practice. In setting boundaries around the school I report on the principal as a gatekeeper to the implementation of the e-education policy. I then backtrack through the system, reporting on two important systemic structures beyond the school's boundary, namely the district office and the provincial education department. At district level I report on the experiences of the head of the e-learning unit namely the chief education specialist (CES). At provincial level, I report on the experiences of two officials in the e-learning directorate, the deputy chief education specialist (DCES) and the chief education specialist (CES). In this regard my inquiry was guided by Elmore's (1980) backward mapping approach (refer to Chapter 3) which focuses on two specific themes, namely; the ability of each unit within the system to affect the behaviour of teachers who are the target of the implementation of the e-education policy, and the resources required by each unit within the system to have that effect.

5.2 Drawing boundaries around schools

5.2.1 Ability of the school to change the behaviour of teachers to implement policy

The theme drawing boundaries around the schoolfocuses mainly on the experiences of the principal as unit of analysis. The focus is on the various institutional practices relating to the manner in which participating principals manage their schools. I report on the rationale of the school for using ICT for administrative purposes, institutional

practice in the use of ICT, the school's policy relating to the use of ICT, monitoring and evaluation of ICT use in classroom practice and the provisioning of resources for the school for teaching and learning.

5.2.1.1 ICT school practice and leadership

"You see somewhere you got to force it down otherwise you know what, it becomes a toy you play with it for a month, and then it's shelved."

Inclusion Criteria	Ethos and climate of school; School culture; School policies; School leadership; School governing body support;School administrative functions; ICT curriculum integration. School collaborative practice.
Exclusion Criteria	Teachers' administrative practices; Systemic support; Socio-economic factors; District administrative processes.

In most schools the implementation of ane-education policy began with the primary need to change the administrative functioning of the school in a quest for school efficiency and effectiveness.The school practice seemed to support teachers using ICT for administrative purposes in their curriculum planning, preparation of work, lesson planning and assessment recording (See 4.3.7). Depending on the level of administrative support required by the principal, particular teachers wereoften tasked with additional ICT administrative duty such as updating of the database of the school, placing resource orders for district ratification, procurement of teaching and learning materials, presentation of school budget, conducting annual surveys using customised databases or creating poll registers for school governing body elections.

At the former model C school the principal described the curriculum software support that teachers in his school obtained from the ICT resource centre of the school. Teachers are encouraged to use the ICT curriculum learning support to supplement their teaching and assessment practice. The school made a significant investment to acquire ICT curriculum content to support the use of ICT by teachers in their teaching practice. The former model C principal explained the software curriculum support to teachers.

> *Everything is curriculum based, ja, ja. And then of course there's the basic development programs of design and making question papers.*
> *P 8: School B - Principal.txt - 8:75 (114:117)*

In the well resourced independent school, management also seemed to give teachers required support without prescribing the use of ICT. However, the use of ICT seemingly contributes to theannual performance management appraisal of teachers. In this manner the school was arguably applied its performance management policy to subtly coerce teachers to use ICT in their teaching practice. The principal of the school tactfully related the school's support of teachers in this regard.

> *The school has also made it [ICT] available for the teachers whether they use it or not is their prerogative…Yes, it plays a role when they have to write the personal development programme at the end of the year.*
> *P 9: School C - Deputy Principal.txt - 9:8 (59:61)*

The principal of the inner city school seemingly also incorporated the use of ICT as a criterion for assessing teacher professional performance namely, the integrated quality management system (IQMS). Both inner cityschool and the independent school exercised control by instituting a policy requirement that ICT is incorporated into the daily practice of teachers. On enquiring how these schools ensured that their policy is being implemented by teachers, the public school appeared to follow-through in terms of monitoring the implementation of ICT in the classroom practice of the teacher.

Two schools in this study namely, the former model C school and the independent school identified their internal policy as a means of driving the implementation of ICT into the daily practice of teachers. The excerpts below illustrate that the two principals concurred with each other with regard to ICT curriculum integration policy.

> *Ja, so you must change your inside system as well so they [teachers] must realize that I won't fit into the system if I cannot operate this [ICT]... So the only thing that can keep it going is to create the need for that and also to have a policy that enforces the continuous use in the classes, ja.*
> *P 8: School B - Principal.txt - 8:84 (199:200)*

> *The ICT programme is broad but that was one of the key goals. It has been incorporated into the curriculum and it's not optional.*
> *P 9: School C - Deputy Principal.txt - 9:8 (59:61)*

Both the independent school and the inner city school acknowledged that the huge (one of the largest budget allocations) financial commitment of the schools to have ICT resources should yield a return on investment, namely improved teaching and learning. The former model C principal explained his notion on achieving a 'return on investment':

> *You see that's money driven, when you invest a lot of money into something you want a return. Our return is academic excellence. So with our class visits, with our IQMS, with our academic visits to classes we want to see those lessons, we paying for.Ja, no definitely, purely a financial decision.You see somewhere you got to force it down otherwise you know what it becomes a toy you play with it for a month, and then its shelved. So the only thing that can keep it going is to create the need for that and also to have a policy that enforces the continuous use in the classes, ja.*
> *P 8: School B - Principal.txt - 8:116 (427:430) 8:115 (418:423)*

The leadership of principals in this sample of schools demonstrated their ability to change the behaviour of teachers through various initiatives. These initiatives, school policy, school administrative demands and appropriate channels of communication played out in the institutional practice of the school and thus paved the way for teachers to become exposed to intentions of the school's e-education policy. The principal of the inner city school explicated the ICT policy demands placed on teachers in respect of completion and submission of learner assessments.

> *With your policy you also got a hold on what's happening in the classroom [holds his hand in a fist position – representing policy], if the policy says marks must be e-mailed, assessments must be done in the computer centre and things like that...I just say I take no marks anymore unless you e-mail it to me. Your assessment comes via e-mail or I don't see it. I don't sign it off... Then I say right take your time, you have the whole weekend, do it and e-mail it. I check it, I approve it, I e-mail it back. Easy, because when you start using you start understanding it, and the more you use it, the more easier it becomes.*
> *P 8: School B - Principal.txt - 8:86(200:208); 8:104 (346:348)*

The principal of the independent school illustrated that the need for effective communication was the main driver to use ICT in the administration of the school. In

his response he explained how the use of ICT in the administrative functioning of the school facilitated teacher access to policy documents and official resources.

> *As I said, it's a great communication tool if you are purely using it for work e.g. checking email after class is so easy and instant. You don't have to wait long for response. It has revolutionised the workplace from management point of view...Staff wise, communication is the primary reason we've had to put a computer on every table for each teacher and everyone can access a number of documents. In senior prep we've included all the school policies ranging from sports to academics to social and government policy so all those documentation is available.*
> *P 9: School C - Deputy Principal.txt - 9:39 (190:19); 9:1 (31:35)*

All participating schools used ICT as an administrative tool to a greater or lesser extent, but principally as a means to store and retrieve learner data. The two principals in this sample of public schools expanded on their administrative use of ICT. Most of the ICT administrative processes seemed to be school initiated and some are as a result of compliance with the relevant district or provincial requirement. The principals of the inner city school and independent school tended to lead by example in the manner in which they administered their schools (see above excerpts). Firstly, these principals were apparently active users of ICT in their daily practice (see above excerpts). Secondly, principals created an opportunity for access to appropriate technology in order to enhance school administrative processes.

Though the principal at the township school was not proficient in the use of computers or ICT, he nevertheless seemed to have transformed the administration system of the school to be ICT compliant. The technology teacher at the same school expressed his approval of the progress his principal had made in transforming the administrative system of the school.

> *I really appreciate that his [Principal] head is screwed on, our admin of the school is 100 [100% ICT] and all that.*
> *P 1: School A - Teacher 1.txt - 1:51 (324:326)*

The principal at the former model C school cited one instance of how the use of ICT for administrative purposes has reduced his reliance on a paper-based approach.

> *And you know what as a principal, the day you need a copy of this, you can't find it. You know it's somewhere, you just can't find it. Or suddenly the quintile money allocation, you know that you've had it, but it's gone. Now it's easy to get it. That's what we want to do now is scan those documents in and save it.*
> *P 8: School B - Principal.txt - 8:191 (1107:1113).*

Principals at the participating schools appeared to take different approaches towards themotivation of teachers to use ICT in their daily practice. In both public schools the principals seemed to encourage teachers to use ICT in their daily practice by attempting to reduce the burden of bureaucracy, paperwork and time. The principal of an inner city school narrated his concern of the paper load that burdens teachers, and offered ICT support as a means to assist teachers.

> *We trying to do away with this paperwork. We got a big server so we can save a lot, all our documentation… That's time consuming, because the biggest thing with the teachers is time to find those things, to take it back to use it in the class again. That's why we are trying to make the process a bit shorter for them.*
> *P 8: School B - Principal.txt - 8:77 (128:129)*

At well resourced schools it is acceptable practice that various secretaries are employed to assist support and facilitate teacher's administrative duties. In this study the poorly resourced township school principal explained how the employment of a teacher-assistant led to the reduction ofthe administrative duties of teachers.

> *May I just mention that we do have what we call teacher-assistant which is aimed at alleviating the paper load for our educators. There is a young girl who is helping out people at the foundation stage. In addition, we have issued every teacher with a memory stick*
> *P 7: School A - Principal.txt - 7:15 (122:128)*

5.2.1.2 Transforming schools – Creating an ethos of a shared vision

"So we brought in young, energetic new dimension, new generation teachers into each grade... So we planned, that was a political game as well."

Inclusion Criteria	School employment strategies; Teacher induction and support; School based teacher training initiatives.
Exclusion Criteria	Department teacher In-service training initiatives; Teacher self-study initiatives; School clusters

All schools in this study seem to convey a similar message in their attempt to change the teacher corps at schools to reflect the ethos of the school. Principals appeared to hold the view that a change in the teaching staff to include ICT envisioned teachers would gradually lead to ICT being used for teaching and learning.In the township school, the principal and governing body made attempts to change the mind-set of teachers to accept ICT as a tool for teaching and learning. The principal elucidated his idea for motivating teachers.

> As I usually tell the educators that none of us has a primus stove [oil-burning stove] in the kitchen so why do you want to use the blackboard. Think about it, you want a microwave. Don't work hard, work smart.
> School A: Principal.txt

At the independent school, teachers were supported with technology resources and encouraged to gradually adopt ICT in their teaching practice.

> Yes, we encourage it. I don't think the policy that says we must use it but it does make learning more exciting and improves learners' attention. There is a section in policy that deals with use of information technology in your classes and teachers can use that as base to ask for ... a projector or whatever may be the case.
> School C: Principal.txt

However, at the inner city school the principal seemed to apply a more aggressive approach, by gradually trying to change the teaching staff with younger generation ICT competent teachers. He indicated that this strategy was aimed to gradually employ teachers that would change the ICT ethos of the school. The school governing body also created teaching post for each of the seven grades at the school, and filled these posts with 'younger generation teachers'. The principal of this inner city school described his staffing strategy and the support he gave to teachers.

> *I think the big advantage was that our governing body said they were going to create a third class in each grade and they will appoint nine governing body teachers. So we brought in young, energetic new dimension, new generation teachers into each grade. So that helped us in a grade where there are three teachers, one is a young generation teacher. The old teacher is still there but, she is out-voted by the other two now. So we planned, that was a political game as well. To appoint teachers that have the skill, we've appointed a new teacher now. An excellent interview. We actually phoned on the intercom phone his principal and his deputy, ag HOD.Great references.fantastic guy, his been in our school for now four weeks, he has not presented one lesson. He says you guys are in a different world, I want to go back where I come from, I cannot work like this. We said hey, that's why you here because you are good, we will empower you with this, because it new for you. We will help you, because with your skills and with this…*
> *P 8: School B - Principal.txt - 8:166 (849:855); (299:304)*

The same inner city school principal explained the recruitment drive of the school and the initiation of an intensive induction programme to support newly appointed teachers to use ICT in their teaching practice.

> *Internally we have boffins here like Miss Bo, Vanie, VanZyl, ja those guys train them, ja whose got problems. Wehave an induction programme for new teachers, yes it takesus about three months the induction programme, to say thisis how we do it.*
> *P 8: School B - Principal.txt - 8:153 (784:789)*

School principals in this study seemed to realise the need to develop the capacity of their teachers from within their institutions to support ICT transformation at schools. In this regard, the independent school and the well resourced former model C school relied on their own resources to develop teachers in the use of ICT. Both schools identified the need and the importance of forging ahead and not to wait for external support (district) to develop their teachers. The principal of the independent school related his story on how his school developed capacity and supported teachers in ICT.

> *Initially, they looked into teachers training and it was compulsory; this was for you to use it, we encourage it. That was one way of the measures we used to ensure that the teachers are proficient and make efficient use of computers in their classes.*
> *P9: School C- Principal.txt.*

> *(continued)*
> *They also extended the computer rooms available in the school… A few years ago, we started with computer teacher but he couldn't cope entirely by himself with the integrating and networking of the school. He was sent to a training course at University of Pretoria.*
> *P9: School C- Principal.txt.*

At the former model C school the deputy principal was recently employed by the school particularly for his ICT skills, and was responsible for teacher support in integrating ICT into the curriculum. This school also employed a full time technical assistant to support teachers with ICT technical issues. The principal of the school elaborated on the opportunities for support and training that the school management and teachers were exposed to.

> *That's why we enjoy the KAD programme becauseonce every three months, my whole management goes formanagement training… We create opportunities here, otherwise it comesfrom nowhere. We send our teachers quite often to seminars,courses things like that.*
> *P 8: School B - Principal.txt - 8:152 (783:784)*

Contrary to other schools in this study, the township principal appeared to be dependent on district support for the training of teachers. The principal indicated that the professional development needs of teachers (for example ICT teacher training) are noted in the school improvement plan (SIP), which he expected the district office to follow through on providing training for teachers. The principal of the township school described how without appropriate teacher training the laptops that the school had acquired for teacher use, may lose their value.

> *Let me mention why it's important to have these ICT equipment in your premises but having it in a township school is a challenge due to theft. The other challenge is- how many teachers would know how to use a laptop if we gave each one of them a laptop? So we have to come up with programmes to develop them, train them and stimulate them because chances are they will give the laptops to their children. Therefore, the challenge is training and development...That would be noted and presented to those who are supposed to hear it- the district must pick it up from there.*
> *P6: School A- Principal.txt*

5.2.2 Resources required by schools to affect the behaviour of teachers to implement policy

In this sub-theme I report mostly on the narratives of the principals as they relate their experiences about issues that impede their ability to foster the use of ICT in their schools. I report on principals' concerns relating to the universal issue of lack of physical ICT resources, the need for ICT-curriculum based content resources, specific pedagogical training for their teachers, the need for policy guidelines, the challenge to recruit ICT competent teachers and changing mindsets of teachers.

5.2.2.1 ICT curriculum resources

"I got the interactive whiteboard, we got the projector, we've got the lap-top, we've got the demo lesson now where's the content?"

Inclusion Criteria	ICT-curriculum integrated content. ICT curriculum based teaching and learning resources.
Exclusion Criteria	National curriculum policy; ICT attainment standards.

The initial response to resources required by the school, led most school principals including the principal of the affluent school to suggest that physical ICT resources were necessary for the successful implementation of the school-based e-education policy. The principal of the independent school responded to the need for ICT physical resources for teachers.

> *I think most teachers would like to use the best piece equipment in their classroom, that is a given, but the problem it is expensive. We'd like to replace the old projectors with the newer ones because they pick up the internet. We have also identified a number of learning areas that would benefit from having a projector in the classroom. In terms of resources, that would make all the difference.*
> *P 9: School C - Principal.txt - 8:122 (475:483)*

On deeper interrogation, school principals indicated other compelling issues that are necessary for curriculum delivery using ICT. The principal of the former model C school identified a need for appropriate ICT based curriculum content. Such content is

crucial for curriculum delivery and the support of teachers in the use of ICT in their classrooms (see next excerpt).

This principal of the former model C school seemed concerned about the lack of curriculum content that is available to schools to integrate ICT. He had through school means acquired ICT curriculum content for some learning areas from a private company specialising in educational software. He gave a detailed explanation of the hurdles he experienced in obtaining suitable ICT curriculum based content. He also described his frustration at the constant changing of the national curriculum policy.

> *KAD [private company] said they will provide that [curriculum content], but they not coming to the table. So that they go to Britain and get those British things and they bring them in. And now we they trying to change it, but those things are patented and all that, and you can't just do that. That is one of the questions we have. The schools that took the math package with them, now three years later they say where's the lessons?...I got the interactive whiteboard, we got the projector, we've got the lap-top, we've got the demo lesson now where's the content? Where's the content? So I think there's a big fuel in the development of the content? Once we can stabilize the curriculum, and know what the curriculum would be. I see in the newspapers now, in the primary school, they want to cut down to 4 or 5 learning areas…*
> *P 8: School B - Principal.txt - 8:122 (475:483);*

The same principal explained that because schools are desperate for relevant ICT curriculum-based content, principals and teachers seemed indiscriminate in their method of approach to access curriculum based material. He also expressed the desire for locally developed ICT curriculum content. In this regard, the principal apparently felt that the Department of Education should create an ICT curriculum development unit to develop such content, which could be packaged for school curriculum support.

> *We try to make them all educational based. I think the problem at the moment is to find content…Ja, "The great escape", but we want to know, we want to know content, content, there's no content. The guysbuy any program that they can get their hands on, and it all in pounds and dollars and this and that.But I thinka lot of the content can be developed here in our country.If there's people that geared for it Ja, ja. If theeducation department opens a section and say we are doingcontent for e-learning and they put the people there, andthey equip them and everything, they can provide that. You get your lesson on a CD.*
> *P 8: School B - Principal.txt - 8:205 (1199:1203), (468:470)*

In contrast with the argument put forward by the principal of the inner city school above, the principal of the independent school seemed to suggest that schools and teachers in particular should change their mindsets and not be 'curriculum bound'. He related his point of view:

> *There are so many people who are curriculum bound especially this time of the year because they feel as though they don't have the time to teach. That is where a new mind shift needs to happen*
> *P 9: School C - Deputy Principal.txt - 9:42 (216:219)*

Teachers as classroom practitioners supported the principals' view in respect of the need for appropriate ICT based curriculum content. An inner city school teacher suggested that software and web-resources should be given to schools by the district office, in the same way in which textbooks are evaluated and recommended by the district.

> *And then offering us and say you know how to work acomputer, here's the education software you can, give alist of educational software you [District] evaluated and say theseare the one's we went through and we think these are theone's that are excellent… Ja, just like the way they do with textbooks. Orgive a list of open source websites that's accessible tothe teachers, that they actually went through and say we'veput our stamp of approval on it.*
> *P 4: School B - Teacher 2.txt - 4:141 (1089:1091) (1093:1096)*

5.2.2.2 The need for ICT competent teachers and capacity building

"Teachers have resigned they left. They just said you know what I'm not in for this... And there must be training, because a lot of our people are not trained, our people come from disadvantaged areas where this does not exist."

Inclusion Criteria	ICT teacher competence, knowledge, skills and expertise in the use of ICT. Teacher ICT professional and academic qualifications. Pre-service training; School-basedcapacity building initiatives for in-service teachers.
Exclusion Criteria	Learning areas competencies; Teachers as self learners; Teacher's self initiated study. District, province and national training initiatives

A resource required by all schools that emerged from the voices of teachers and school principals is the dire need for ICT competent teachers that are entering the teaching profession. Both principals of the public schools indicated that new recruits that are skilled or qualified in ICT are in short supply. School principals seemed to be hard pressed to identify new teacher recruits that are ICT competent or at least have the will to use ICT in their teaching practice. The principal of an inner city school expressed the issues at play in trying to recruit teachers that are ICT competent.

> *Ja you know challenges like to convince people[teachers] that it's important, that there's a need for that. Challenge is to find well equipped people…you might have this but the skills are not there, or the passion is not there. Then it's [computers] locked in the safe, I mean it won't be used…ja, you know what, over the last three years, we really started with this. Teachers have resigned they left. They just said you know what I'm not in for this.*
> *P8: Principal School B*

Fundamental to the need for competent teachers is the issue of ICT teacher training for in-service and pre-service teachers. The voices from all participants in this study appeared to concur with the notion that higher education teacher training is not developing ICT competent teachers. The township principal explained his idea of producing ICT skilled teachers at higher education institutions.

> *I think so and I think that when it gets to the training of educators, one should introduce somewhere in the course whether as a minor or a major to introduce it a requirement for teaching before they graduate from varsity.*
> *P7: School A- Principal.txt*

An Afrikaans teacher studying towards a postgraduate degree and employed at the independent school mainly toprovide technical and pedagogical support to other teachers in the use of ICT,voiced his opinion with respect to pre-service teacher training at a higher education institution.

> *I've got a concern that students coming from Tukkies [meaning University of Pretoria], that they are just oblivious to the technology in the classroom, and I believe that is the breading ground where it should really start at university level. So that when a student comes in they should actually be the drivers…but the teachers going into the schools are not geared [very emphatic] to do those things yet.*
> *P 5: School C - Teacher 1.txt - 5:70 (586:591)*

All school principals in this study recognised the need for teacher training, particularly in the pedagogical use of ICT. In-service teachers seemed to have surpassed the ICT literacy stageand they now desired specialised training in pedagogical methods, time management to balance the integration of ICT with curriculum delivery and advanced ICT skills. The technology teacher in the township school expressed his excitement to learn how to use ICT more effectively in his teaching practice.

> *Yes, all I'm doing on excel is my recording [meaning administrative task] But it would be good to see how we can incorporate excel in teaching, because I know that many people love excel...[excited] oh, oh I can see it. It opens a big door for teachers.*
> *School A: Teacher 1.txt.*

Participating principals appeared to require teachers to become more skilled in the manner in which they employed ICT in their daily teaching and learning practice. The former model C school principal narrated his vision of an ICT skilled teacher emerging from university study.

> *This is a tool and everything around it is a tool, they [teachers] must just use it, that's why training is very important. I would say over the next 3-4 years I would expect that we appoint coming from the university or anywhere, that walks into my class and I say there's the network point there's the laptop, there's it, thank you very much can I just quickly transfer my lesson to my laptop [illustrates the process using his cell phone and the laptop]. That's how I see it. If the HOD says where's you prep, I just say can I transfer it quickly, where's your laptop, blue tooth on alright there's my prep…*
> *School B- Principal.txt*

The voices of the principals in this study revealed various degrees of reliance on systemic support for teacher training. In the case of the township school their need for support seemed to be one of desperation. The principal explained that though teachers should take responsibility for their own development, he expected the department of education to facilitate the training of teachers.

> *And also for the teachers already in the working environment, they [District] should come up with interesting course or seminar or workshop to add to their teaching credit. I don't think the department has been focusing in that... Obviously the responsibility starts with us; it's about where we want to go... the teachers will raise objections. So try and help yourself out first and it's also the responsibility of the authority [Department of Education] for example... We are all teachers and we all need support.*
> *School A: Principal.txt*

On the other hand, the inner city school and the independent school are apparently self reliant and less optimistic of support from district. Both of these schools seemed to provide in-house opportunity for teacher training. The former model C school principal elaborated on the training opportunities the school offered for new teacher recruits.

> *We create opportunities here, otherwise it comes from nowhere. We send our teachers quite often to seminars, courses things like that. Internally we have boffins here like Miss Bo, Vanie, Van Zyl, ja those guys train them, ja whose got problems. We have an induction programme for new teachers, yes it takes us about three moths the induction programme, to say this is how we do it. Forget about where you come from 'this is how we do it', 'this is why we want it' and this is 'how we want it'. We make an effort, it's time consuming, it takes a lot of time.*
> *School B: Principa.txt*

The principal of an independent school explained the need for training for all teachers in his school. The school has developed one teacher to champion the process of ICT integration into the curriculum by supporting teachers as and when they need support. Although the main task of this teacher is ICT support, this placed excessive strain on this teacher.

> *At the moment, some of our staff would benefit from a training programme because there is only one person available and as much as he is willing to help, it becomes too much for one person…Certainly, there is need for teachers training…*
> *P8: School C: Principal.txt*

A public school principal described the dire need for adequately skilled teachers. Although he is a principal of a well resourced inner city school, he seemed to realise the need for ICT training of all teachers, particularly those that are from disadvantaged communities.

> *And there must be training, because a lot of our people are not trained, our people come from disadvantaged areas where this [ICT] does not exist. And even if you deliver this today there, it will not work because the guys are not skilled... You need to empower the guys and equip the guys to get them to use these things, because the more they use it the easier it becomes. And the easier it becomes the more you start experimenting with it, the more you experiment with it the more you discover which makes it much more easier.*
> P:7 School B . Principal.txt

The township school principal explained the limitations he experienced in training teachers in the use of ICT. He described the Integrated Quality Management System (IQMS) process through which training needs of teachers was determined. The IQMS assessment instrument was used to record each teacher's professional development needs, which were noted in the school improvement plan (SIP). The limited budget of the school would be used where possible for the professional development of some teachers, but not necessarily for ICT training. He expected the district office to react to the composite needs of the school as indicated in the school improvement plan and to provide training to teachers. He elaborated,

> *You'll assist with immediate support. Once again, I'll refer to our budget; we do have a tab for development of educators. That would be noted and presented to those who are supposed to hear it- the district must pick it up from there.*
> *School A: Principal.txt*

5.2.2.3 The need for ICT policy and policy guidelines

"Look we've got that White paper, but something more better and more…that explains it better and more structured"

Inclusion Criteria	Systemic policy support (department of education, provincial and district policy). Official circulars, memoranda and guidelines.
Exclusion Criteria	School's policies and institutional support.

All three schools in the sample, through the voices of teachers and principals, appeared to desire ICT policy guidelines that are tangible. They did not seem to perceive the national e-education policy as a workable document. Even though teachers in all three schools were aware of the e-education policy and principals were unaware of the policy's existence, there appeared to be an outcry for more simplified policy guidelines for schools. A teacher of theformer model C school expressed the sentiments of all schools with respect to the need for policy guidelines and support from district, province and national.

> *Interviewer: When you and the principal spoke to me earlier you said 'there is so much that we can do but we do not know what must we do'*
> *Teacher 1: Maybe set up a better syllabus, may have meetings. Say to all the teachers in the computer rooms we have a cluster meeting for you. Do this…Do This … get ideas exchange ideas…That must come from the department. Look we've got that White paper, but something more better and more…that explains it better and more structured.*
> *P 3: School B - Teacher 1.txt - 3:57 (702:715)*

Another teacher at the former model C school indicated a lack of guidelines from district. This teacher expressed a dire need for ICT integration policy guidelines that would enable her to teach effectively. She gave vent to her feelings of frustration.

> *There needs to be a link. We don't know what they want, we making up as we go along. We using our own stuff... They don't give guidelines, I don'tthink it fair. I don't think many teachers, I don't thinkits fair*
> *P 4: School B - Teacher 2.txt - 4:135 (1075:1078); (1082:1084)*

Schools are seemingly on their own with respect to developing their ICT policy. All of the schools were at different levels of progress with the development of their own ICT policy: The independent school had a copy of their policy and immediately e-mailed it to me (See Appendix E5). The policy document however, is generic and effectively spells out acceptable behaviour for learners in the use of ICT. The document does not relate to issues of teaching and learning. The former model C school indicated that they are developing an ICT policy and "it's in the process of development and changing all the time", while the township school did not have an

ICT policy as reflected by the principal's plea 'we are heading towards that [ICT school policy] and may I request you to assist us please.'

In the narratives of the principals of all schools in this study, they implied their knowledge or lack of knowledge of the national e-education policy. None of the participating principals referred to the e-education policy in our discussions, either implicitly or explicitly, as a source document for their planning. The principal of the model C school seemed to be "waiting" for appropriate policy from the national department of education. He explained his anticipation of an e-education policy and district response to his inquiry.

> *Interviewer: are there any provincial, national or district policy that you can turn to, to give you guidance for the school itself?*
> *Principal; No, no. I often spoke to the IDSO, the lady who phoned me just now. But the answer we get lately is that you must do is right for your school. And do what's best for your learners. I think once the Gauteng-on-line computers are installed and are operational, there will be a policy from the top coming down for that.*
> *P 8: School B - Principal.txt - 8:105 (355:362)*

The principal of an independent school suggested that though the e-education policy may exist, he had no knowledge of it. He acknowledged that there may be gaps in the implementation of the e-education policy which the independent school had ignored and forged ahead.

> *It's [e-education policy] probably available out there but we are unaware. I know that when I was in a government school, I'd get those documents and I'd end up just filing them away. Nowadays, we are so reliant on IT that I'm not sure if I have seen the white paper policy document {laughing}. However, there are missing gaps since inception and maybe in independent schools we can forge ahead with what the government has prescribed as a periphery. We get more leeway in terms of what is best for the learners.*
> *P 9: School C - Deputy Principal.txt - 9:28 (150:154)*

The principal of the inner city school expressed his concern that the district office remained at a distance in term of policy support. He elucidated the lack of policy guidelines, directives and support that are expected from a district office.

> *Ja, I think the time is right now for the district to play abigger role. To come forward and say guys we areimplementing Gauteng-on-line centres in you schools, we starting thisMath, Math Literacy, we starting this and this, this is the biggerpicture. This is where we are now this is where we want togo, and this is how we are going to get there. Some of youguys are almost there; some of you guys haven't started.This is what we going to do. There's no big picture, That's the way to go, because it's [ICT] there already, they not using it.*
> *P 8: School B - Principal.txt - 8:195 (1149:1155)*

The same principal described his frustration at not being able to access sufficient help in setting up the school computer laboratory (provincial funded). He put across his uneasiness with not knowing whether he is proceeding correctly in creating an e-learning school, but at the same time acknowledged by district for his ICT progress.

> *When the Gauteng-on-line came here we could not find a person that could advise us. The what? The where? The how? What must we do with that? What is it used for? Nobody can tell us…We get a lot of support, in a way of 'we like what we see', 'we like what you do' [Pause] And we get the blessing of what we do and how we do, but nothing else, there is nothing [qualifies his opinion], I don't think there is anything [reaffirms].*
> *P 8: School B - Principal.txt - 8:183 (1053:1059)*

5.3 Beyond the boundary of the school

5.3.1 The ability of district and province to affect the behaviour of teachers to implement policy

In this sub-theme I focus on the capacity of the systemic structures of the district and provincial education departments to influence the behaviour of teachers towards implementation of the e-education policy.

5.3.1.1 District and province ICT administrative directives

"That's why the course was here, they [district] don't take paperwork anymore… They say from now on you will be doing it like that."

Inclusion Criteria	District's ICT administrative processes; District's ICT administrative training and support.
Exclusion Criteria	School's administrative initiatives and processes.

This sub-category is defined by administrative directives taken by systemic levels to persuade schools to adhere to policy requirements. The district has indirectly changed the behaviour of teachers in relation to the implementation of the e-education policy by enforcing schools to adhere to ICT enabled administrative processes. At most public schools teachers are apparently tasked with this administration responsibility and are often clustered for software ICT training by the district office. In other administrative functions schools are obliged to complete the annual survey, which is a comprehensive electronic database of the school's teaching and non-teaching staff, learner population, building audit, physical resources and an inventory of ICT equipment.

The district also enforcedthe use of a district supplied software package in schools for learner data, curriculum planning, financial control and school time-table planning. The township school principal described the purpose of this program, for which teachers or secretaries receive appropriate training.

> We are linked to this SAMS programme which in a nutshell refers to the recording of information of learners. It is in some way linked to that ...[internet], it's a data capturing programme as well as the annual survey that we are doing via .... Our financial system is also in the system and we use Pastel programme.
> P 7: School A - Principal.txt - 7:8 (73:76) (78:82)

The principal of the former model C school described the district's administrative demand that the procurement of learning support material is done electronically. He explained the use of his school as a centre for school cluster training in the use of the prescribed software for procurement of teaching and learning material.

> *That's why the course was here, they [district] don't take paperwork anymore. They've got a format it's on the computer, you've got to complete it and e-mail it.*
> *P 8: School B - Principal.txt - 8:190 (1093:1097)*

> *(continued)*
> *They don't want papers anymore. That's why they had all the media centre teachers, and all the teachers working with textbooks and the retrieval of books and the ordering of books. They say from now on you will be doing it like that.*
> *P 8: School B - Principal.txt - 8:190 (1093:1097)*

The technology teacher at the township school was tasked with the procurement of teaching and learning support materials. He narrated how he coped with this administrative duty while having to teach at the same time.

> *Let me come back to the LTSM [learning-teaching support material] part. I am currently busy with placing book orders for the entire school so I have ample time to do this because I do mythings on the computer. I can make copies of my notes and give it to my learners to continue as I am busy working with the internet. We don't have a lot of admin help so we have to do it, yourself.*

5.3.2 Resources required by district and province to affect the behaviour of teachers to implement policy

In this sub-theme I focus on resources that the district and provincial education department may find necessary in bringing about change in the behaviour of teachers in the implementation of the e-education policy. The following sub-categories were evident from the coding of data, and these are the need for policy guidelines and channels of communication, guidelines for ICT curriculum integration and ICT assessment levels, district capacity and competence to monitor and evaluate implementation of e-education policy, the need for a shared vision and unified strategy, the need for ICT willing schools and ICT teacher training.

5.3.2.1 The need for ICT policy, policy guidelines and effective channels of communication

"The e-education policy is actually is the bible...just preaching the documents that we adopted from the department [National]", "I don't blame those teachers if they haven't seen it [e-education policy], these policy documents."

Inclusion Criteria	Provincial and national ICT policy guidelines; Systemic channels of communicating the e-education policy.
Exclusion Criteria	School ICT policy;School or teacher's personal interest or access to the e-education policy; Schools channel of communication of the e-education policy to parents; cluster and cascade collaboration

- **Adopting the e-education policy**

The provincial department of education and the district office seemed to speak with one voice in their attempt to explicate the lack of their own e-education policy initiatives. Both systemic levels did not appear to have developed their own ICT education policy or policy guidelines that could be used to portray and simplify the mandate of the e-education policy to schools. The district office chief e-learning specialist responded to the issue of a district ICT policy as follows:

> *Interviewer: Does district have its own ICT policy?*
> *District Official: [very long pause] Eh…not necessarily. We just preaching the documents that we adopted from the department.*
> *Interviewer: Which documents would that be?*
> *District Official: The e-Education policy, obviously. Which is our bible, you know what ever we develop even in our operational plans. That's is where we take our , our, all our operational objectives.*
> P10: District.txt

At both district and provincialsystemic levels the education department officials reported that they have "adopted" and "aligned" their directorates to the national e-education policy. The e-learning directorate at provincial level appeared to be fully conversant with the process of creating mandated policy. Despite this, the provincial e-learning directorate apparently did not have an e-education policy that drives the national e-education agenda, nor did it have policy to guide districts' e-learning directorates.

The same can be said about the district office, in that district has also adopted the national e-education policy and relied on this document as is evident from her words "the e-education policy is actually is the bible".The chief education specialist (CES) offered an explanation for the e-learning directorate's apparent policy deficiency.

> *CES: Before you [laughs] In developing our policy, ok we take the national we match the provincial document you know, because that's the province, we having the premiers office, still coming with their own vision, coming with their own strategy, to make sure we align the provincial aims or objectives and goals with those of National's, and then we mix the two and come up with our own policy. So that's the process that has been started, that's the policy that's going to ensure it's our policy, and…*
> *Interviewer: How far is that process in place at the moment? In developing your own policy?*
> *Interviewer: [silence]... Is it in the process, is it reaching finalization, is it in the process? Is it in the pipeline?*
> *CES: How? We always sit at the ground stage. Already we have one circular that is approved.*
> *P12: Province.txt*

While district and province find their feet in establishing their own e-education policy, these systemic structures seemed to act merely as a conduit for the national e-education policy. School teachers, howeverexpressed adire need for clear policy guidelines in order to implement the e-education policy (See 5.2.2.4). Teachers appeared to seek more tangible policy guidelines and not simply an imposition of the national e-education policy. Ironically, provincial and district officials expected schools to have their own ICT or e-learning policy, but schools apparently did not have district or provincial policies to guide them. Schools on the other hand, seemingly did not mention or refer to any of the provincial circulars or district memos nor did they reference the national e-education policy in their official school e-learning policy document (see Addendum E).

At district level, the e-learning specialist suggested that theobjectives and mission statement of the e-learning directorate (refer to Addendum E7) that were used at seminars should be clearly understood by schools. However, schools are looking to district for making the e-education policy clearer for them to understand and implement. In this regard neither the district office nor the provincial e-learning directorate appeared to have produced any policy guidelines to schools that simplified or elucidated the expectations of the national e-education policy. Schools seemed to be on their own to integrate the national curriculum policy with the e-educationpolicy.

At both these systemic levels, there was an absence of policy directives to school that would guide the implementation of e-education policy in schools.

- **Communicating the e-education policy to schools**

Fundamental to the lack of adequate guiding policy was the issue of communicating the e-education policy to schools. This sub-category also focuses on the district and province's modus operandi of communicating all policies or e-education policy related circulars, guidelines or memoranda to schools.A crucial resource required by district and province was to improve the e-education policy channels of communication between province, district and school. All participating principals were seemingly unaware of the existence of e-education policy as they did not mention the policy as a resource document. Contrary to the experience of principals, systemic structures beyond the schools' boundaries (district and province) indicate that all schools apparently have the e-education policy. The provincial deputy chief e-education officer explained their dilemma with respect to communicating the e-education policy to all relevant stakeholders at school.

> *DCES: Normally when we go to schools, which is a problem generally with all the other policies. You go to the school, and ask them do you have this particular policy they say no, but when you probe you find that its there, [laughs out loud], you know. And, and but our case is to have educators where, all the educators are capable I mean are aware of what we are having and they implementing all the policies.*
> *P11: Province Officer.txt*

The e-learning units of both district and province identified road-shows, seminars and conferences as the means to communicate the objectives of the e-education policy and showcase e-learning best practices. The provincial e-learning official claimed that many schools are far ahead in e-learning because of their exposure to these road shows. The provincial directorate suggested that road-shows allowed them to reach their target audience and communicatethe e-education policy. The deputy chief education specialist (DCES) at provincial level elaborated on his confidence in road shows as a means to communicate the e-education policy and as a means to change the behaviour of teachers towards implementing the e-education policy.

> *DCES: In terms of changing that behaviour of teachers, you see one thing that I had observed, before I joined Head Office, was what CES and the other members did was to do the road shows, road show in order advocate e-learning and district officials also did the shows with the schools, but it was not a once off thing, even now currently that programme is still running, where we still advocate this and this of ICT's.*
> *P:12. Province.txt*

A teacher at the inner city school described how she apparently came to know about the existence of the nationale-education policy, through her participation in an e-learning exhibition organised by the local district's e-learning unit.

> *Teacher 2: Yes, the white paper isn't familiar to all educators. I heard of the white paper when I went to e-learning exhibition station.*
> *P 2: School A - Teacher 2.txt - 2:53 (413:416)*

The district e-learning official claimed that communicating the e-education policy to all stakeholders was a challenge. At district level the e-learning education specialist appeared tobe rethinking the road-show or conference approachas means to communicate the e-education policy. According to her, road shows, seminars and conferences are limiting methods to communicate the e-educationpolicy as they exposed only the e-learning champion teacher at the particular school to the policy and not all teachers. According to the district official, the selected teachers that represent their schools at these e-learning seminars and conferences did not expose all stakeholders at their schools to the e-education policy. This culminated in a gap in the way the e-education policy was supposed to be communicated.

Both district and province indicated that teachers who attend the e-learning conferences and district meetings tended to take the policy documents with them when they transferred from one school to another.The district e-learning official described her negative experience of using conferences as a means to communicate the e-education policy "Because this system of clusters and big conferences, I notice it does not work, much more hands on, individual approach, even if we can do two schools a year".

> *Because this system of clusters and big conferences, I notice it does not work... Why, its because only one or two delegates [who attend the conference], and when they come back [top school]. The fact they say I [other teachers] did not get to attend the conference. I said people its time to connect with the schools, so they are yet to see us... Some of them might not even be aware that we exist as a unit, you see.*
> *P 12: District.txt - 2:53 (413:416)*

- **Cascades and school clusters**

With regard to using the cascade system of communicating the e-education policy, the district and provincial e-learning units also stand divided in their view of its effectiveness. The provincial e-learning directorate appearedto be convinced that their cascade system is a process that provides ample opportunity for the e-education policy directives to be mediated effectively at all levels of the system. With the cascade system seemingly in place, provincial officials indicated that the e-education policy document *is* in every school. The provincial e-learning official explained the cascade process in communicating the policy.

> *DCES: …So we workshop these policies again. Thus it is cascaded down to the schools, via the clusters ok. So our facilitators at the district level have formed clusters, and that is cascaded down to the CELTs, the school's e-learning team and that's how our policies are being mediated in the province.*
> *P12: Province.txt*

Contrary to the expectation of province's strategy on the formation of formal clusters (CELTS) in districts, the district officer did not seem convinced of its effectiveness. There seemed to be a mismatch in understanding between district and province in terms of the channels of communicating the e-education policy. The district official expressed empathy with teachers already overburdened with curriculum based clusters. She expressed her concern that clusters did not function as a means to inform schools about the e-education policy.She expressed her beliefs that the cascade and cluster systems of communicating the e-education policy are processes that did not work.

> *Regardless of the fact that whenever I send out a memo, I say ICT the in brackets in full what it is. But not everybody get to read that memo. That is for me…the question of clusters information doesn't filter through, the cascading model it does not work [emphatic]. It does not work you see. I don't blame those teachers they haven't seen it, regardless of the memos that have gone to the schools, or the...the…these policy documents.*
> *P11: District Officer.txt - 11:116 (830:835)*

The district e-learning official apparently changed her strategy of communicating the e-education policy to schools. The e-learning district official proposed working with all stakeholders at individual schools to communicate the e-education policy. The e-learning unit seemingly embarked on a whole-school training approach, training one school at a time. The district official enthusiastically explained her new communication strategy.

> *So, at this point in time, what we are doing, we are visiting schools and training the whole staff, on the e-Education policy… But with e-learning everybody have got to come onboard. So what we do, we go out we bring the school to a stand-still, the SGB, the educators, the clerks,*
> *P10: District.txt*

In this district strategy all stakeholders seemed to be targeted and exposed to the e-education policy. The whole-school training involved a one-hour PowerPoint presentation to all stakeholders. The participants in this workshop were given a hard copy of the PowerPoint presentation (see Appendix E7) and either a handout of the e-education policy or a websites address for schools to access the document. She relatedhow the workshop unfolded.

> *Then we give them a one-hour presentation, where we give them the whole background on the document [e-education policy]. We have prepared slides for them, we make copies we hand them out, we also give them hard-copies, but the hard copies because we don't have enough, we just give them to the HOD's [head of department]. Otherwise we just give them the web-site, because it is available on-line.*
> *P10:District.txt*

The main goal of the district official's new approach to communicating the e-education policy is to prepare teachers for future workshops or training. She believed that the one-hour workshop would lay the foundation for teachers to understand the broader framework of the e-education policy.

> *So that whenever we invite them for training, whenever we introduce ICT, they will understand the thinking you know, where we coming from, you know. They will understand the use of ICT's within a broader framework of the policy that has been adopted by the department.*
> *P10: District.txt*

5.3.2.2 The establishment of ICT curriculum integration guidelines and ICT attainment levels

"We still haven't set those standards as a unit [district], not even as a department [province]"

Inclusion Criteria	ICT curriculum integration guidelines and district support; ICT attainment levels
Exclusion Criteria	Teacher ICT qualifications

Participating schools seemed to be integrating ICT into the curriculum through their own interpretation and understanding. At all three schools in this study the observed lessons were indicative of teachers using ICT to teach the curriculum (See Appendix F1-F6, classroom observation video clips). Schools are trying to make sense of how to integrate ICT into the curriculum. Without any guiding policy on how to integrate ICT into the curriculum, schools are exploring this through teachers' own initiatives.

Most schools and teachers have acquired their own ICT software and resources that are curriculum based and are learning through their own experiences of how to integrate ICT. The principal of the former model C school explains that the national curriculum policy is open to his interpretation and thus the opportunity to integrate ICT. He expressed his enthusiasm for ICT to be integrated in the core curriculum policy.

> *Interviewer: The new NCS policy, would you say the NCS has catered for ICT integration?*
> *Principal: No…it is, it is, its how you going to use it. I think it leans it more than ever before, that you can use it… No its not spelled out, its not there. But I think the way we do it and how we use it, when I think back now definitely more than ever before. Ja, the previous things were all referred back to a specific text book, its open now…It leads it more definitely, more than the old curriculum, or even when we first started with OBE, it was chaos, nobody knows what to do. Everybody just tries their own thing… I think it would be lovely for in a policy document for a learning area, at the end of each topic or there's 4or 5 websites where you can find more information on this or that. That will be fantastic, because that's what the teachers need..*
> *P7: School B – Principal.txt*

District and provincial e-learning directorates did not appear to have guidelines to support teachers' attempts to integrate ICT into their teaching and learning. The lack of ICT curriculum integration policy or guidelines did not seem to capture the attention of systemic structures. The provincial e-learning directorate appeared to focus on ICT resources (software) and management issues (time-tabling). The DCES of the e-learning unit responded to ICT curriculum integration guidelines as follows:

> *Interviewer: How does the province plan to encourage teachers to integrate ICT into the curriculum?*
> *DCES: Well we've given out the draft document that we've got. We have made sure that each and every school they allocate a time table, they allocate a period on the time table where all learners will have access to that, but over and above we also got support structures in terms of our CELTS structures, our cluster e-learning team our clusters andour provincial e-learning officials they assist, they visit schools there thereafter again we say we also need to provide schools with some ICT resources, get curriculum program, that's another aspect which we can solve and make no mistake with that and we have already made our plan to support the e- teacher initiative project. So definitely*
> P11: District.txt

All schools in this study have also developed their own ICT attainment levels (see Addendum G) appropriate for each phase in the school. Both district and provincial departments seemingly did not have established guidelines for ICT attainment levels. The district and provincial e-learning officialsappeared to be seeking guidance to set ICT attainment levels. The district e-learning official explained that ICT

attainmentstandards have not been determined by the district office nor have they been developed by the provincial e-learning directorate.

> *Interviewer: Does your unit have student attainment standards in terms of ICT? In other words do you have what you expect schools to teach their children?*
> *District Official: Ja, not as yet. But I see that we are not going to be complete until we are able to do that, you know. We still haven't set those standards as a unit, not even as a department [provincial].*
> *P11: District.txt*

The provincial e-learning chief education officer corroborated the utterances of the district officer in respect of ICT attainment levels for schools. The e-learning directorate seems to be searching for a solution for this deficiency, with the expectation that relevant research could provide a solution.

> *Interviewer: Does this unit or directorate have student attainment levels in terms of ICT?*
> *CES: You see at the moment, we are seeking research in this regard, we need a research, you know to guide us for some of the questions you are asking, so hopefully when we get a report we can implement it*
> P11: Province.txt

5.3.2.3 The need for systemic competence and capacity in e-learning directorates

"I'm beginning to study, you know. Yes, because people want to know, that you know your stuff...They need to know I'm an ICT co-ordinator who is knowledgeable...unfortunately we are a very small unit, hey...and I've only got three facilitators"

Inclusion Criteria	District capacity to realise policy goals; District and province ICT qualifications, knowledge and skills; ICT Pedagogic know-how; District and provinces perceptions of ICT competence; Ability of the e-learning units at both district and provincial level to support schools; manpower resources and their capacity to engage in supporting schools; School perceptions of district and provincial E-learning officials competence;
Exclusion Criteria	Teacher's capacity to realise policy; District and provincial's perceptions of teachers ICT competency; Institutional support; Inter and Intra school collaborations to realise policy.

In this sub-category I focus on two complementary aspects of systemic competence and capacity. In the first instance I present various participants' views on the district's ICT professional competence and the support (or lack of support) that these systemic units offer to schools. Second I focus on human resource constraints (capacity) confronting district and province in respect of their support to schools.

- **District competence**

The voice of a district officer suggested that she needed to be acknowledged as a well resourced ICT person. The district official indicated that she had begun to further her studies in order to gain recognition from schools as an expert in the field of e-learning and in this way have her competence recognised by the schools. She made several utterances of the same words, apparently as a plight to be acknowledged as someone 'who knows what she is doing', her verbal protest seemingly being in response to the reaction she got from principals of schools. She also felt that there was a need for her to demonstrate through her current studies that she is an authority in the field of e-learning. The district official pointed out that the vision and mission statements (See Appendix E7) of the e-learning unit was ofher own design and represented her motive to drive the e-education policy implementation process personally.

> *District Official: I think first of all they need to look up to me as somebody who knows what she doing.*
> *Interviewer: And how would that happen?*
> *District Official: I'm beginning to study, you know [laughs]. Yes, because people what to know, that you know your stuff. When you are giving a workshop they want to know it's worthwhile…So, first of all people have got to know that you know what you doing. You know where you are trying to get them to. Make your objective and your vision very clear...we got our own slogan 'E-Learning Unit: creating smart schools' .*
> *Interviewer: that is particular to your unit?*
> *District Official: To me, you know. That is what I want to see happen. That is what is driving me. So, I think it is very important for people to know they are led by somebody who know what she seems to do. That's why I am very quick say I'm busy with my honours [laughs],*
> *P:11. District.txt*

At both the district and provincial levels, the voices of the department of education's officials were in contrast to the experiences of teachers in classrooms and the

perceptions of principals. The district and provincial officials were adamant that they possessed the necessary competence to support schools, whilst schools were not confident that they could obtain help from these systemic units. A teacher at an independent school echoed the sentiment of all participant teachers in this study. He expressed the view that district officials apparently lack competence and capacity to support schools.

> *No I would not. I would not, because if I see what is happening in government schools, we are way beyond that. And I don't think they have, this is a personal opinion, that they have the knowledge,expertise or the resources to be able to do it the way it should be done.*
> *P 5: School C - Teacher 1.txt - 5:66 (558:563)*

Schools did not mention the district office or the provincial education department as a potential source of obtaining advice or capacity building support. In the report of the district e-learning specialist, she narrated her concern that district officials experienced situations in which schools and teachers in particular were above the ICT competence level of the district officials.

> *District Officer: And than it's a little embarrassing for the facilitators sometimes when they go to schools, and they find that teachers are far ahead.*
> *P10: District.txt*

In the excerpt that follows the provincial education department official seemed confident that district officials had the necessary competence to support schools. She raised her concern that the district e-learning unit did have the competence but not adequate human resource capacity to manage and support all schools.

> *CES: It is not being fair on the district; we have people who are…that have expertise at the district level who will able to assist them and so on and I have already indicated that we are having this problem of capacity, a person to share himself with so many schools. Hence we have the other strategies of clustering schools to promote collaboration, working and ja, ja, ja.*
> *P11: Province.txt*

- **District capacity**

The e-learning chief education specialist at district office and the province e-learning directorate indicated that their lack of capacity to support schools stemmed from the limited human resources that were characteristic of their unit. Both district and provincial officials suggested that their ability to effect the e-learning policy was constrained by the fact that the e-learning units were manned by too few officials in relation to the number of schools that they had to service. Schools seemingly also acknowledged the inability of the district office to service all schools. The district official narrated her concern of the lack of adequate personnel in her unit.

> *District Official: Unfortunately we are a very small unit, hey. We are only fourpeople, myself who is the co-ordinator and who does the management work. And I've only got three facilitators. The strategies that I've adopted, first and foremost I believe that schools have to be informed about the policy [implying the e-Education policy], so that what ever action that we take [pause] you know, the schools will understand it within the broader framework of the department's thinking.*
> *P10: District.txt*

At provincial level the e-learning directorate officials indicated that their e-learning directorate was a newly established unit without sufficient staff to administer the implementation of the e-education policy in all schools. The deputy chief education officer articulated his concern:

> *But I think it's also to do what the CES has said in terms of human resource, that we are running short of human resource. If you look at our district officials at most they have three e-learning officials and if you look the ratio of the e-learning official and the school and you check that against the number of school days that we've got, it's by chance that you can visit one school twice in a year, hence they looking to other schools for support.*
> *P11: Province.txt*

The provincial e-learning team recognise their human resource limitation. In order to overcome their inability to support schools the e-learning directorate at provincial level suggests the need to establish two separate, yet cohesive units within the

directorate that will facilitate different aspects of the e-learning policy mandate. Both, CES and DCES identified a need for the establishment of an e-learning policy development unit that would focus on policy development, and an e-learning policy implementation unit that would support, monitor and evaluate policy implementation. The e-learning official explains how the restructuring of the e-learning unit would promote better functioning.

> *CES: Um… one, we [are] having a problem with the human resources. At the moment we are having one unit , at some point we thinking we need at least a minimum of two units ok, we should have the people who a focusing on policy, development of policy and all that ok. We should be having people who are looking at support of educators, because you know, sometimes, the team we have to have to develop policy, conference, support teachers, the two clash…human resources is one…*
> *P12: Province.txt*

According to the e-learning directorate the lack of human resource severely impacted on their ability to oversee the implementation of the e-education policy. At provincial level the education specialist also indicated that the e-learning directorate is a newly established unit and they have yet to monitor the implementation of the e-education policy. The provincial unit seemed unable to visit all schools and thus suggested that it was the district's responsibility to monitor and evaluate all schools in their district. The chief education officer elaborates on the problems she experiences with regard to monitoring the implementation of the e-education policy at schools.

> *CES: Monitor implementation? Ahmm, The provincial thing that's discussed in our office, we having the district visits you know. And we have a formal meeting like this, trying to check properly of the processes of mediating the policies or implementation processes, we don't stop there. We go further to see schools and visit them to see how far you've gone. Offcourse if we do that for many schools we will not be able to finish. We having a set of schools which we visit, with the district, to see how far they've gone. So the expectation is there, the districts are doing their visits to schools too, to say after we have indicated what is suppose to be done and how its suppose to be done, and actually checked and monitored the implementation, they do the same.*
> *P12: Province.txt*

5.3.2.4 The need for a shared vision and unified strategy between e-learningand curriculum directorates at district and provincial levels

"Compulsory is not the language that I would like to use. I would rather say it's [e-education policy] a guideline.", "Now they show you an aspect of the curriculum that you have never even heard of, they show you high tech stuff that you can't even understand", "We don't have a specific budget we rely on other directorates, you have to go and beg"

Inclusion Criteria	Coherent understanding and a common shared vision between the unit for curriculum development and the e-learning unit at both district and provincial systemic levels; systemic cohesion in implementing the e-education policy; District and provincial e-learning financial constraints.
Exclusion Criteria	The ICT policy and curriculum integration strategies of schools; School budget and infrastructure.

A prominent feature that emerged from the findings is the lack of a shared vision between the provincial education department, the district office and schools as to the extent to which the national e-educationpolicy is to be implemented as authorised or mandated policy. The provincial e-learning official explains her understanding of the e-education policy. She seemed uncertain whether the e-education policy is an imposed policy that must be implemented at all systemic levels or whether the national e-education policy is merely a guideline.

> *Interviewer: Is the policy compulsory, is it a guideline? What is your perception on implementing the national policy?*
> *District Official: [long pause]Ja, compulsory is not the language that I would like to use. I would rather say it's a guideline. And we've got to find a way of, you know, making it or making the teachers finding sense in using it, making more sense in using it. It's my responsibility, as a co-ordinator, to make sure that schools buy in to it, I wouldn't say compulsory as such.*
> *P:10 District.txt*

At district level the e-learning chief official also suggested that the national e-education policy was not compulsory for implementation but rather served as a guideline to schools for implementation. She expressed her concern that schools and teachers must make sense of the document in order to implement the policy as a guideline.

> *Interviewer: Is it [e-education policy]suppose to be implemented in schools? CES: It's a policy document so it no way usually [laughs hysterically], we are suppose to be implementing it, but at the same time we can say we having guideline document from national. And we also developing guidelines at provincial level for school to implement whatever you want in that document.*
> P:12 Province.txt

At school level, most schools in this study are seemingly implementing the e-education policy without realising that they are doing so. They seem to lack policy support and guidelines as to how to go about implementing the e-education policy. These schools are following their own professional understanding and interpretation of how ICT is to be gainfully employed within the school context. A principal of the former model C school explains his efforts to obtain policy support and expresses his expectation that policy will eventually follow from the systemic levels.

> *Interviewer: are there any provincial, national or district policy that you can turn to, to give you guidance for the school itself?*
> *Principal: No, no. I often spike to Jorinha, the lady who phoned me just now. Because she's very knowledgeable and she really helps us a lot [referring to the district IDSO assigned to this school]. But the answer we get lately is that you must do is right for your school. And do what's best for your learners. I think once the Gauteng-on-line computers are installed and are operational, there will be a policy from the top coming down for that.*
> *P7:School B Principal.txt*

One of the main findings with regard to district and province,point to the disjuncture between the curriculum implementation and e-learning unit at both district and provincial levels.The unit for curriculum is staffed by experts in curriculum and the unit for e-learning comprises of specialists in e-learning.These units (e-learning and curriculum directorates) exist as separate system support entities and consequently there is a mismatch of intentions. At school level the teacher is expected to integrate ICT into his or her teaching and learning practice in delivering the curriculum. However the district curriculum officials inspect teachers on curriculum-based issues associated with the implementation of the national curriculum policy, whilst the e-

learning unit is supposed to provide support to schools in terms of the e-education policy. Hence, the officials from the curriculum unit focus exclusively on curriculum issues and do not seem to havecompetence in e-learning. The district e-learning official narrates the dilemma she experiences emanating from this division of purpose between the two units.

> *District Official: As far as I am concerned we actually not supposed to be a separate directorate from curriculum. Because now I'm burning my own candle there, they are burning their own candle there...we tried to involve curriculum but it's not working, but we tried it out. But if we were in the same directorate, whenever anything from curriculum goes out, my wish is that it would be all integrated…So that's what we are doing it separately now.*
> *P11: District.txt*

On the other hand the officials from the e-learning unit did not engage with curriculum delivery issues. This problem arises because they cannot address the use of ICT in teaching and learning without infringing on the curriculum unit. The district e-learning seemed to be focused on establishing schools e-learning infrastructure, though they are aware that the e-education policy goes beyond mere infrastructure issues.

Although the provincial e-learning chief education specialist expects that teachers not to view ICT as an 'add on' but rather an integral part of the curriculum for teaching and learning, the same lack of correspondence is playing out between the systemic curriculum unit and the e-learning unit. Furthermore the voices of the e-learning officials at district and provincial levels suggested that they would be able to exercise greater influence on schools if the e-learning unit were an integral part of the curriculum unit. The provincial chief e-learning specialist explains their strategy to resolve this dilemma.

> *CES: One other angle that we emphasizing on is the collaboration with curriculum people so that educators should realize that e-learning is not an add-on you know, its part of the curriculum, ok*
> P11: Province.txt

> *(continued)*
> *CES: So we training our curriculum facilitators so that when they go out to the schools to support educators they see it as one thing [with emphasis], you know. And when they go and do a lesson plan and see the type of resources they are could use in their classrooms, some of ICTs should be part of that, and that should be one thing and not e-learning on that side and curriculum on this side so we training our curriculum facilitators to integrate it.*
> P11: Province.txt

Another major problem faced by the e-learning directorates at both system levels was the imposed budgetary constraints. At both the district and provincial levels the e-learning units operate only on an administrative budget. Since these units do not have their own monetary allocations as a resource to disburse to schools, they find their ability to function effectively constrained. The culmination of this lack of resource means that they are limited to support in ICT infrastructure or resources. The problem is exacerbated by the fact that government schools are also prevented from channelling their curriculum support budgets to include e-learning resources. The district e-learning specialist explains the limitations they experience in guiding schools to acquire appropriate ICT resources.

> *District Official: The problem at this point in time in Gauteng, I think it's a problem that other provinces had, we don't have an allocation [meaning budget] for ICT like we have for LTSM, and this is something that I've always queried because for LTSM you've got your ILP allocation, you've got your Dinaledi allocation, you've got your kick-up allocation, I mean I remember there was a time that they[schools] were so flooded with that money, that they even approached me and said we are drowning under books[textbooks], we want to spend the money on ICT's. And I wrote a letter to the province and they respond to us 'No'*
> *P12: District.txt*

The district e-learning official describes the initiatives and various attempts she had undertaken to support schools. She narrates her frustration at not being able to convince higher systemic authorities that ICT is an integral part of curriculum resources.

> *District Official: Yes, it was ring fenced[term used to indicate that money cannot be used for any other purpose except what it was budgeted/intended for] and as far as they were concerned resources, curriculum resources don't include ICT. Even with that I have a problem, because if you read the Dinaledi policy and the Kidza policy, there is now where, where the policy says ICTs are excluded. It's actually broad, it says this allocation is to support, or to, to resource schools your know in terms of LTSM etc, you know whatever it is to support curriculum delivery. Yes, it was ring fenced[term used to indicate that money cannot be used for any other purpose except what it was budgeted/intended for] and as far as they were concerned resources, curriculum resources don't include ICT. Even with that I have a problem, because if you read the Dinaledi policy and the Kidza policy, there is now where, where the policy says ICTs are excluded. It's actually broad, it says this allocation is to support, or to, to resource schools your know in terms of LTSM etc, you know whatever it is to support curriculum delivery*
> *P10: District.txt*

At both district and provincial level the e-learning specialists give vent to their frustration of not being able to adequately support schools. Their apparent financial constraints seemed to prevent them from effectively functioning as an e-learning unit to support school and teacher's needs. In the narrative of the province's e-learning specialist, she describes the e-learning unit's need for financial resources and financial independence to be able to support schools.

> *CES: Another thing is, I am not sure whether I should say it is the issue of the budget. We don't have a specific budget of so many Rands for e-learning to buy equipment or even for training educators, we rely on other directorates to supply us with the budget so that we can do what we are suppose to be doing. Which is kind of strange because you have to go and beg and when the people say yes the we can run and do what we suppose to be doing. …There's no budget that is particularly ring-fenced for e-learning.*
> P12: Province.txt

5.3.2.5 The need for "ICT willing schools" - promoting school collaboration

"Because our people never really believed that they could run their schools as world class institutions...hence we are advocating the use of cluster meetings to take place so they can support each other"

Inclusion Criteria	School culture, climates and ethos; schools as change agents; schools as dynamic institutions, schools as socio-cultural institutions and communities of change; District and province's school collaboration and partnerships initiatives. Cluster e-learning teams (CELTS), District school twinning initiatives.
Exclusion Criteria	Teacher professionalism; teachers competencies; teacher capacities; Schools' initiatives for collaboration and partnerships. Teacher's collaborative initiatives. School socio-cultural links and affiliations.

One particular resource that district apparently required is what the district official calls "willing schools". The district chief education specialist indicates that the culture of hand-outs and excessive support has actually created schools that can neither stand on their own nor sustain themselves.

> *Let us get schools onboard as equal partners. Let us not just make them into receivers of …its not good for their souls. They have to be brought as partners, we would rather have 50 schools participating but let it be 50 willing schools*
> *P10: District.txt*

The challenge that the district currently encountered was that of changing the socio-cultural mind-sets of schools to develop themselves into e-schools.

> *I always say to them guys it's unfair to let our kids [referring to township children] wake up at half past four in the morning and be on a bus by five to access those things 40km way from where they live. When you can transform the very institutions that we've got in the townships.*
> *P10: District.txt*

In attempting to change the mind-sets of these communities of practice at townships schools, the challenge was more pronounced with schools that did not use the financial opportunity to rise above their socio-cultural conditions. The district officer apportioned this to what she believed to be a "cultural issue" that plagues township

schools. She was adamant that many schools were not empowered to take control and use ICT opportunities to improve their own teaching-learning environment. In her opinion this culminated in constant support to township schools and has led to their inability to develop as progressive institutions of learning. She narrates her plight in trying to get township schools to change their socio-cultural approach to ICT.

> *And for me they don't have reasons to justify that, because in terms of allocations, look how the department has structured the quintiles. The poorer the community the more money we pump into it. I mean we've got a school in Mamelodi that gets up to R2 million in allocations, but when you walk in there you don't see it. I, I think that's a cultural thing. …Then you've got to wake them up a bit. So I think it's, I don't know if it's the correct word 'cultural barriers', you know…they just need a bit of encouragement and a push here and there, because our people never really believed that they could run their schools as world class institutions.*
> *P10: District.txt*

In an attempt to get "willing schools" onboard, district and provincial officials rely on ICT enabled schools to collaborate and support other schools. The nature of the support is apparently not defined and it would seem that schools determine their own levels of partnership, but in so doing could promote the implementation of the e-education policy. This principle seems to be well entrenched at provincial level, and is evident from the voices of the e-learning education specialist. School collaboration and partnership appears to be strongly advocated at both systemic levels. The provincial officials use the term 'twinning' to represent collaboration between two schools. One of the e-learning officials at provincial level narrates how 'twinning' is a uniquely provincial e-learning initiative.

> *DCES: …But it is also one of the programs that we also advocating in the e-learning directorate, to say in terms of supporting our schools lets encourage our schools to twin with one another. Let those who have let them assist with those who are struggling, so it's also one of our programs.*
> *P11: Province.txt.*

The township school in this sample collaborates with an independent school for technical support and curriculum planning. This township school is also 'twinned'

with another public school for ICT literacy support. The principal of this same township school elucidates further partnerships that were forged through the use of ICT. The schools involved in this collaboration were not from the same suburb and were separated geographically by some 40km, yet collaboration resulted in the sharing of skills, expertise and resources. The principal explains the collaborative experience.

> *Thereafter, the department came up with this idea of collaboration. We sent 50% of the teachers to a college in lotus garden once a week for basic computer literacy lessons. While we were there, the relationship between the two schools grew.*
> *P6: School A - Principal.txt - 7:2 (48:51)*

The former model C school principal explicates how his school is used as a model for e-learning schools. His school's achievements appear to be mentioned at district meetings, and this exposes his school to visits from other schools often out of district boundaries.

> *Ja, because he heard, at one of their district meetings, my IDSO said that you know what, Constantia primary and Apex Primary and Watervalley primary, our schools are doing this. So the guys came to visit us. So they use us much more as a benchmark, and because of that, ja you got our blessing and just carry on and do.*
> *P8: School B – Principal.txt*

According to the two provincial e-learning specialists, the formation of school e-learning cluster teams called CELT's (Cluster E-Learning Teams) is a provincial and national initiative to support schools in the implementation of the e-education policy. The two provincial education officers were seemingly convinced that the formation of CELT's is a provincial capacity that could promote collaboration between schools as they negotiate the national e-education policy. At the provincial e-learning directorate the chief education specialist appears to be convinced of the effectiveness of school clusters (CELTS) as a structure for schools to support schools effectively.

> *CES: Ja, this is so true. Hence we are advocating the use of CELTS clusters, so the cluster meetings needs to take place so they can support each other, and it can be directed as what needs to be done.Hence we have the other strategies of clustering schools to promote collaboration, working.*
> *P12: Province - Focus Group.txt - 12:48 (416:422)*

The notion of school cluster support systems seems to take on a variety of nuance. Although no district clusters exist for ICT, all teachers in this study seem to value the idea of cluster meetings as a forum for sharing knowledge, ideas, skills and pedagogic experiences. A teacher at the independent school shares his experience of working in teacher cluster support groups "in the cluster meetings they [teachers] can learn about these things. Use those opportunities to do practical on learning to use the ICT's]. Another teacher at the former model C school also expresses his interest in the idea of forming ICT cluster groups within the district. This teacher gives his rationale for establishing ICT cluster groups "maybe set up a better syllabus, have meetings. Say to all the teachers in the computer rooms we have a cluster meeting for you. Do this…Do this … get ideas exchange ideas".

However, contrary to the provinces' CELT structures and wishes of teachers for cluster formations, the district officer is not convinced of the efficacy of establishing ICT cluster teams. She believes that teachers are already over burdened with other curriculum based clusters and ICT clusters will not work. However, she explains that collaborating with the curriculum designated clusters will be more effective.

> *No I really wouldn't like to form clusters,because I feel this is too much on the schools and allthat, and all that. I would rather see ourselves workingtogether with curriculum within their cluster meetings.Like who does languages, he always invites us. What I do Iinvite curriculum software come and demonstrate what youhave, that is what I am doing so far, but I am not thinkingof separate ICT classes...Because this system of clusters, I notice it does not work, much more hands on, individualapproach, even if we can do two schools a year, better then….*
>
> *P11: District.txt*

5.3.2.6 The need for ICT teacher training

"We firmly believe that training alone is not just going to be proficiency, we believe in support, support, support."

Inclusion Criteria	District and province's perceptions of the need for teacher training in e-learning; professional development of teachers.
Exclusion Criteria	Teacher and principals perceptions of training in ICT or e-learning; schools initiatives for teacher capacity building in ICT. Teacher self study

Teacher training is a required resource that runs as a common thread through all spheres of the system. The voices of school teachers, principals, district and provincial officials are in unison with regard to this resource. A resource required by both district and province and an aspect in dire need at schools is the issue of teacher training. Schools have evidently indicated their need for training often through the school improvement plan (SIP) and both district and province are acutely aware of this need. However, district and provincial office do not seem to be in touch with the nature of training required for schools. All schools in the sample have instituted a two-stream approach to the use of ICT in their schools. School principals and teachers realise that ICT literacy is a necessary competence for teachers and learners, and ICT integration into the curriculum is a consequence of ICT literacy. School teachers now require training in the pedagogical use of ICT in their teaching practice and not merely ICT literacy training. Province on the other hand believes that schools are not aware of this difference. The district official explains her plan to train teachers from disadvantaged communities.

> *District Official: Yes, for example the white paper speaks of getting the learners ICT capable by 2013. So even with the strategies that we develop, we make sure that we meet that ambition of the department by getting everybody ICT capable by 2013. And you already know of the programmes [in-service training programmes for teachers from two disadvantaged communities] that I am trying to get off the ground with UP [University of Pretoria] in an effort to try and make the 2013 objective.*
> *P:11 District.txt*

The provincial e-learning specialist narrates their strategy of training teachers through the teacher development unit. The specialist seems to suggest that training alone will not yield proficient teachers, that there should also be relevant and ongoing support.

> *CES: Uhm…to change the behaviour [laughs] it will take a quite a long time, ok. But with things that we have planned and with that strategy we will workshop the educators and already we've had discussion with teacher development directorate, these are the programmes we'd like to train our teachers on, so we going to train them on that. We firmly believe that training alone is not just going to be proficiency, we believe in support, support, support, ok. So hopefully our district officials are going to support the educators in the implementation of again.*
> *P:12. Province.txt*

At the former model C school the mathematics teacher suggests that district office is unaware of teachers' level of ICT skills. Her desire is for more advanced ICT skills training to take place in order to enhance her teaching and learning practice.

> *But I do think there's a certain amount of under-estimation, I think they [District] underestimate what there is and what teachers can do already. And they thinking more along the line of getting teachers trained on word.*
> *School B: Teacher 2.txt*

5.4 Summary

In this chapter, I presented the results from the interviews with the principals of all three schools, the district e-learning leader and the two e-learning officials from the provincial e-learning directorate.

The main categories that were explored in the interviews were how systemic structures responded to their capacity to change the behaviour of teachers to implement the e-education policy and what resources these systemic units (school, district and province) required to have the desired effect. The main themes that emerged suggest that principals of schools are creating every opportunity within their means to foster the implementation of the e-education policy. The schools however lack (among other); ICT policy implementation guidelines, ICT competent teachers, relevant curriculum content to integrate ICT; training opportunity to develop teachers' ICT pedagogical skills and district as a source of e-education policy support.

At district and provincial levels the issues that inhibit policy implementation are more pronounced and these include the lack of; ICT policy implementation initiatives, proper guidelines to schools for the implementation of the e-education policy, competence of the curriculum directorate, cohesion between curriculum and e-learning directorate, fiscal independence, understanding of teachers' real needs as compared to perceived needs, willing schools, effective channels of communication, common understanding of systemic support structures in respect of school clusters,

ICT curriculum attainment levels, pedagogical focus on ICT, policy implementation monitoring and evaluation mechanisms to name but a few.

5.5 Literature reflection

5.5.1 Introduction

In this section I situate the results of the findings within the context of international debates and empirical studies. I report on evidence that is supported by the literature but also report on new insights that emerged from this study. I synthesized the results of this study to encompassed ICT policy transforming schools as institutions of teaching and learning, and ICT policy transforming the systemic structures of district and province.

5.5.2 Echoing existing knowledge on ICT policy transformation, teaching and learning

5.5.2.1 ICT policy transforming schools

The manner in which ICT policy in transformed schools unfolded in numerous ways: beliefs and vision of principals; leadership of the principals; school capacity and teacher development initiatives; support and collaborative networks; management of teaching; ICT curriculum content and the recruitment of skilled and competent teachers.

Beliefs and vision of principals

The beliefs and vision of principals are central to ICT implementation in schools (Fullan, 1992; Spillane et al., 2002). All principals in this study had a similar understanding of the significant role of ICT in their schools and were unwavering in their commitment to promote its use. Principals in this study were visionaries in their understanding of ICT for teaching and learning, but also of the vocational (Hawkridge, 1990) role of ICT. School leadership was pivotal for ICT on education reform to take place. Although schools in this study did not have a coherent whole school ICT policy, teachers were guided by institutional goals, shared vision and

aspirations of principals. All three participant schools were managed by principals that identified with the need to use ICT across the entire spectrum of the school's activities. Similar findings emerged from the literature in which Fullan (2002) found that the visionary role of the principal should be those of support and development as well as an agent of change. Phillips (1986), Condie et al. (2002), (Becker, 2000) and Stevenson (2004) found that the use of computers will only flourish within schools that encourage it through the leadership of the principal.

Leadership of the principal

Elmore (2005), Fullan (1992), Leithwood and Montgomery (1982), Yuen et al. (2003) and Yee (2000) suggest that the leadership of the principal is key to successful ICT implementation in schools. School leadership was a crucial factor for the infusion of ICT into the school's teaching, learning and administrative environment. According to Fullan (1992) organizational challenges, opportunities, responsibilities, and leadership strategies must be considered well before ICT implementation in schools. In the two public schools in this sample, principals did not have the opportunity to respond to these issues of strategic planning (computers were placed in classrooms as a need to become competitive with emerging trends). Both public schools had to make significant structural adjustments and changes to their existing buildings to accommodate ICT laboratories. At the private school, however, it seems that organizational strategies were in place before computers were placed in classrooms, as the school's physical structure was designed and planned to accommodate computer and research centres. All participant schools were progressive in using ICT for teaching and learning and administrative purposes and seemed to enhance their level of functioning. In my study principals enthusiastically pursued ICT to transform the administrative capabilities of their schools. Similarly in the literature O'Dwyer, Russell and Bebell (2004, p. 4) also found that "Teachers are influenced by the level of structure of the system in which they work". This was consistent with findings in my study, in which teachers were gradually coaxed to change the way they worked and used ICT for non-instructional professional needs.

Kozma (2005), Rumsvik (2006) and Andrews (1999) argue that principals are pivotal to structuring the school environment to support learning. In schools where a shared

vision for teaching and learning exist between teachers, principals, learners and community there is a focus on moving the school forward and not a focus on "figuring out what policymakers want them to do and then doing it – or not" (Kozma, 2005, p. 141). In my study autonomy and local decisions (although constrained by a rigid National Curriculum policy) had not deterred principals from pushing the ICT integration agenda forward in their schools.

School capacity and development of teachers

Principals are at the heart of school capacity and the development of teachers' knowledge and skills are institutional practices that would lead to sustainable education reform (Fullan, 2000). According to Schiller (2002), the successful implementation of ICT as an educational innovation is not only about equipment or software but also about influencing and empowering teachers. The need to acquire teachers that are competent and skilled in the use of ICT is a common thread that runs through the literature (Grey et al., 2006). Principals were challenged to find suitably qualified or skilled teachers. Findings from my study echo those found in the literature.

Support and collaboration

In all three schools in this study, the institutional culture and practice was one ofsupport and collaboration. Principals argued that teachers required support in view of improving teaching and learning in their schools. At school level collaboration took place through teachers' own initiatives to learn and network (see 4.3.4) and not in response to externally developed policy. Teachers in these schools were encouraged by principals to share knowledge and collaborate with each other. Principals in this study were focussed on influencing, empowering and supporting teachers, though this played out differently according to the socio-cultural context at each school. At the independent school the principal was also actively involved in developing teachers' skills in the use of ICT. The former model C school provided in-house capacity buildings and school management was exposed to a monthly ICT training camp. This finding concurs with the literature in terms of intra-school support and collaboration in which "islands of innovations" formed (Bracewell et al., 2007; Hadjithoma & Karagiorgi, 2009, p. 84). In the township school, the professional development of

teachers in ICT was mainly left to the teacher's own initiative, congruously withWilson and Berne's (1999) findings in a case study of schools, in which teachers were responsible for their own professional development.

Management of teaching

Another similarity, echoing literature, was the distinction made between 'traditional' management of teaching and 'flexible' management of teaching in schools. Kozma (2005, p.141) describes traditional schools as those that are hierarchically structured with teachers' classroom practice 'tightly controlled by inspectors and principals'. Furthermore he explains that teachers are often accountable for teaching a specific lesson in a specific way and on a specific day. Within the institutional practice of the three schools in this study, the findings are consistent with Kozma's (2005) definition of traditional schools. In this study, public schools as institutions of learning and teaching are clearly defined by the norms and standards policy document (Department of Education, 1998) that regulates subjects into well defined time controlled categories. School principals are not at liberty to exercise planning discretion on how to allocate the teaching-learning time of official curriculum subjects. Notional subject time is clearly established by national policy, and schools are obliged to adhere to these regulations. Schools (particularly government schools) are structured around the management of teaching and could not be restructured to cater for flexible learner grouping or changing of the school scheduled to accommodate more time for learner projects, teacher planning and collaboration as suggested by Darling-Hammond (1997).

ICT curriculum content

ICT curriculum resources refer to ICT curriculum content and software that support teaching and learning. The development of curriculum content for ICT-supported teaching and learning is a policy area of concern in the literature (Ng, Miao& Lee, 2009). Findings in my study concur with the literature review in that government had introduced ICT into schools without the corresponding curriculum content to support teachers. Within the South African context the e-education policy (Department of Education, 2004) makes several pertinent references to ICT-curriculum integration. However, the National Curriculum policy (Department of Education, 2002, p. 28)

makes very little reference to the use of ICT resources in support of learning. A screening of the attainment targets revealed that ICT competencies were not included in an explicit way in the formal curriculum but generically as "the learner is able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies". This mismatch between what teachers are expected to do with ICT in their classroom and curriculum demands is consistent with findings in the literature (Gulbahar & Guven, 2008; Cuban, 2001).

Haddad (2003) argues that the introduction of computers in schools without the accompanying curriculum related ICT-enhanced content creates a problem for integrating ICT into teaching and learning practice. Pelgrum and Plomp (1993) suggest that software curriculum development is a macro responsibility. Haddad (2003) supports the notion that curriculum development is an obligation of policymakers and integral to the teaching-learning process. Furthermore, policymakers have a choice to develop or acquire curriculum content software. However, a principal in my study expressed the dire need for appropriate local ICT-based curriculum content. Similarly, Unwin (2005) and Haddad (2003) also found the need for the development of local content as opposed to the acquisition of curriculum content that is not ideally suited to local context. Teachers in my study also acknowledged that the curriculum needs to cater for local context and to prepare learners for life outside of school.

Recruitment of skilled and competent teachers

The need to recruit teachers that are competent and skilled in the use of ICT is a commonchallenge that plagued all principals in this study. Similarly, findings from the literature (Gray et al., 2006) found that principals were concerned that the lack of specialised teachers for ICT will negatively impact on the range of activities offered by the schools, and the effective implementation of the curriculum. Further findings from the literature (Gray et al., 2006; Gulbahar & Guven, 2008) indicate that a majority of principals anticipated an increase in teacher shortages over time, particularly is subjects such as sciences, mathematics, technology and design and ICT. Their claim is consistent with the findings in my study, in which principals were challenged to find suitably qualified or skilled teachers.

5.5.2.2 ICT policy transforming districts and provinces

The transformation of district and provincial e-learning directorates will be discussed in the light of the emerging findings in my study and situated in literature in the field. The results from my study identified the following findings: issues of a shared vision and unified strategy between directorates, channels of communication, ICT curriculum integration and attainment levels, systemic competence and capacity in the e-learning directorates, "ICT willing schools" and school collaboration and ICT teacher training.

Shared vision and unified strategy

A finding in the literature similar to that of my study was the lack of a shared vision and unified strategy between the different directorates (curriculum directorate and the e-learning directorate) at both provincial and district level. Younie (2006) found that a multi-agency of initiatives on ICT existed in the UK education systemic structures. This multi agency culminated in the lack of communication and cooperation between the various agencies, also culminating in the retarding of planning and implementation of policy initiatives. Similarly within the context of my study, although minimal agency and the lack of collaboration between different directorates within district and provincial education departments were evident, the e-learning and curriculum directoratepursued the same national curriculum policy agenda but in different ways. The result was that the e-learning directorate staff often worked in isolation from other directorates.

Channels of communication

Channels of communicating the e-education policy to principals and teachers have a direct bearing on what transpires in classroom practice. O'Dwyer et al. (2004) found that district decisions influenced classroom practice. Similarly in my study the passive decisions taken by the district directorate in terms of their silence, absence and non-support also influenced classroom practice.

ICT curriculum integration and attainment levels

The international trend particularly in developed and developing countries is the design of appropriate curricula that reflect ICT integration and ICT assessment standards in the activities that define teaching and learning. According to Fluck (2001), the preparation of a curriculum framework for the use of ICT in schools is a long and costly process for government. However, he maintains that such a framework is one factor that will move schools towards real change in implementing ICT in teaching and learning. Fluck (2001) also promotes the notion of key ICT competency skills to cater for the government's vocational (Hawkridge, 1990) need for economic growth and international competitiveness. Condie et al.(2007) found that teachers were using ICT schemes designed by government, to integrate ICT in the curriculum.

Internationally, many developed and developing countries restructured their national curriculum to incorporate ICT into the design (Chan, 2002; Lim, 2007). Various systemic structures take responsibility for this task, depending on whether a centralised or decentralised system is favoured. In the range of countries in the literature, responsibility for education is distributed in different degrees between central government and local government tiers (Plomp et al., 2009). Within the South African context central government designs the curriculum through the national department of education, while decentralised provinces are tasked with implementation (Blignaut & Howie, 2009). Post 1994 South Africa has witnessed rapid and successive curriculum change. However, these curriculum changes have not seized the opportunity to include ICT as a standalone subject (Howie & Blignaut, 2009) neither for a vocational rationale, nor as a pedagogic one (Hawkridge, 1990) by integrating ICT in all subjects across the curriculum. Thus the e-education policy (which places emphasis on these rationales) and the national curriculum policy continue to be two non-coherent and isolated policies, each making its own demand on teachers.

In the United Kingdom, the National Curriculum also went through revisions with the introduction of ICT. However teachers implementing this policy change acknowledged that the broad aims of the curriculum policy were not easily interpreted

by teachers and thus were not implemented in their classroom practice (Fluck, 2001). This phenomenon also played out in the findings of my research study, with a participant teacher requiring simplified policy and guidelines that he could interpret as indicated by the former model C teacher as follows “look we’ve got that White paper, but something more better and more…that explains it better and more structured”. In the UK experience, Fluck (2001) notes that a reasonable uptake of the policy was achieved through a comprehensive series of guides that linked the broad ICT aims to conventional subject areas. Within the South African context, the absence of specific guidelines from all relevant systemic structures was still evident, leaving schools to decide for themselves. Becker (2000) also found that curriculum overload was a contributing factor to the lack of use of ICT in the practice of teachers, because teachers felt that the use of ICT inhibited their curriculum delivery, as was evident with a teacher in this study.

In many countries there is a divergence of philosophy and practice in the manner in which ICT is integrated into the curriculum, or exists as a standalone subject in the national curriculum. But there are concerted attempts by governments to include ICT in the curriculum offering in one way or another. This is significantly different from the South African context in which ICT is relegated from the policy focus of curriculum planners. The international trend reflects concerns of governments to build frameworks and strategies to promote the educational use of ICT (Kearns & Grant, 2002). Lessons in ICT policy implementation indicate how the Flemish government has responded effectively to Hawkridge’s (1990) rationales for introducing ICT in education. The Flemish government policy includes non-compulsory ICT attainment targets for primary schools, formulated as ICT competencies (Tondeur, van Braak & Valcke, 2006). Their rationale for not defining a new school subject for ICT in the primary school was that ICT has relevance for all subject areas. In this regard ICT competencies are cross-curricular attainment targets, with central ICT competencies to influence the learning process. Within the context of my study national, province and districts have not taken the lead to determine ICT-curriculum integration guidelines nor ICT attainment standards.

Sherry's (1998) study indicates how a district was involved in supporting schools to provide curriculum implementation guidelines. Districts through project leaders were involved in developing schools' home web-pages that had links to learner activities and to curriculum resources that could be shared by teachers. As part of this district's activities, curriculum based resources were made available for teachers, like a classification scheme for internet-related resources, district-wide curriculum related ideas, activities, lesson plans and resources that could be accessed by teachers via the Internet. Similar to Sherry's (1998) study, teachers in my study 'expected' the same type of support from their local districts. Teachers in this study were well aware of the potential of collaborative effort and support they can give each other. However, they needed impetus from district office to coordinate this process. A teacher at the township school describes his vision regarding the district offer of support "I mean the department should be accessible, the department should pool teachers like us, if you can give us a simple classroom and say listen on the computer develop lessons".

Systemic competence and capacity

In my study systemic competence and capacity in the e-learning directorates was twofold in nature, namely human capital and administrative agents. Cohen and Barnes (1993a, 1993b) claim that policy intended to change the teaching practice of teachers, as in the case of the e-education policy, requires learning by actors who are charged with implementation of the policy. Spillane and Thompson (1997) suggest that 'learning' in turn requires that those who make or administer policy implementation perceive their roles to be teaching rather than as mere regulators of policy. Spillane and Thompson's (1997) view of district capacity from a teaching and learning perspective is contrary to the way in which district officials in my study viewed their role in policy implementation. Karagiorgi (2005) found that districts did not view themselves as systemic structures that create opportunities for teachers to learn. Similarly in my study districts viewed their administrative purpose as the transmission of policy (Hamann & Lane, 2004). At both province and district levels the e-education policy focus seemed to have been applied to enhancing the ICT administrative prowess of schools. Schools were required to convert their administrative systems to adhere to particular districts demands. In this regard district appropriately responded by providing the necessary support in the supply of

administrative software, as well as train and skill teachers in the use of ICT for a host of administrative functions.

How and what teachers learn (new curriculum, new teaching methods, policy or skills) depends significantly on the capability of district leaders and teachers' knowledge, beliefs and experiences (Spillane & Thompson, 1997, p. 186). In my study, districts did not seem to have the capacity to support schools as teachers tried to make sense of how to integrate ICT into their pedagogical practice. Spillane and Thompson (1997, p. 199) construe district capacity to support policy as the ability to learn the "substantive ideas at the heart of the new reforms and to help teachers and others within the district to learn these ideas". Furthermore, they define district capacity as consisting of human capital (knowledge and skills), social capital (having social links within and beyond the district, trust to support open communication) and financial resources (allocation of staff, time and materials). These constructs of capacity aptly describe the issues facing district and province's e-learning systemic units in my study. Provincial e-learning leaders claim that districts officials had relevant human capital to support schools with respect to knowledge and skills, while school principals and teachers were otherwise convinced. This is similar to Karagiorgi's (2005) study suggesting that when district officials visited schools they were unable to solve teachers' problems. The district e-learning teams in my study also did not seem to have capacity for social capital, seemed to lack social links *within* the district and trust to support open communication with schools.

Contrary to Karagiorgi's (2005) finding, in my study the e-learning directorates at district and provincial levels had not made themselves 'visible' to schools. Spillane and Thomson (1997) found in their study that districts identified and capitalised on teacher-leaders, who were committed and knowledgeable about the new policy to drive the new policy. In my study participant teachers also recognised the value that a pool of individual ICT experts, with well developed understandings of the e-education policy, would bring to ICT integration in their classroom practice. Systemic e-learning units namely, province and district indicate that their capacity to implement the e-education policy in all schools was severely constrained by the lack of capacity within each unit (Farell & Isaac, 2007; Ng, Miao & Lee, 2009)

> *"We go further to see schools and visit them to see how far you've gone. Off course if we do that for many schools we will not be able to finish. We are having a set of schools which we visit, with the district, to see how far they've gone. At district level, I cannot talk about district"* (Province e-learning CES).

In like vein a teacher expressed that teachers do not have confidence or trust in the local district's e-learning unit as a competent resource to address their ICT implementation concerns, "And I don't think they [district] have the knowledge, expertise and the resources to be able to do it the way it should be done".

Similar findings also emerged in Ofsted's (2001, p. 13) study of local education authorities. Local districts did not have the essential understanding of their schools' ICT needs. In the UK situation (Ofsted, 2001) it was unusual to find district officials with a good overview of current ICT developments in their schools or sufficient understanding of whole-school issues relating to ICT. Local districts lacked support and guidance for schools' ICT development planning. This finding reflects the same experiences of principals and teachers in my study with respect to district's apparent lack of support, visibility and guidance to schools (Spillane et al., 2002).

ICT willing schools

The need for "ICT willing schools" emerged as a prominent finding in my study. Harris' (2002) argues that school willingness is intrinsically linked to senior management and classroom teachers' desire to attempt new approaches. These schools were aware that some approaches would not succeed, but acknowledged that reluctance to try new teaching practices would not promote school progress. Harris (2002) also found that schools took a risk to promote the use of ICT, by providing appropriate ICT resources to allow all learners to achieve their potential. However, in my study the district leader's perception and experience of school willingness to change was contrary to Harris's (2002) findings and contrary to the findings in respect of participating schools in this study. In my study, all participating schools were willing to explore and venture into introducing ICT into teachers' daily practice.

Uniquely different from findings in the literature (Spillane& Thomson, 1997) are the experiences of the district e-learning official. Her experience relates to particular

schools in her district that were reluctant to venture into ICT integration and attempt new teaching and learning practices. She expresses her concern that the lack of willingness occurs particularly in township schools and believes that it is a socio-cultural issue "I think that's a cultural thing. …Then you've got to wake them up a bit. So I think it's, I don't know if it's the correct word 'cultural barriers…because our people [township schools] never really believed that they could run their schools as world class institutions". Furthermore, she also found that these schools lacked the will to be innovative, forward-looking and were often disinterested in sustaining district initiatives. The district e-learning official's perception was that schools hadbeen turned into institutions that were constantly receiving hand-outs and hence deprived of self empowerment opportunity. She explains her dilemma "let us not just make them into receivers of …it's not good for their souls. They have to be brought as partners we would rather have 50 schools participating but let it be 50 willing schools". According to Spillane and Thomson (1997) schools' reaction to opportunities presented by district depends primarily on teachers' beliefs and experiences which influence their willingness to change, but it also depends on the capability of district leadersto create a learning environment in which schools develop local capacity through collaboration and access to new information about teaching instruction,.

School collaboration

In my study developing communities of practice seems to take on different nuances at district and provincial levels. District and province seem to have different ideas about the need for collaboration and what it entails. Although province favoured formal teacher cluster meetings and cascade systems as a way to promote the e-education policy among teachers, district did not see the merit of such an exercise. This finding is contrary to the literature in which international trends seem to be promoting peer collaboration at district level as an effective means to develop teacher competences and pedagogy in the use of ICT (Hadjithoma & Karagiorgi, 2009). Granger, Morbey, Lotherington, Owston and Wideman (2002) illustrated that other forms of learning that are less formal such as internet learning, learning from friends and family and particularly peer collaboration were much more useful to teachers and more likely to

translate into the transfer of skills to classroom practice. These forms of informal learning were particularly evident from the experiences of teachers in my study.

Granger et al. (2002)also indicate that the importance of collaboration 'cannot be over-estimated', as teachers need each other for a variety of professional purposes such as peer teaching and learning, planning and ICT technical problem solving. Findings from my study revealed that while district and province do not share a common philosophy of school clusters as a means of promoting school and teacher collaboration, school teachers were practicing collaboration in an informal way. If districts and province neglect to capitalise on this essential form of teacher learning, the chances are that the implementation of the e-education policy will be further retarded.

ICT teacher training

Evidence from this study identified teacher training as an essential component to ICT policy implementation. The need for teacher training surfaced at all systemic levels namely province, district, school principal and teachers. Although the district and provincial education departments are acutely aware of this need, very little has been done to move teacher ICT training beyond school level intervention. Significantly different from the literature was that most developed countries have moved beyond basic ICT skills and were progressing to diversify their ICT teacher training programmes (Waite, 2004). Lessons from studies (Ofsted, 2002, p. 3; Kirkwood, van der Kuyl, Parton & Grant, 2000) addressed teacher training challenges, like grading courses according to teacher competence levels, cost in terms of teacher personal time and expense, duration and time of training, relevance to classroom practice, face-to-face training as opposed to distance learning and teachers' feelings of inadequacy, stress, and frustration. Stevenson (2004) and Galanouli et al. (2004) found that professional development programmes helped teachers to integrate ICT practice. The lack of teacher training initiatives was clearly evident in my study. However teachers in my study acknowledged the need for specific training and the lack of district response to their needs.

5.5.3 New insights

In this study the findings elicited several new insights in policy transforming schools, and district and province education e-learning directorates. School level transformation took the following forms: ICT leadership and institutional practice, ICT curriculum resources and the school's need for policy guidelines. At district and provincial levelsnew insights revealed the need for shared vision and a unified strategy within directorates, communicating policy, establishing ICT curriculum integration guidelines and ICT assessment standards. New insights were not only in terms of the teachers appropriating policy, but in the South African context these insights pushed the boundaries back in terms of existing debates in the field of study.

5.5.3.1 ICT policy transforming schools

It is important to note that the e-education policy existed as an "invisible policy" and did not directly transform schools. Principals were unaware of the existence of the e-education policy. Teachers on the other hand, acknowledged that they were aware of a 'policy out there' but they were ignorant of the policy mandates. However, ICT policy transformation did occur within the institution.New insights in terms of ICT leadership and institutional practice that emerged were twofold in nature. Firstly, these were in terms of school collaboration and networks. Secondly, these were in the management of the teaching of ICT.

School collaboration and networks

In this study principals and teachers formed collaborations and networks with successful and forward looking schools to keep abreast of changes and challenges in the use of ICT in teaching and learning. Mutual support was another motivating factor for ICT collaborations and networking between schools. Collaboration between schools took on various nuances in this study. Schools formed links with other schools that shared the same vision and aligned themselves with other schools of similar socio-cultural contexts. Schools also formed collaborative links with other disadvantaged schools and thereby exercised a social responsibility. This significant aspect of school-school collaboration was not evident in the literature.

Management of the teaching of ICT

Andrews (1999) also found that some schools lacked self awareness, vision, and leadership and did not know when or how to respond to change, while others accorded low priority to ICT use in education. The lack of leadership was not evident in the schools in my study. Principals had a visionary outlook that was inspired by a belief system and set of attitudes that seemed to motivate change in their schools. They were willing to take risks and to go against the grain in the interest of teaching and learning. In the absence of provincial and district directives and support, these principals were proactive an enthusiastic in empowering and building the capacity of teachers to implement ICT in their teaching practice. In contrast, the international experience illustrates that principals found managing ICT infrastructure easier than managing teachers' use of ICT (Dale et al., 2004). Principal also felt that the implementation of ICT was an area of concernwhich they were not trained to manage (Harrison et al., 2002). Karagiorgi (2005) and Pedersen et al. (2006) concur with the ImpaCT2 (Harrison et al., 2002) study that most principals felt they lacked the experience and expertise to control the new technology in school. According to Veen (1993) and Pelgrum (1993), principals' poor attitudes or lack of insight and understanding retarded ICT integration in their schools.

New insights that emerged in terms of ICT curriculum resources for the transformation of schools focussed on curriculum content, recruitment and capacity building of teachers and schools' need for policy and policy guidelines.

Curriculum content

Significantly different from the literature is that in my study, school principals (although constrained by curriculum delivery demands) found means and methods to integrate ICT into their curriculum without any policy guidelines. Kozma (2005) suggests that districts, schools and teachers should have some freedom within the curriculum policy to adjust instructional goals to cater for local context, socio-cultural needs and learners' interest. In this regard the principal of the former model C school acknowledged that he interpreted the National Curriculum to be open to ICT integration.

Recruitment and capacity building

There is seemingly a dearth of literature on the particular recruitment strategies of principals and school governing bodies. Of the limited studies conducted in this area, findings indicate that the absence of policy support did not sustain the innovative practices of principals (Thompson, Nixon & Comber, 2006). In this study a principal actively pursued a strategy to appoint ICT competent teachers that affiliated to the vision of the school. In my study the principal of the former model C school made a concerted effort to gradually change the mindset of the teaching cohort in his school to reflect a staff that shared his vision for ICT implementation. He strategically appointed an ICT competent teacher at each grade level to effectively change the mind sets of other teachers in favour of ICT use. He also appointed a teacher whose main focus was on ICT integration into the curriculum. Another strategy he employed was to develop teachers by creating opportunities within the context of the school.

As a curriculum implementation resource schools expressed the need for policy and policy guidelines. In the South African context, National Curriculum policy and the e-education policy are two significant policies that do not seem 'to talk to each other'. Consequently, participating schools in this study seemed to be operating in a vacuum, applying the National Curriculum policy but oblivious in the mandated e-education policy. In the absence of national e-education guiding policy principals of schools were developing their own policy for ICT implementation. Although all schools in this study had no whole school ICT policy, the ICT policy of the school seemed to have devolved into specific learning areas and in the ICT attainment standards of the school. Such devolution of policy to specific learning areas or subjects facilitated subject specific contextualization of learners' learning.

Schools' need for policy and policy guidelines

In contrast, findings from the literature indicate that schools do not operate in isolation of government mandates. In the UK, schools had ICT policy but often only in response to satisfying impending school inspection, and were rarely indicative of the influence of ICT on teaching and learning (Andrews, 1999). Andrews (1999) claimed in these cases the institutional practice had not yet developed (or not thoroughly enough) a solid policy to cope with ICT in their classrooms and beyond, at

present and in the future. In my study all schools evidently did not have well defined written policy intentions that embraced all aspects of teaching, learning and curriculum integration. However, school principals were well in tune with the view of the potential of ICT as a tool for teaching and learning, embraced ICT in practice and had a vision of the future of ICT in their schools.

The literature argues that for effective transformation to roll out at school there needs to be a common and coherent understanding of policy at all levels of the education system (Hopkins& Levin, 2000; Kozma, 2008). Furthermore, each of the different directorates needs to be in sync with the others and each has its unique responsibilities in the system to ensure effective implementation of the policy on the classroom floor. This process is emphasized in the literature and is vital for the effective uptake of policy in the classroom. School change in terms of ICT in education practices at schools was coordinated with the larger system (Sergiovanni, 1994; Talbert & McLaughlin, 1993). According to Kozma (2005, p. 142) school, district, province and national policy should be in "sync, coordinated by an overarching set of goals or vision". Cohen and Hill (2000) and Elmore (1995) indicated that coherent and coordinated policies that are targeted at all components of the system tend to reinforce and enhance improvement. In my study the schools were isolated from the larger system, which culminated in the lack of consistency and policy focus at different levels of the system. Yet schools formulated and implemented their own school based e-learning policy.

5.5.3.2 Transforming province and district directorates

New insights that emerged regarding transformation of district and provincial e-learning directorates elicited the following: creating shared vision and a unified strategy within directorates; channelling the e-education policy; establishing ICT curriculum integration guidelines and ICT assessment standards.

Creating a shared vision and a unified strategy

In my study there is an apparent lack of a shared vision of the e-education policy and a lack of a unified strategy at different levels in the education system. Government

ICT policy on education was not viewed by province and district e-learning directorates as an authorised (Levinson et al., 2009) prescriptive mandate for implementation. The district official responded to her interpretation of the national e-education policy as follows, "compulsory is not the language that I would like to use. I would rather say it's a guideline". Similarly, she did not believe that the policy should be imposed on schools. An explanation of this finding may be corroborated by a similar study (Ofsted, 2001), which found that local education authorities (districts), may lack the professional expertise to inform decision making, culminating in districts inadequate consultation and support of schools. According to Elmore and McLaughlin (1988) district administrators' reaction to policy and strategies creates conditions for teachers' willingness and ability to appropriate policy. Districts act as 'processors" to policy demands, develop implementation strategies and allocate resources while principals act as facilitators of policy. Spillane and Thompson (1997) view local capacity as teacher's capacity to teach in new ways, and district's capacity to support these changes. They also contend that local education authorities (districts) are charged with making policy which is as important as administering policy implementation.

Channels of communicating the e-education policy

Significantly different findings in my study indicate that district and province seemed to act merely as channels of communicating the national e-education policy, without administering policy implementation. In my study district's own interpretation of the e-education policy and policy initiatives were absent. Districts, in this study seemed to perform an administrative function of transmitting national policy, and in all cases schools in my study had not received policy. In all three schools in this study, principals were oblivious of the existence of the e-education policy. Consequently principals' ignorance of national policy meant that they could not facilitate national mandates. Schools in my study, particularly teachers, required policy support from the systemic structures to guide their teaching practice.

Within the context of my study the issue of district's challenges to communicate the e-education policy was not focussed on the interpretation or misinterpretation of the policy intentions by teachers, but on the lack of means to transmit the policy

document to those for whom it was intended. The literature is silent in this regard, so I am tempted to suggest that this lack of communicating the national e-education policy to stakeholders was unique to the local context of my study. In my study district officials accepted and acknowledged that school principals and teachers may be unaware of the e-education policy document, but school principals were also unaware of the existence of the specialised e-learning directorate which was established to administer the implementation the e-education policy and support schools. The literature on communicating policy differs significantly from the issues at play in the context of my study. Most literature that focuses on communicating policy identifies the challenges that policymakers face in crafting a system to communicate the mandates of policy exactly as they intended. Research on communicating policy focuses on attempting to express the main underlying principles of the text of policy accurately to the actor at the point of implementing policy (Spillane, Reiser & Reimer, 2002). Thus according to Brown and Campione (1996) communicating the rationale for the policy to local actors situated at the point of policy implementation is crucial to the success of policy implementation. They contend that some practices of policy may be the result of actors missing the genuine intent of the policy. In this regard it is a common understanding that teachers are often unaware of the specifics of policy (Kozma, 2003a). The overarching assumption arising from the above discussion is that policy *will* be communicated to the teacher, but it is the interpretation of the policy intent that is of concern.

ICT curriculum integration guidelines and ICT assessment standards

Contrary to the literature, findings in my study indicate that the South African national curriculum framework does little to advance the integration of ICT into the curriculum (Blignaut & Howie, 2009; Department of Education, 2002). In this regard all schools in this study attempted to integrate ICT into their curriculum delivery practices and develop ICT assessment standards, mostly through the effort of teachers. Schools and teachers in my study were apparently unacknowledged by district for their innovativeness, as district was out of touch with schools' endeavours to integrate ICT. Furthermore, school teachers were experimenting with ICT in their classrooms and were uncertain whether or not they were exercising pedagogically sound practices in their attempt to integrate ICT in their teaching-learning repertoire. A teacher at

theformer model C school says “there needs to be a link. We don’t know what they want, we making up as we go along. We using our own stuff... They don’t give guidelines”

5.5.4 Conclusion

School transformation regarding the appropriation of ICT policy in education in a South African context leaned significantly towards principals as change agents. In my study vision, beliefs, attitudes and leadership were fundamental for the implementation of an e-education policy. The absence of the national e-education policy and the lack of curriculum resources did not deter principals from fulfilling their leadership role. The leadership of principals was twofold namely, pressurising teachers to implement the school formulated policy on the one hand while providing continued support to do so on the other hand. Significantly the absence of district support and guidance catalyzed, school principals to form school-school collaborative networks that served as a source of continued support, motivation and inspiration.

Chapter 6

Implications for policy, research and practice. Summary of findings, recommendations and conclusion

6.1 Introduction

This chapter attempts to present a summary of the key findings and to foreground these findings against the research questions and theoretical framework of this study. The literature research assumptions outlined in chapter one, will be revisited in the light of the findings of this study. New knowledge that emerged from this study and suggestions for further research will be presented. The chapter concludes with recommendations for policy implementation to improve teaching and learning.

The main purpose of this study was to explore how national policy on information and communication technology influenced teaching and learning in school classrooms. In responding to the research questions of this study: What is the ability of the hierarchical unit within the education system to affect the behaviour of the teacher that is the target of the policy? andwhat resources does this unit require in order to have that effect? I present key findings according to provincial and district response to the national e-education policy, responses of schools and principalsas change agents. In addressing the research questions: How does education policy on ICT influence teaching and learning within South African schools? and how do teachers appropriate education policy on ICT in schools? key findings are presented according to teachers' beliefs, attitudes and professional practices.

6.2 Summary of key findings

6.2.1 Province and district response to the national e-education policy

At the systemic level I found that the absence of incremental reform or guidelines in respect of the e-education policy from national government suggests that national government had not pursued the implementation of the e-education policy with the same conviction as it had with other education policy initiatives. The national e-

education policy implementation strategies seemed limiting, simplistic and without specific systemic (province and district) mandates, directives or time frames as indicated by the policy statement “each province will set its own targets within the broader framework” (Department of Education, 2004, p. 39). According to Spillane, Reiser, and Reimer (2002, p. 390) local implementation will be hampered if national government does not design clear and consistent directives with respect to the “behaviour desired from implementing agents and agencies”.

Furthermore province and district e-learning officials did not seem to pursue the national e-education policy as a policy that was destined for implementation. Spillane et al. (2002) explain how personnel at system structures modify policy intent and principles as they interpreted policy through their own frames of reference. In the current study, district and provincial e-learning officials appeared to view policy through their own experience and seemed to have missed (or misconstrued) the core intentions and implementation strategies of the national e-education policy (Spillane, Reiser& Reimer, 2002). It is apparent from the findings that district officials did not refuse, retard or resist policy, but seemingly did not understand the policy intent or implementation strategies of the e-education policy(McLaughlin, 2001).

Although districtand provincial e-learning officialswere officially authorised by the enforcement mechanism of the national e-education policy, any formation of policy had to be “warranted institutionally” (Levinson et al., 2009, p. 771) and supported by the personal qualities of “those involved”. However, there was a sense of ambivalence at both district and provincial levels on whether the e-education policy was meant to be implemented. This uncertainty may be a reason that district and provincial education departments did not pursue the government policy implementation agenda. In the current study, the e-learning directorates appeared not to believe in a need for their own interpretation of the e-education policy guidelines. They apparently viewed themselves as conduits of government policy by adopting the national e-education policy. Thus both province and district e-learning officials seemingly lacked the “will” to make policy or develop an incremental supporting policy for schools (Levinson et al., 2009, p. 771).

In the current study, exigencies expressed by teachers and principals in schools for policy guidelines could have been a catalyst motivating district and provincial e-learning leaders to respond to the call for support. Perhaps, e-learning officials' unresponsiveness to the policy support needs of teachers could be attributed to the fact that they may still be steeped in a traditional culture of a top-down approach to policy implementation. Local actors at district and provincial levels apparently did not exercise agency in the policy process. Consequently schools (teachers, principals)were not coerced, pressured or encouraged to implement the national e-education policy. This apparent lack of support from district and provincial e-learning officials, coupled with the lack of enabling policies had a consequential effect of alienating schools from the district.

6.2.2 Response of schools

In the current study (against a backdrop of systemic instability and lack of systemic support) school-based initiatives were promoted to implementICT. At school level, principals were key to the implementation of the school-based ICT policy. In most developed countries, principals and teachers have at least an overarching understanding of the national ICT policy directives (Harrison et al., 2002). Within the context of the current study,on the other hand,principalswere uninformed and oblivious of the e-education policy directives, while on the other hand teachers expressed a superficial understanding of this policy. However, teachers in the current study developed and implemented a school-based ICT policy separate fromthe national e-education intent.

In their need for guidance and mutual support principals and teachers initiated "communities of practice" (Wenger, 1998; Wenger, 2000) in the implementation of ICT. These communities of practice developed within each of the schools in the current study, forming networkswith other schools. All participating schools in this study attempted to develop a network of like-minded schools. Initially, communities of practice developed through mutual engagement and a shared vision. Schools and teachers affiliated to other schools as members of a community of practice and tried to understand and negotiate meaning about the implementation of ICT.The former model

C school aligned itself with forty-three other schools, the township school forged links with another public school within the same socio-cultural context, and the independent school developed mutual engagement with other private schools.

These communities of practice were not determined by locale, but were based on the need to establish an understanding of how to integrate ICT into the teaching and learning practice across the curriculum. In these communities of practice, principals and teachers shared a common purpose needing to stay abreast of ICT innovation and pedagogical trends. The partnership thus developed was subject to continual negotiation“in the very process of pursuing it”Wenger (1998, p. 77). The independent school and former model C school were committed to the idea of communities of practice and pursued it with a sense of purpose that promoted sustained and supportive communities of practice. As the township school however, operated on an ad-hoc and needs basis, the community of practice did not develop into a structured format. Furthermore, it was evident that all three schools demonstrated social responsibility towardsthe identified resource scarce schools by offering professional support in terms of ICT skill and pedagogy development to these schools in a collective vision of a better society.

6.2.3 Principals as change agents

I argue that communities of practice led school principals (as change agents) to form policy as “a kind of purposeful knowledge making” (Wenger, 1998). In this regard the leadership of principals was pivotal in determining the direction in which the school would move to integrate ICT. The personal qualities of principals, combined with their engagement in communities of practice, and the practical exigencies arguably created an institutional environment warranting the need for a policy on ICT integration within the school context. Principals evidently created the warranting conditions and had the will to make policy for their schools (Levinson et al., 2009).

6.2.4 Teachers' beliefs, attitudes and professional practices

In responding to the main research question "How does education policy on ICT influence teaching and learning within South African schools?" and "how do teachers appropriate education policy on ICT in schools?", I put forth the view that teachers' beliefs, attitudes, and professional practices were the main drivers of change in ICT e-education policy formulation and implementation.

This study created an opportunity to view and understand policy formation and appropriation as a socio-cultural practice "[as] a set of activities embedded in and informed by certain cultural models and social relations" (Sutton & Levinson, 2001, p. 141). Appropriation as a 'form of creative interpretive practice' (Sutton & Levinson, 2001; Levinson et al., 2009) provides the backdrop against which teachers in the current study are viewed. Teachers engaged in their own interpretation of what was important and essential as they became involved in the practice of an e-education policy. So what drives teachers to appropriate, formulate and implement a local school policy? Why did teachers in this study change their teaching practice when many other teachers have not taken on the challenge (Wilson-Strydom et al.,2005)? What influenced the professionalism of these teachers given the educational landscape from which they emerge?

I argue that the beliefs and attitudes of teachers'use of ICT were the mainstay of their classroom practices. Beliefs and attitudes of teachers inform their value system, which in turn dictates their actions and classroom practices (Drake, Spillane & Hufferd-Ackles, 2001; Spillane 2000). In this study I found that teachers believed that they could make a difference in the lives of learners.

Within aconducive and supportive institutional culture that promoted ICT implementation in the school, teachers in the current study actively took on the challenge of integrating ICT into their teaching practice and became the main drivers of change in their schools. Participating teachers were engaged in numerous practices that promoted ICT integration into their teaching-learning repertoire. In the current study teachers' practices guided their beliefs and attitudes (Spillane, Reiser, Reimer,

2002). School policy on ICT was developedthrough teachers' practices - I posit that the life history of actors in each research site influenced the construction of local policy. In this regard experiences of three teachers in the corporate world contributed to a change in their belief systems about the use and value of ICT in education. They thus returned to the teaching profession motivated to empower learners to meet the vocational challenges of the corporate world.

Teachers in this study were engaged in pedagogical experimentation, and recognised their role as drivers of ICT. They exhibited a strong will to learn and develop, were innovators and trendsetters and had a strong sense of concern to develop ICT skills of learners for vocational purposes. This array of qualities indicates that teachers in the current study were personally competent. According to Sutton and Levinson (2001) and McLaughlin (1987), policy successes are critically dependent on the local capacity and will of teachers as implementers of policy. McLaughlin (1987) indicates that local capacity can be addressed by policy initiatives for teacher training and by the allocation of financial resources. However, teachers' will, attitude, motivation, and beliefs are less influenced by policy intervention.

I examine teachers' beliefs and attitudes as significant constructs to explain why teachers appropriate ICT policy. From a socio-cultural approach to policy analysis, it appears that teachers in this study were motivated by their instinctive professional attitudes and beliefs to overcome educational challenges and to pursue what is in the best interest of learners and institutions (schools). The ICT classroom practices of participating teachers go against the norm of challenges experienced in their daily lives, namely: education policy overload, low teacher morale, overcrowded classrooms, class of diverse learners, new teaching philosophy, curriculum policy changes, absence of systemic directives and support. Notwithstanding these challenges, participating teachers appropriated and implemented an ICT policy negotiated at a personal, cultural and social level. Sutton and Levinson (2001) affirm the exceptional practice of these teachers as a socio-cultural approach to policy:

> '*social democratic processes must have leaders and groups struggling with courage, passion, and a strong sense of moral conviction to bring about change" (Sutton and Levinson, 2001, p. 119).*

Teachers in the current study demonstrated a strong sense of moral conviction to bring about change in the lives of learners. Teachers were intrinsically motivated to pursue ICT implementation at their schools without the promise of service benefits, monetary incentives, promotion opportunity or professional benefits.

Why did these teachers choose to incorporate ICT in their teaching practice?The corporate experiences of some of the teachers in this study seemed to be a significant contributing factor to their beliefs and attitudes culminating in their changed classroom practices.In each of the schools (the former model C school, township school and the independent school) I encountered at least one teacher in the sample that had left the teaching profession, entered the corporate world and subsequently returned to the teaching profession. At each of these schools, teachers were seemingly the drivers of ICT integration. Plausibly their corporate-life experience reflected a reality of the world beyond school. These teachers apparently understood the demands of the corporate world and this experience entrenched their belief system.The sole intention of these teachers was to make a difference in the lives of learners by being effective teachers and doing their professional bidding.

But, it is not only this experience that seemed to have a bearing on the belief systems of teachers' appropriation of policy. Teachers in this study were motivated to equip learners with ICT tools of the future. Teachers exhibited a strong sense of commitment to optimise learners' chances in education - as mediated by teachers' own ICT experiences. Almost all teachers expressed that ICT in their teaching and learning practice will enhance the lives of learners and prepare them for the workplace. A teacher at the township school explains his beliefs in the use of ICT in his classroom practice.

> *"The classroom must be made as real as possible to what the learner's experience home, and eventually greatest is preparing them for the workplace... But to make them realise that this thing will be a part of their working life in a big way. Office, factory, even if you clean floors you know, it's an electronic gadgets.(School A - Teacher 1).*

The principal of the former model C school explains his level of conviction that ICT has a place in the education of learners to:

> *"Like I say children in primary schools now, don't even know what they going to do one day. There will be jobs that do not even exist at the moment that they will be doing. So, who must equip them, we must equip them…" (School B – Principal).*

I submit that the corporate experience and teachers' vision for futures oflearners represent two compelling factors driving the belief systems of participating teachers. In this regard I posit that teachers'life experiences, will and determination influence their belief systems to appropriate school-based ICT policy in their teaching practice. It is teachers' beliefs and attitudes that drive their commitment and dedication to teaching. This is evident from the manner in which participating teachers undertook to develop and improve their knowledge, skills and pedagogy. Most of the participating teachers took the initiative to further their education in ICT by making use of their own initiative to be self-taught.

Teachers in this study therefore believed that exposing learners to ICT learning experiencescould enhance career chances of learners.To my mind this belief initiated intrinsic motivation to form communities of practice in order to meet technological challenges in teaching. All teachers in this study formed their own informal reference groups drawn from teachers utilising ICT across the curriculum, within their school and between other schools. This school collaboration initiative allowed teachers to discuss ICT issues such as, instructional pedagogy, curriculum relevance, skills and assessment methods. After much collaboration and deliberation teachers formulated an instructional framework policy consisting of ICT curriculum integration and ICT attainment standards, which ultimately formed the basis of an ICT curriculum policy for schools. Hence, a bottom-up policy formulation process occurred. My findings indicate the significance of policy appropriation (Levinson, Sutton &Winstead, 2009) within a local context and the ability of teachers not only to be developers of policy that has meaning for them, but also to be drivers of ICT implementation in schools.

In this study, teachers and principals were agents of change, generating new and enabling policy (Sutton &Levinson, 2001). Irrespective of the lack of systemic support, teacher agency was encouraged by leadership, support and guidance from the principals within the school context (Sutton & Levinson, 2001). The current study also adds another dimension to the socio-cultural approach to policy analysis (Sutton& Levinson, 2001). In this regardteachers' ignorance of nationale-

educationpolicy may be conceived as a kind of appropriation, since it resulted in the need for policy development and implementation at school level by teachers. This appropriation seemingly stems from the professional attitudes and beliefs of teachers.

I found that the will, beliefs and attitudes of teachers in the implementation of ICT was not driven by the e-education policy mandates, but rather by teachers' professionalism and a desire to improve teaching and learning. The school-based e-education policy was informed by teachers' classroom practices, their belief systems, the leadership and will of the principal, and warranting institutional demands. Practices of teachers coupled with their professional conduct and beliefs determined the e-education policy of the school. In this manner, teachers exercised agency and appropriated a school-based policy. Significantly the school-based ICT practices reflected the policy intentions of the national e-education policy. The latter thus requires a further investigation into the purpose of policy if practice is effective in the absence of knowledge of policy.

6.3 Significance of findings – new knowledgegenerated

The new knowledge that emerged and pushed boundaries back in this field of study was fourfold in nature. First, teachers' professionalism and agency wascrucial in formulating and implementing a school-based e-education policy in practice.Second, teachers repositioned themselves not as recipients or reactors of the e-education policy but as social and cultural actors of school-based policy appropriation and formulation.Third, the lack of systemic support catalysed communities of practice between schools. Fourth, teachers' ignorance of the nationale-educationpolicy may be conceived as a new construct to policy appropriation (Sutton & Levinson, 2001), since it resulted in the need for policy development and implementation at school level.

Contrary to much of the literature on ICT policy implementation at schools this study found that the innovative ICT practices of teachers determined the formulation and implementation of a school-based ICT policy(Somekh, 2000; Hopkins & Levin, 2000;

Carnoy, 2004; Tondeur et al., 2006; Wilson-Strydom et al., 2005). The status of the national e-education policy existed as an 'invisible policy' within the school context. Teacher professionalism included professional confidence, professional interpretation and professional consciousness that were crucial to the policy appropriation process. Teachers repositioned themselves not as recipients of policy (merely reacting to policy) but as social and cultural actors with the ability to articulate, construct and implement new educational procedures that eventually became formulated and appropriated as new educational policy within a school (and community of practice) context.

Furthermore, teachers were disillusioned by the manner in which government programmesor reforms were imposed on them, without adequate support or expertise on the way to apply the new educational reform. District e-learning officials seemed to lack capacity and competence to provide ICT-integration and policy support to teachers.Schools seemed to operate in vacuums in terms of implementing the e-education policy. Lack of district support however led to improved teacher collaborative efforts, shared experiences, trust, collegiality and the willingness to experiment with new pedagogies. Participant teachers were content to try out new approaches to teaching, to develop and integrate ICT across the curriculum to suit their local context and to make decisions to develop, modify and expand on the ICT attainment standards.

Literature on the socio-cultural approach to policy implementation (Sutton & Levinson, 2001) reveals that the conventional flow of policy (as it filters down to be implemented within the school context)assumes one of three responses: teachers may modify their actions in adherence to policy, may purposefully delay implementation or may simply resist policy directives through inaction. This study adds a new dimension in policy appropriation, namely that teachers' ignorance of the nationale-educationpolicy may also be conceived as a kind of appropriation. Figure 6.1 below provides a schematic indication of how socio-cultural conditions may promote local policy to be appropriated, formulated and implemented at schools.

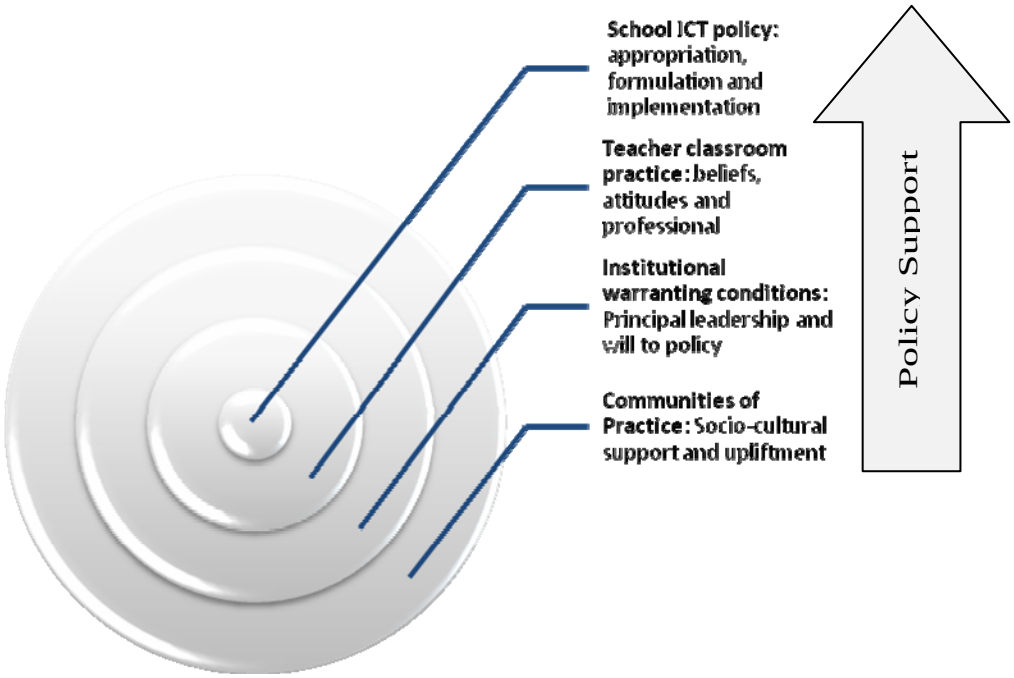


Figure 6.1:A socio-cultural approach to local policy formulation and implementation

6.4 Research assumptions revisited

This section responds to the research assumptions made in chapter one.

Research assumption 1:

Once policy has been formulated it will be implemented.

Findings do not support this assumption. In the current study it was found that the national e-education policy, though well crafted and inclusive in its design, was not implemented at schools and remained as symbolic policy. I posit that teachers should be included as co-constructors of policy.

Research assumption 2:

Policy that is officially authorized and backed by government enforcement mechanisms filters in a linear fashion from macro to meso to micro levels in the education system.

Findings do not support this assumption. In the current study the national e-education policy filtered from national to province and district, but remained inaccessible at the school level for which it was ultimately intended. I posit that a bottom-up

consultative approach inclusive of relevant stakeholders be adopted that affirms practice as a crucial mechanism to inform policy.

Research assumption 3:

Actors at these various levels are knowledgeable about authorized policy, and implement policy according to guidelines.

Findings do not support this assumption. In the current study, province and district were knowledgeable about the authorised policy but they did not implement the policy according to their mandates. Principals, on the hand, were ignorant of the authorised policy; teachers were aware that such a policy existed but were ignorant of the contents of the policy. However, a school based policy was formulated that ironically reflected the ideals of the authorised policy. I posit that a participatory approach to policy formulation be adopted that encourages policy appropriation.

Research assumption 4:

Teachers may modify their actions in adherence to policy, or purposefully delay implementation or simply resist policy directives through inaction.

Findings do not support this assumption. In the current study, teachers were ignorant of the mandates of the e-education policy and thus did not resist, delay or adhere to national policy imperatives. However teachers' classroom practice determined and formulated a school-based e-education policy. Thus, the implementation of the e-education policy unfolded not as 'policy *in* practice' but as 'policy *as* practice'. I posit that teachers have the professional ability, knowledge and vision to formulate policy. If policy is formulated from practice it will be willingly appropriated and effectively implemented.

Research assumption 5:

Systemic structures provide sustained policy support and resources to teachers.

Findings do not support this assumption. In the current study systemic policy support and guidance from province and district were lacking. Schools did not receive resources to promote the implementation of the e-education policy. I posit that officials at the district and provincial levels be teacher experts in the field of ICT to improve teaching and learning by means of sustained policy support to teachers.

Furthermore, officials should perceive their role beyond that of policy administrators to that of policy formulators and implementers.

Research assumption 6:

*The practice of policy is determined by actors situated at the point of policy implementation and may be different to policy as conceived by the policymaker.*Findings do not support this assumption. Significantly different in the current study was that teachers although ignorant of the e-education policy as envisioned by the policymaker, implemented the policy as intended. I posit that teachers have the knowledge, expertise and professionalism to formulate policy with the same vision and insights as policy makers. Thus, teachers are an extremely valuable resource in policy implementation and should not be ignored in the policy formulation process.

6.5 Suggestions for further research

Any qualitative study uncovers more to investigate, and whether one scans the horizon or delves for depth in the field, opportunities for further research abound. The ICT policy landscape is rich with possibilities for research in educational issues. New frontiers to explore relate to policy implementation issues, and the role and responsibilities of local actors within this context. A number of areas for possible research were identified as a consequence of this study:

- How does the e-education policy influence teaching and learning in secondary schools?
- How can communities of practice be sustained as a means of support to teachers implementing the e-education policy?
- How does the socio-cultural context of districts influence e-education policy appropriation?
- Why is there a lack of will to formulate e-education policy at district and provincial levels?

- How can districts be supported in providing practical guidelines and support to schools in implementing ICT policy?
- How do e-education policy mandates affect the structures of schooling, and how do these in turn mediate teacher identity and agency?
- What socio-cultural contexts in township schools influence the implementation of ICT in teaching and learning?
- How do ICT communities of practice operate within former model C schools?
- How can effective ICT communities of practice be established at township schools?

Further studies may build upon the findings of the current study and may deepen the quality constructs of transferability and generalizability. I recommend these areas of research to better understand experiences of teachers with regard to e-education policy appropriation, mediation and implementation.

6.6 Recommendations for policy and practice

The following recommendations for policy, practice and scholarly interestare made as a result of this study. These recommendations emerged within the context of this bounded case study. However they may be translated to similar policy implementation scenarios.

- **Recommendation 1**

This study entrenches teachers as significant role players in the implementation of policy. In order for policy to change teachers' practice, policymakers should engage teachers as pedagogical professionals in the formulation of policy. In this regard, teacher agency and the appropriation of policy are key to successful implementation.

- **Recommendation 2**

The use of backward mapping model as a research strategy may improve our understanding of policy implementation issues, create new opportunities for policy studies and contribute to the achievement of policy goals.

- **Recommendation 3**

Principals as leaders of schools should be knowledgeable of the national e-education policy in order for government mandates to filter into classrooms.

- **Recommendation 4**

District and provincial e-learning directorates should elevate their professionalstatus beyond administrative functioning and transmission of policy. E-learning directorates should formulate policy guidelines and offer sustained support to schools. Furthermore, curriculum directorates and e-learning directorates should by necessity be an integrated unit with a shared vision for ICT curriculum integration.

- **Recommendation 5**

Officials at both curriculum and e-learning directorates should be professional experts in ICT, in curriculum and in ICT-integration curriculum delivery. These directorates should aspire to translate policy into practice at directorate level, by applying ICT to their own administration and services. Communities of practice may be developed through district initiatives. These communities of practice may exist between districts, and between districts and schools.

6.7 Conclusion

Utilising a socio-cultural approach to policy *as* practice, this study added various nuances and textures to the expanding body of research that explored teachers' experiences of the implementation of the e-education policy. The beliefs, attitudes, will and professionalism of teachers to improve teaching and learning through the use of ICT are integral to policy implementation. Policy implementation whether

favoured by top-down policy analysts or backward mapping proponents, continues to occupy centre-stage in policy studies. A sustainable benefit of the backward mapping approach is that, as actors at various levels are drawn in, their own positive and proactive professional roles are enhanced in an interlinked process of defining and implementing policy. It could be expected that over time, this flexibility and responsivity of the educational system would develop to include teachers' voices.

Whatever the intention of government for crafting the e-education policy, the introduction of ICT into schools created change in the school environment and left an indelible mark on the practice of teachers. Teachers should not be seen as mere conduits of national policy, but rather as social, cultural and professional actors that have the ability to articulate, construct and implement new education policies. Teachers are crucially situated at the point where policy meets practice. They are an extremely valuable resource in policy implementation and should not be ignored in the policy formulation process.

> *"Those who seek to understand the meaning and import of educational policy seek at thesame time to inform it, as citizens and as professionals.Being mindful of the dangers ofspeaking for others, policy researchers are nonetheless in a position to raise awareness inthe policy formation process of the multiple sites in which policy manifests, as well as themultiple meanings that governing policy may acquire in daily practice."*
>
> (Sutton & Levinson, 2001, p. 15).

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Appendix A1

Lay Summary

Introduction to Schools

1. **Name**: Thiru. Vandeyar

2. **Affiliation**: University of Pretoria – Faculty of Education

   Focus area: CIE [ACE;BEd(hon);MEd;PHd]

   - Programme Co-coordinator MEd(CIE)Computer Integrated Education

     Purpose: Instructional designers/management of E-learning/

   - PGCE

3. **Study/Project**: PHd: How do schools take up government policy on ICT

   Focus Question: How does education policy on ICT influence teaching and learning in South African schools?

4. Permission to conduct research – Official Department of Education (copy)

5. Formal letter of introduction to principal (copy)

6. Primary schools that are functional, stable, and using ICT to teach the NCS not just ICT as a stand alone

7. My research study would entail:-

   - Interviewing one teacher that is predominantly involved with teaching the curriculum using ICT
   - Observing as many lessons as possible
   - Interview with the principal
   - Collecting data on: Mission/History/Context/Syllabi & Policies (ICT)
   - Photographs/video/Voice recordings

8. Anonymity and confidentiality

9. Duration: At least one term, until saturated data capture

10. Non obtrusive, abide by school schedule and policies

11. Suggestions of teacher sample?

12. Date for interview with principal?

13. Other concerns:

    ……
    ……
    ……
    …

Thank You

Appendix A2

Letter of consent - principal

Faculty of Education
Department of Curriculum Studies
University of Pretoria

100 1908 - 2008 UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Date:

The Principal/Deputy Principal
Cornwall Hill College
Pretoria

Letter of Consent for Principal/Deputy Principal (or Delegated representative)

Dear Sir.

I am a lecturer/student [a graduate student under the direction of Professor Liesel Ebersohn] in the Faculty of Education- Department of Math, Science and Technology of the University of Pretoria.

I am conducting a study to research the **take up (appropriation) of education policy on ICT within schools in South Africa**.

Your participation in this research will involve being interviewed and observed during the conduct of your normal work programme. I will try my utmost to ensure that most interviews do not exceed 45-60 minutes at a time. You will also be involved in ensuring that the essence of your input captured during the interviews is correctly recorded.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty, obligation and it will not affect your situation position within the school. The results of the research study may be published, but your name will not be used. All information that you provide will be kept strictly confidential. No school or person will be identified in my research and participants will be entirely anonymous and referred by pseudonyms.

Please note that the principal will be aware of your identity and thus your participation will not be confidential.

There are no foreseeable risks or discomforts if I agree to participate in this study.
Although there may be no direct benefit to you, the possible benefit of your participation is the research findings and conlusions drawn from the study will be made available to you and you may be invited to research forums/seminars in which this study is relevant.

If you have any questions concerning this research study, please call me (012) 420 2372 or [e-mail: thiru.vandeyar@up.ac.za].
Sincerely,
T.Vandeyar

* * * * *
****
I, _____ of Cornwall Hill Preparatory school give my consent to participate in the above study.

_____ (signature) _____ (date)

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Ethics Committee of the University of Pretoria at 012-4202772 or sonja.coetzee@up.ac.za

Appendix A3

Letter of consent - teacher

Faculty of Education
Department of Curriculum Studies
University of Pretoria

Date:

100 1908 - 2008
UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

The Principal
Cornwall Hill College
Pretoria

Letter of Consent for Principal (or Delegated representative)

Dear Sir/Madam.

I am a lecturer/student [a graduate student under the supervision of Professor Liesel Ebersohn] in the Faculty of Education, Department of Curriculum Studies of the University of Pretoria.

I am conducting a study to research the **take up (appropriation) of education policy on ICT within schools**
in South Africa.

Your participation in this research will involve being interviewed and observed during the conduct of your normal work programme. Although I will try to be as unobtrusive as possible, I will require your valuable input both before and after the conduct of your lessons. I will try my utmost to ensure that most interviews do not exceed 45-60 minutes at a time. You will also be involved in ensuring that the essence of your input captured during the interviews is correctly recorded.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty, obligation and it will not affect your situation position within the school. The results of the research study may be published, but your name will not be used.

There are no foreseeable risks or discomforts if I agree to participate in this study.
Although there may be no direct benefit to you, the possible benefit of your participation is the research findings and conlusions drawn from the study will be made available to you and you may be invited to research forums/seminars in which this study is relevant.

If you have any questions concerning this research study, please call me (012) 420 2372 or [e-mail: thiru.vandeyar@up.ac.za].
Sincerely,
T.Vandeyar

* * * * *
****

I, _____ of _____ school give my consent to participate in

the above study.

_____ (signature) _____ (date)

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Ethics Committee of the University of Pretoria at 012-4202772 or sonja.coetzee@up.ac.za

Appendix A4

Letter of consent – parent

University of Pretoria - Department of Math, Science and Technology Education

Faculty of Education
Goenkloof Campus
Leyds Street

Pretoria

100 1908 - 2008 UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Dear Parent / Guardian

INFORMATION REGARDING RESEARCH BEING CONDUCTED AT YOUR CHILD'S SCHOOL

This letter is to inform you about the research that will be conducted at your child's school. The research will form part of my Phd degree that specializes in Computer Integrated Education. The purpose of my research project is to investigate *how teachers appropriate (take-up) education policy on ICT to influence their teaching and learning practice*.

In order for me to collect my data I will be interviewing and observing teachers in their classroom practice. I will only interview the teachers by asking them questions before and after the lesson. Lessonobservation will focus on how teachers teach using ICT and this will entail observing their classroom practice and how learners respond to their teaching. The data will be collected as and when I am invited by the teachers to observe their lessons. I have already received permission from the Department of Education and the Principal to conduct the research.

Your child will not be directly involved in the research except that they will be observed in their normal classroom environment. All the necessary arrangements have been made regarding the research. All ethical issues have been considered and precautions have been taken to prevent any unfair or unethical practices. All information will be handled strictly confidential and any photography will not be used where the identity of the child will be revealed. Your child's name will not be used in the research report. Your child will not be at risk during the research. The observations will take place in a safe environment. Please remember the research is voluntary. If your child does not want to take part in

the research, they can withdraw at any time. Their choice to withdraw will not result in any consequences. If you have any concerns about the research, or if you do not want your child to take part in the research, please contact me or the school through Mr L. Smith.

Thanking you in anticipation.
Yours in education
T. Vandeyar
Researcher **Principal: _____**
(012) 4202372
✂----------

I, _____ parent/guardian of _____

in grade _____ of Cornwall Hill Preparatory School give permission for my son/ daughter/

guardian to participate in the above research study.

_____ (signature of parent/guardian)_____ (date)
Yours in education
Mr T.Vandeyar

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Ethics Committee of the University of Pretoria at 012-4202772 or sonja.coetzee@up.ac.za

Appendix A5

Letter of assent – learner

University of Pretoria
Faculty of Education
Department of Math, Science and Technology
Groenkloof Campus
Pretoria

100 1908 - 2008 UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

LETTER OF INFORMED CONSENT TO A MINOR CHILD
A Phd research project of the University of Pretoria
Project title: The appropriation of education policy on ICT in South African schools
(To be read to children under the age of 18 years.)

Why am I here?
Sometimes when we want to find out something, we ask people to join something called a project. In this project we will want to observe your teachers and you as you participate in your normal classroom activities that is focused on your own development and learning. Before we ask you to be part of this study we want to tell you about it first.
This study will give us a chance to see how we, together with your school and teachers, can help schools, teachers and the government to better understand how computers in used in schools for teaching and learning.
We are asking you to be in this study because your parents/guardians have agreed that you can be part of our study.

What will happen to me?
If you want to be part of this study you will only need to do what is expected of your teachers as you participate in your normal classroom activities. This will be done when your teacher invites me to visit and observe his/her lessons.
If you agree, I would like to take photographs and audiovisual footage of you during some of the classroom activities. People will not be able to see your face or hear your voice if I decide to show the images of you in your classroom. In the reports that I write I will not mention you by name nor will I use a photograph that will reveal who you are.

Will the project hurt?
No one, not even someone in your family or your teachers will be told of how you performed in class or of how you react or respond to your teacher.

Will the study help me?

We hope this study will schools, teachers and the government about the use of ICT in schools.

What if I have any questions?

You can ask any questions you have about the study. If you have questions later that you don't think of now you can phone me or you can ask us next time I come to visit you here at your school.

Do my parents/guardians know about this project?

This study was explained to your parents/guardians and they said you could be part of the study if you want to. You can talk this over with them before you decide if you want to be in the study or not.

Do I have to be in the research study?

You do not have to be in this project. No one will be upset if you don't want to do this. If you don't want to be in the project, you just have to tell me. You can say yes or no and if you change your mind later you don't have to be part of the project anymore. It's up to you.

Writing your name on this page means that you **agree to be in the research study** and that you **know what will happen to you** in this study. If you decide to quit the project all you have to do is tell me or your teacher.

Signature of the learner: _____ Date: _____

Signature of the researcher: _____ Date: _____

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Ethics Committee of the University of Pretoria at 012-4202772 or sonja.coetzee@up.ac.za

Yours in education

Mr T.Vandeyar

Appendix A6
Interview Protocol – teacher

Research Question:

How does eduaction policy on ICT influence teaching and learning inside public schools in South Africa?

A. Background questions	
1	How long have you been teaching?
2	What subject/learning area did you specialize in, in your initial teaching qualification?
3	What learning area are you teaching now?
4	What kind of training/professional development related to ICT have you received?
5	How long have you been teaching?
6	What subject/learning area did you specialize in, in your initial teaching qualification?
7	What learning area are you teaching now?
8	What kind of training/professional development related to ICT have you received?
B. Key Questions	

1	Why do you use ICT in your classroom?
2	What do you believe are the core personal goals for teaching ICT in the classroom?
3	What do you see as some of the opportunities of integrating ICT into your learning area? (Prods) • For learning? • For teaching?
4	What do you think is/are the most important contribution/s of ICT to education?
5	How long have you been utilizing computers to teach your learning area?
6	How do you go about planning your lessons using ICT in the classroom?
7	How often do you use ICT in teaching this subject/learning area?
8	How much freedom do you have to decide on the content of what you teach in lessons that use ICT in the classroom?
9	Who decides how you teach using ICT in the classroom? (Teaching strategy) • Do you make this decision? • Subject Committee?/Subject leader?/ HoD?/Subject advisor?
10	Have you used ICT in teaching other subjects? Why? **Or do you think that ICT has a place in teaching other subjects? Why?**
11	What are some of the challenges in integrating ICT in your lessons?
12	What led you to use ICT in your teaching? (Prods) • Directive? By whom or what? • Personal interest?
13	Do you collaborate/partner with other teachers in making use of ICT? If so what kinds of collaborations exist?
14	How has using ICT in your classroom changed your approach to/understanding of teaching?
15	What role do you see ICT playing, if any in the professional development of teachers?
16	How and in what ways do you think ICT has influenced learning among your learners?
17	In what way has ICT affected your learners? (prods) • learners' *motivation to learn* (if at all)? • Cater for different learning styles? • *learner morale*? If so, In what way and for whom?

18	How do you ensure that what you teach using ICT is suited to your learners needs? (prods) • Content? • Relevance? • The presence or absence of specific learning needs or accommodations?
19	To what extent has the use of ICT in your learning area improved performance/attainmentlevels of your learners?
20	Do you use ICT for administrative purposes? Please elaborate.
21	If there is anything that could be changed, what would you change about the way ICT us being used in schools?

Appendix A7

Interview protocol – principal

Semi-structured questions used for the interviews with principals.

Focus of the interview	**Questions to be posed**
History and background of the School	1. When was this school established? 2. How long have you been a principal/deputy at this school? 3. When were computers introduced in this school? 4. What are the main uses of ICT at this school?
Vision of Education and Role of ICT	1. What are the key values and aspirations for ICT at your school? 2. What do you think are the key contribution and roles of ICT in education? 3. For what purpose do teachers use ICT in your school? 4. Does the use of ICT affect the roles of teachers and learners and the interaction between them? If so can you describe either the expected roles or the observed impacts.

Implementing policy and institutionalizing the use of ICT in the school	1. Does your school have an ICT in education policy? Can you please elaborate 2. What provincial, national or district policy documents do you refer to for guidance to develop your own school ICT policy? (prod: Can you name some of the policy documents that you can refer to for guidance?) 3. How do you ensure your school policy to take effect in classroom practice? • What policy guides the integration of ICT in teaching and learning? 4. How do you think you could change your teacher's behaviour to apply education policy? 5. What resources does do you think you will need in order to change the behaviour of teachers towards applying the education policy on ICT? 6. Is the use of ICT integrated across the curriculum or is it a standalone subject? 7. How does the school/teachers go about designing school-based curriculum to incorporate ICT policy 8. Which policy documents do you or your teachers refer to for curriculum planning? (Does it make provision for ICT inclusion in teaching and learning) 9. What are the main benefits or satisfaction that has been derived from the use of ICT in the school curriculum? 10. What are the biggest **challenges** in implementing ICT use in education? 11. Do you think teachers have the necessary pedagogy to naturally integrate ICT in their teaching practice? 12. What key measures have been put in place to support ICT in education use? (Whose motivation?) 13. Is there somebody in the teaching staff particularly appointed as a result of ICT implementation? 14. Do you think the introduction of ICT in the school resulted in any changes in the relationship amongst teachers, especially with respect to collaborations? 15. What **opportunities** are available for the professional development of teachers with respect to ICT use in the school? 16. In your opinion is there any change in the role of being the principal (deputy) as a result of ICT being introduced into the school curriculum? 17. To what extent has the district office or provincial government provided assistance or given guidance in respect to the use of ICT in your school?

Appendix A8

Interview protocol – district and province

Focus of the interview	Questions to be posed
Section 1: **General information, Leadership and vision**	As you may know, you have been selected to participate in this survey because you are the district E-learning program leader. Throughout the survey, I will be asking you about issues that relate to ICT in education in your province. Many of the questions will ask you about policies within the Gauteng Department of Education or National Policy. Other questions will be specifically directed to your "unit". This refers to your unit within the National Department of Education and in particular the Gauteng Department of Education (exact division/directorates name) 5. Please describe your role function as District E-learning specialist. (Designation?) • Prompt: in promoting ICT in Education in schools? 6. How long have you been in this post? Can you describe your experience? Career path 7. What qualifications do you hold? Prompt: Professional, Academic & relevant to ICT/E-learning/Policy

Section 2: **Policy planning and implementation with a systems perspective.**	8. Can you describe how this district education department has taken up the national ICT in education policy? 9. Does the district have its own ICT in Education policy? How was it developed? What was the source documents used to conceptualise this policy? 10. Can you describe how thedistrict ensures that policy (District, Province or National) reaches schools? • Have there been any actions / initiatives that the district education department has undertaken to inform or communicate national policy intentions? Workshops/training/Subject-advisory or interest groups • What measures has your department taken to ensure that this policyin being implemented at schools? 11. Are there any expected outputs from district offices and schools to determine compliance with policy? 12. Do you think the ICT in education National policy improves:- • Teaching ? In what way, can you elaborate • Learning? In what way , can you explain.
Section III: **Building capacity and effective practice**	I would like to shift focus to more general ICT issues. 13. What role do you see ICT in education playing in schools? • What do you see as the opportunities that ICT in education presents to schools? • What are some of thechallenges that the district department experiences with respect to ICT in schools? 14. Does your district have learner attainment standards in respect of ICT? • (If not) are there any such standards being developed? 15. How does the province plan to encourage teachers to integrate ICT into the curriculum?
Section IV: **Professional development**	**16. Do you think teachers are implementing the national ICT in education policy at school? Why?** **17. How do you think you could change teacher's behaviour to apply education policy?** 18. **What resources does do you think you will need in order to change the behaviour of teachers towards applying the eduaction policy on ICT?** **Both technical and human resources** 19. From my school visits, I would like you to respond to some of my observations and interview responses: 20. Is there anything else that you think is important for me to know about ICT in the province?

Appendix A9

Interview protocol –pilot

***Research Question*: How does education policy on ICT influence teaching and learning inside public schools in South Africa?**

B. Background question

1. How long have you been teaching?
2. What subject/learning area did you specialize in, in your initial teaching qualification?
3. What learning area are you teaching now?
4. What kind of training/professional develo
   received?

Jonathan[supervisor], if I ask **policy** goals, am I not inferring a top-down approach as opposed to a bottom-up (backward mapping) approach**?**

B. Key Questions

2. Why do you use ICT in your classroom?
3. What do you believe are the core **policy** goals **of whom, what authority(Jonathan, are you implying DoE, Province or District? when we ask of whom, what authority)** for teaching ICT in the classroom? (prods)
    - Personal goals
    - School goals
    - Policy goals
4. What do you see as some of the opportunities of integrating ICT into your learning area? (Prods)
    - For learning?
    - For teaching?
5. What do you think is/are the most important contribution/s of ICT to education?
6. How long have you been utilizing computers to teach your learning area?
7. How do you go about planning your lessons using ICT in the classroom?
8. How often do you use ICT in teaching this subject/learning area?
9. How much freedom do you have to decide on the content of what you teach in lessons that use ICT in the classroom?
10. Who decides how you teach using ICT in the classroom? (Teaching strategy)
    - **Do you make this decision?**
    - **Subject Committee?/Subject leader?/ HoD?/Subject advisor?**
11. Have you used ICT in teaching other subjects? Why **Or do you think that ICT has a place in teaching other subjects? Why?**
12. What are some of the challenges in integrating ICT in your lessons?
13. What led you to use ICT in your teaching? (Prods)
    - Directive? By whom or what?
    - Personal interest?
14. Do you Collaborate/PARTNER with other teachers in making use of ICT? If so, what kinds of collaborations exist?
15. How has using ICT in your classroom changed your approach to/understanding of teaching?
16. What role do you see ICT playing, if any in the professional development of teachers?
17. How and in what ways do you think ICT has influenced learning among your learners?
18. **In what way has ICT affected your learners? (prods)**
    - **learners' *motivation to learn* (if at all)?**

- **Cater for different learning styles?**
- ***learner morale*? If so, In what way and for whom?**

19. **How do you ensure that what you teach using ICT is suited to your learners needs? (prods):-**
    - **Content?**
    - **Relevance?**
    - **The presence or absence of specific learning needs or accommodations**?

20. **To what extent has the use of ICT in your learning area improved performance/attainment levels of your learners?**
21. Do you use ICT for administrative purposes?**Please elaborate**.
22. If there is anything that could be changed, what would you change about the way ICT us being used in schools?

Appendix B

B1-B11 and B13: See CD

Appendix B12

Document naming protocol

Instrument	Participant	Atlis.tiTM Document naming Protocol

Interviews	School A - Teacher 1	P1:SchoolA -Teacher 1.txt
	School A - Teacher 2	P2: SchoolA -Teacher 2.txt
	School B - Teacher 1	P3: SchoolB- Teacher1.txt
	School B - Teacher 2	P4: SchoolB-Teacher2.txt
	School C - Teacher 1	P5:SchoolC –Teacher1.txt
	School C - Teacher 2	P6:SchoolC-Teacher2.txt
	School A - Principal	P7:SchoolA-Principal.txt
	School B - Principal	P8:SchoolB-Principal.txt
	School C - Principal	P9:SchoolC-Principal.txt
	District - Official	P10:DistrictOfficer.txt
	Provincial – Official	P11:Province-FocusGroup.txt

Appendix B14

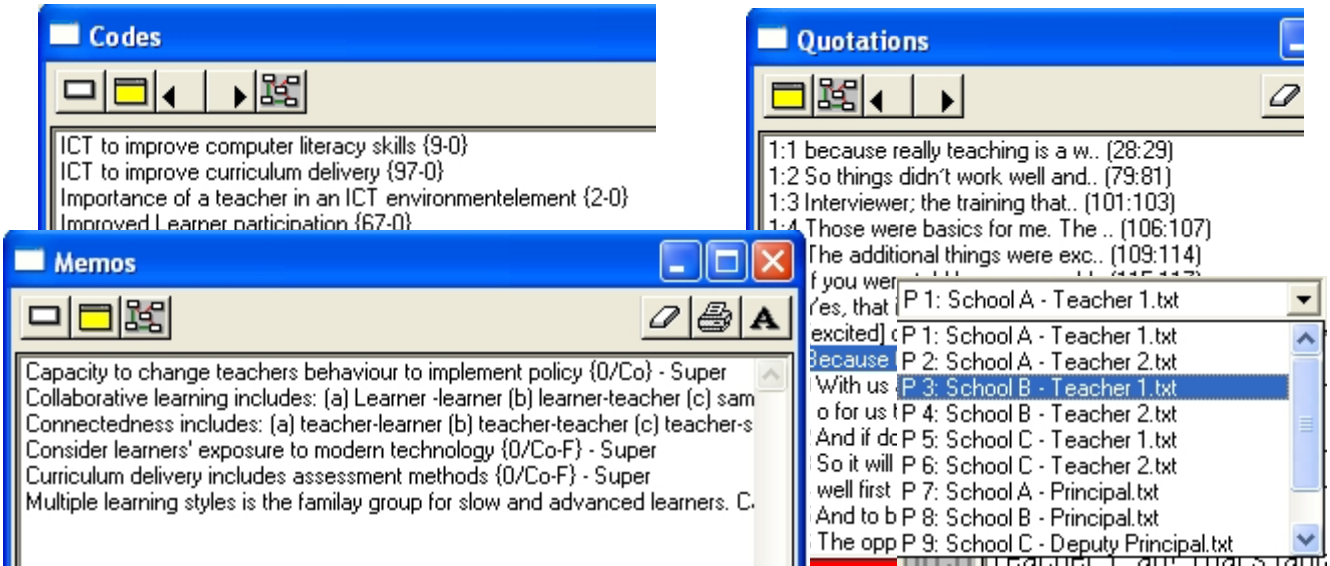
Exemplar of schedule of visits for observations, interviews and other data collection

Number codes in grid indicates time-tabling day for the particular school

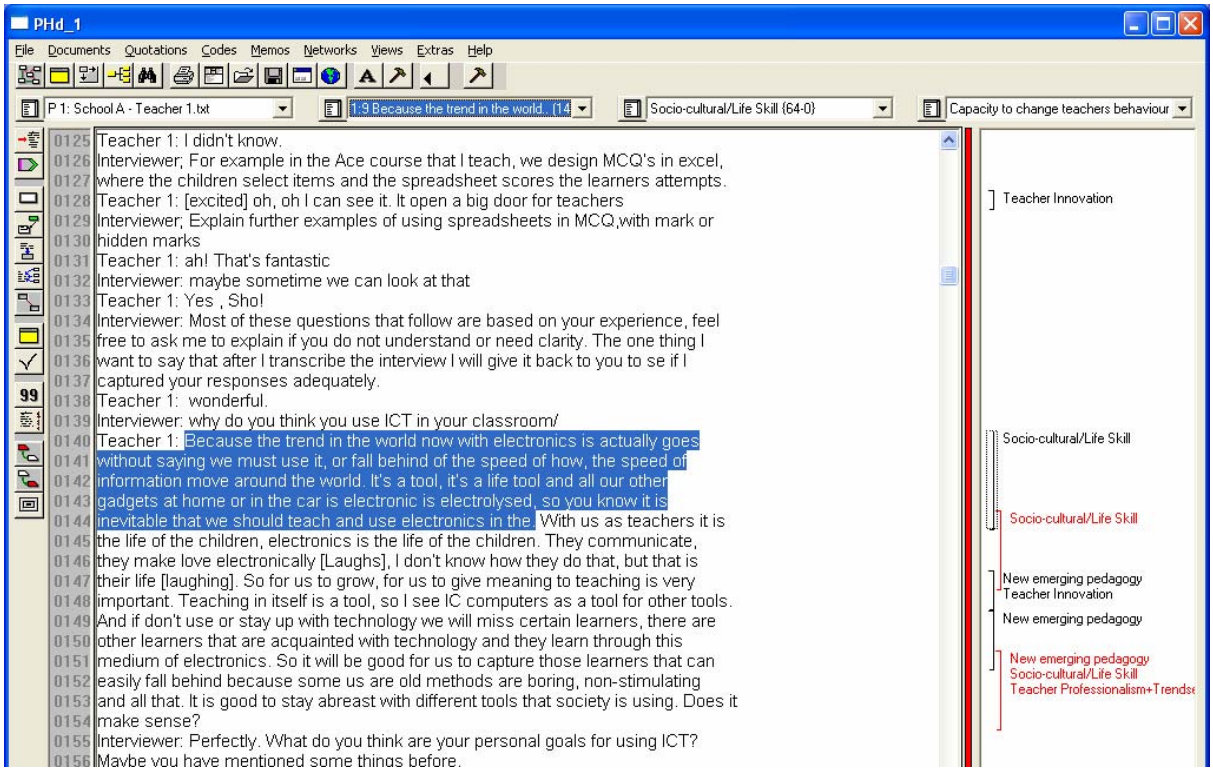
	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	(04/05/2009)	05/05/2009	06/05/2009	07/05/2009	08/05/2009
Arcadia Primary	(5)	Interview Jelly (6)	Interview Jones (1)	Observe Jelly (2)	Observ Jones (3)
Cornwall Hill					Interview Concet
Jakaranda Primary					
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday

	11/05/2009	12/05/2009	13/05/2009	14/05/2009	15/05/2009
Arcadia Primary	4	5	6	1	2 Observation
Cornwall Hill		Observation	Observation		
Jakaranda Primary				Observation	Interview Principal
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	18/05/2009	19/05/2009	20/05/2009	21/05/2009	22/05/2009
Arcadia Primary	3 Interview Principal	4	5 Observation	6	1
Cornwall Hill		Observation		Observation	
Jakaranda Primary				Observation	Observation
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	25/05/2009	26/05/2009	27/05/2009	28/05/2009	29/05/2009
Arcadia Primary	2	3	4	5	6
Cornwall Hill					
Jakaranda Primary	Interview Principal				
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	01/06/2009	02/06/2009	03/06/2009	04/06/2009	05/06/2009
Arcadia Primary	1	2	3	4	5
Cornwall Hill					
Jakaranda Primary					
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	08/06/2009	09/06/2009	10/06/2009	11/06/2009	12/06/2009
Arcadia Primary	6	1	2	3	4
Cornwall Hill					
Jakaranda Primary					
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	15/06/2009	16/06/2009	17/06/2009	18/06/2009	19/06/2009
Arcadia Primary	5		6	1	2
Cornwall Hill					
Jakaranda Primary					
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
	22/06/2009	23/06/2009	24/06/2009	25/06/2009	26/06/2009
Arcadia Primary	3	4	5	6	1
Cornwall Hill		Observation -			
Jakaranda Primary				Observation- Neo	Observation - Peter

Appendix B15



Hermeneutic Unit - Phd



Appendix C

Journal Reflections C1

Selection of schools situational context

Reflection: 3.1

Context: Description of context - Selection of research sites

Based on my perception and experience of primary schools within educational district in which I taught and the fact that the provincial government has been active in the roll out of computer centres through the Gauteng-On-Line (GOL) project since 2004, I assumed that obtaining information-rich township school, that satisfied the selection criteria as a research site would be fairly easy and uncomplicated. According to my sampling criteria, all I required was at least one township school that was using ICT to teach any of the learning area(s). For my first research site, I sought to identify a public township school within the Tshwane[33] South education district. The Tshwane South district consists of 229 (primary and secondary) schools, of which 175 are public schools and 54 independent schools (DoE, 2009).

Selection of research sites **Reflection: 3.2**

Context: Description of context: Selection of sites

The other district office leads took me to schools in Atteridgeville[34]. I visited a school named 'Seaparankwe' which was in the heart of this suburb. Prior to my visit, I contacted the school telephonically, and requested to speak to the principal. I made some simple enquiries about the manner in which ICT was used in the school. The principal informed me that they use ICT for their teaching and learning. On my visit to the school, I was introduced to the 'ICT' teacher, who invited me into his office. I began to discuss the possibility of conducting research with him and explained the criteria for selection. He informed me that at one time they used ICT to teach, however due to the numerous technical problems with the GOL laboratories teachers often had to shelve their lessons. The constant problem with their dysfunctional computer centre made them to abandon any effort to use ICT in their pedagogical practice. The computer centre in now only used for computer literacy. Dismayed but still determined, I requested this school to refer me to other schools that they may know of, that uses computers to teach the official curriculum.

The school referred me to a neighbouring school in the same suburb. At JJ de Jong primary school, I met a colleague who was an ex-district officer, but was now the deputy principal of this school. We shared some information about our careers and then discussed the research project. In this school, computers were used exclusively for developing computer literacy skills. The 'teacher' that was

[33] Tshwane is the name of a municipal district in the province of Gauteng. The province is divided into seven educational districts, of which Tshwane South is an educational district.
[34] Atteridgeville is a predominantly black suburb in the western region of the municipality of Tshwane

employed to teach was not professionally qualified, but rather a student that had computer literacy experience. The computer centre was originally donated by a private company 'IBM' prior to their exit from South Africa during the pre-democracy era. The school desperately sought my assistance in a number of issues that they have to overcome in order to use ICT in their curriculum. I could empathize with their concerns but reluctantly had to exclude this school from being a possible research site.

Selection of research sites Reflection:3.3

Context: Description of context: Selection of sites

I decided to follow a more progressive approach to identify township schools that satisfied my selection criteria. I enlisted the assistance of the co-ordinator of the University of Pretoria's outreach programme at one of the university's satellite campuses. This unit within the university has close links with schools in its endeavour to assist with ICT curriculum support and accessibility of ICT to schools. However, most of these outreach schools are secondary schools using ICT to teach Computer Assisted Technology (CAT). Further leads from the outreach unit led me to primary schools that use ICT only to teach computer literacy, it is not integrated into the school curricula programme. I became concerned that suitable sites for inclusion in the sample may be few and far between. This time I sought to access the teaching experience of students from the Post Graduate Certificate in Education (PGCE) and Bachelor of Education-Honours (Bed-Hon) programmes, these students in the field as pre-service students and in-service teachers respectively. I used the opportunity to discuss my sampling criteria with these students during my lecture sessions, or requested time to do so from other lecturers. An teacher in the BEd(Hons) programme informed me of his school in the town of Eersterust[35], that was using ICT to teach the curriculum. This school as Stake (1995, p. 3) indicates that sometimes selecting a case that adheres to sampling criteria, turns out "to be no 'choice' at all", I was obligated to take this school. I made several visits to the school to meet with the principal of the school. However, each time the principal was away on departmental issues of textbook procurement, unpaid salaries of teachers and the like. However the deputy principal met with me and steered me in the direction of the Head of Department responsible for Information Technology at the school. Thus school A ultimately became my sample representing the township public primary school. I purposefully elaborated on the complexity of identifying a township public school as a research site, to emphasize the fact that many schools though resourced with computers (either through their own means or through government initiatives, or both) were not using ICT in their teaching practice. .

[35] Eersterust is a township in the eastern part of the municipality of Tshwane. It is a township that was demarcated for 'coloured' people during the apartheid era.

Selection of research sites **Reflection: 3.4**

Context: Description of context: Selection of sites

As a matter of importance I need to clarify that I grouped public schools in 'Black', 'Coloured' and 'Indian' communities as schools designated by government as *previously disadvantaged*. So my focus was to obtain a school from this category as a sample. However, not one of the public primary schools in the Indian township of Laudium[36] was using ICT to teach the national curriculum policy. In fact, many of these schools employed people that were not professionally qualified as teachers, to teach ICT as computer literacy. Furthermore, in these schools ICT is viewed as a separate entity and not incorporated into mainstream teaching and learning.

Appendix C

Journal reflection C2

Selection of school A **Reflection: 3.5**

Context: Identification of a township school

Research Site A – Township school

First, I resorted to telephonic communication with schools, requesting to speak directly to the principal. I introduced myself and explained the research project, informing them that the research was sanctioned by the Department of Education. The sequence of questions I posed to them was "does your school have computers?", "do your teachers use the ICT to teach their children?" and "In which learning areas do your teachers use the ICT". Once I had a positive feedback on these three questions I would follow-up and request an interview to discuss and produce the relevant documentation of the project more in detail. Almost all township schools that I contacted indicated that they have computers and they use ICT for teaching and learning. However, when I probed to enquire in which learning areas it was used the response was "we use the computers to teach children how to type" or "we use the computers to teach children how to spell." I then attempted to identify possible sites for the research from my own knowledge of the demographics of schools and through liaising with a senior official (Institution Development School Officer - IDSO) in the education district, who gave me some school leads. Having access to this resource list of possible schools I decided to change my strategy and personally visit these schools. Though personal school visits gave me contextual information, all possible township school research sites did not pan out, through this method.

[36] Laudium is a township in the Western region of the municipality of Tshwane. It is a township that was demarcated for 'indian' people during the apartheid era.

Appendix C

Journal reflection C3

Selection of research sites

Context: Selection of school B – A former model 'C' school

As indicated above my contact with preservice students in the PGCE programme, afforded me an opportunity to access schools that were service through the university-school mentorship programme. During one of my lectures I requested my students to refer me to schools according to their teaching practice experience that satisfied the selection criteria. I was overwhelmed with the response, that there were many schools using ICT to teach the curriculum, I was spoilt for choice. Students readily listed a host of schools where they had personal experience and were impressed with the school's use of ICT in teaching and learning.

Confident that most of these schools would satisfy the sampling criteria, and being classed as a former 'C' schools, I sent out a number of e-mails to schools that were suggested by my students. In the e-mail I formally introduced myself, briefly explained the essence of nature of the research and requested an appointment. From my own experience as a principal, I preferred face-to-face information sessions about any proposed research that was to be conducted at my school. It was my intention to pursue all positive leads, until a school that satisfied all or most of the sampling criteria were identified. While most schools responded positively to my request for an appointment, the need to follow through with all was not necessary. A school situated in Pretoria, within close proximity to the university was the first to invite me to the school. I had a casual meeting and informative meeting with the principal, who was delighted to have his school as a research site for my project. After I gave him my lay summary (Glesne, 2006), formal official documentation and a detail analysis of my expectations from the school, he approved in principal to the research immediately. In my discussion with the principal regarding ethical issues of confidentiality and anonymity, the principal was adamant that his school is trying their best and he does not mind the school to be mentioned by name. The principal immediately introduced me to the deputy principal who was responsible for ICT in teaching and learning. The school satisfied my sampling criteria and was subsequently selected as a research site for the study.

Appendix C

Journal reflection C4

Selection of research sites

Context: Selection of school C – An independent school

I was tempted to pursue an independent school within the suburb that I taught in, as this would be convenient sampling. However, my experience with the pilot study averted my focus from these schools. Furthermore, most of the independent schools in Laudium are structured along religious principles and this would create extraneous issues and complicate the study.

Three possible independent schools were the object of my sampling criteria. I sent out e-mails to the independent schools, two of which are conveniently within close proximity to the university, once again following formal communication protocols. One of the schools, an independent school for girls, replied to my e-mail stating "The Head asked me to reply to you to say that, as an independent school, we are not affected in any way by education policy on ICT to influence teaching." I followed up with the second independent school, with several telephone calls, and then finally a forced visit. The personal assistant to the principal met with me, I discussed the research study and handed in all relevant substantiating documentation, and practically pleaded for an interview with the principal. She informed me that the school will contact me soon when they have made a decision and that was the last I heard from this independent school.

Context: Selection of research sites

Once again, I became concerned that I would not be able to gain access to a research site necessary for the rationale of selecting schools from diverse socio-cultural contexts. I decided to make use of contacts to help remove barriers to gaining access to a schools site (Lofland and Lofland, 1984; Devers and Frankel, 2000). A colleague, who was a teacher at an independent school, made contact with an teacher at the school where I intended to conduct my research. Although I communicated with this teacher (via e-mail), and established his confidence in participating in the study, ethically I did not meet with him until I established the proper bureaucratic protocol. The third independent school was located approximately 20km out of Pretoria, in a beautiful suburb of Irene. The newly appointed primary school principal responded to my e-mail and afforded me an opportunity to discuss the research study. At this meeting I presented my credentials, letter of introduction and other official documentation to support the lay summary. The meeting was very brief, but he indicated he will have to discuss the possibility of the research study with the relevant school authorities.

Three weeks later, I was given another appointment to present my proposed research study; I wondered what it was about my initial portfolio that was not clear. At the second meeting, I was met by the principal of the secondary school, the deputy principal, the information specialist teacher and a

representative of the School Governing Body. They ushered me into the staff room and since it was immediately at the end of the last teaching contact session, the staff room was filled with teachers. We sat around two sofas and I could sense the enthusiasm as I presented my research project. The occasional question and interesting comments in a somewhat active staffroom, made me feel that I was indeed being listened to. The principal immediately sanctioned the search project, stating that the school embraces research studies and affording opportunity to researchers. I was led off with the information technology teacher, who was incidentally also a Phd student, to be introduced to the teacher that (by consensus of the interview group) would be my unit of analysis at this site. It also happened to be the teacher I had been in communication with. Thus, the third research site was established according to the preset criteria and for maximum variation sampling.

Appendix C

Journal reflection C5

Context: Description of context: Selection of teachers 1-6

Selection of teachers at School A

At the first research site, this was a school in the suburb of Eersterust. As indicated earlier, I did not meet with the principal on the numerous scheduled appointments. Even though the principal granted me access to the school to conduct my research, I was not certain whether this was indeed a viable research site. Most of my initial communication was with the deputy principal. She identified the head of department as the person that would attend to all my research concerns, since he was the most computer literate teacher using ICT to teach some learning areas of the national curriculum. I had a detailed discussion with the head of department about my research. I briefed him on the purpose of my study and how I intended to involve an teacher and the principal. The head of department gave me a brief background of the context of ICT use in the school. He had identified himself as the main participant according to my requirements. During the time I spent with him, he indicated that another teacher was also using ICT to teach one of the curriculum learning areas. This teacher was a 'technology' teacher that used the interactive 'white board' in his classroom to teach technology, he taught children in grades 6 and 7 technology. The head of department for mathematics and sciences, taught children in grades 5 to 7 natural science, in the GOL computer centre with desktop PC's.

I subsequently, requested if both of them would be willing to be interviewed and observed in their daily routine of teaching. My observation was that the technology teacher was reluctant to be part of the study, although he did not say this openly, he referred to me as an 'inspekteur'[37] in his casual talks to other teachers in my presence. His utterance gave me an opportunity to allay his concerns about the

[37] 'Inspekteur' is an Afrikaans word for inspector. An 'inspector' in the pre-democratic days of apartheid was a term designated for district officials that came to school to check on Teacher's performance. It is a term within education social circles as one that associated with being 'policed.'

object of the research. After a very casual discussion I informed him that I was not here in my capacity to judge or appraise his teaching or request that they present special 'unnatural lessons', but merely to describe what is happening as I observe them in their natural milieu. Mr Peters, the technology teacher and Mr Neo the head of department agreed to become participants in the research study. I used the initial visit to establish channels of communication by sharing (telephone, cell phone and e-mail) details with the two teachers. This school scheduled its teaching cycle in-tandem with the days of the week. I also requested information about each of the teacher's personal teaching roster, so that I could determine the exact scheduled times for future lesson observations. I was still perturbed that I did not have an introductory meeting with the principal, and requested the head of department liaise with me in establishing such a meeting. The channels of communication were open for negotiating the interview schedule with the two teachers and the principal. Thus at this research site, two teachers were identified as participants for the study.

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Context: Description of context: Selection of participants

Selection of teachers at School B

As indicated above the identification of the unit of analysis at the second school progressed much more easily. The deputy principal was immediately identified by the principal as the most suitable candidate. I was introduced to the deputy principal Mr Jelly, who was recently appointed to the school mainly because of his ICT expertise. On my next scheduled visit to the school, I planned the visit for after formal contact teaching time, I knew that he would be more relaxed and open to discussion. I spent approximately 40 minutes with Mr Jelly in a meeting about my planned method for data collection. Our discussion was not very formal as we strayed off into involved discussions about the world of ICT. It was easy to establish rapport with this teacher, simply because we had much common ICT learning (self taught) experiences. The discussion progressed to identifying the date and time for the interview and the scheduled class visits for observations. This school operated on a six-day school cycle, unlike school A, this meant that I had to keep track of school day according to the cycle and the actual date (see appendix A).

During my interview with Mr Jelly, our discussion led to the mentioned of another teacher at the school that was very enthusiastic about using ICT in her teaching. Although she is not assigned to the computer centre, she has become very involved with the use of ICT. She also recently won an award for using ICT in her teaching of mathematics. I was very keen to meet this teacher and he subsequently invited me to observe the 'Apple-Macintosh' ICT project that she was involved in. Mr Jelly introduced me to this teacher. This teacher, Ms Jones, had a very spirited and cheerful personality and we developed rapport almost instantaneously as she explained the project that the childrens engaged in at that moment. On further casual discussion with her and noting her enthusiasm in using ICT in her classroom to teach some learning areas, I requested if she would be willing to be a participant my

research study. Ms Jones had no reservations at all and she willingly agreed. Thus, I now had the two teachers that would culminate in my unit of analysis at this site.

I followed through with planning to schedule the principal interview and observing those lessons that she used ICT to teach the national curriculum. Both the deputy principal and Ms Jones had access to e-mail facilities, during and after official school hours. We shared contact details to open and facilitate channels of communication.

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Context: Description of context: Selection of participants

Selection of teachers at School C

At the independent school, I was formally introduced to the head Teacher for ICT in the primary school phase (although I had communicated with him via e-mail), immediately after my appointment with the interview committee. Our introduction was very brief, as he was to report for duty for an extra-curricular event. We were officially introduced by the Information Technology head of the secondary school and we shared cell phone contact details and I was given an appointment to see him the next day after school hours. The next day I arrived at the school 10 minutes earlier than the scheduled time but unlike the public schools, I was not allowed to go to his class or office but was made to wait in the visitor's lounge while the secretary contacted him. Mr Concet arrived a few minutes late and I introduced myself and the research study to him. I also gave him another copy of the lay format information and supporting documentation.

By this time he was well aware of the focus of the research and clinically mapped the way forward, without much prompting from me. Mr Concet taught mainly Afrikaans to grades 5 and 6. At this school grade 7 was lodged in the secondary school division. His major concern was how many lessons do I need to observe, this made me sense that he felt that he should satisfy my lesson observations needs as quick as possible. My response to him was that it is difficult to assess. I also informed him that I would like to understand the contextual issues at play and that the data gleaned from my lesson observations may be saturated after 2 lessons or after 10 lessons. This implied that I could not commit to a fixed number of observations, except that I would like to capture as much lesson observations as possible over at least two consecutive school terms. His question raised uncomfortable thoughts that suggested to that my research should be 'quick and dirty.' Mr Concet suggested we meet an hour before school starts to conduct the interview. We remained in constant communication with each other through cell phone short message services (sms).

On one of my visits for classroom observations at the school I was introduced to another teacher, during the tea break in the staff room. This young mathematics teacher spontaneously invited me to observe a lesson of his. His impulsive decision made me realize that the use of ICT in teaching and learning at this independent school was the norm and not the exception. During and after the lesson

observation, we had an interesting discussion of the use of ICT in teaching and learning. The report with particular teacher was so open and sincere that I requested for him to be a participant in this research study. Mr Humby agreed and subsequently became the second candidate at this independent school. I hasten to add that most teachers at this school have made the transition to using ICT to teach the national curriculum, but my limited time and resources would not afford me the opportunity to interview and observe all teachers at this school. Suffice to say that with the inclusion of Mr Humby, I now had two teachers at each this school as voluntary participants in this research study.

Appendix C

Journal reflection C6

Context: Description of context: Selection of principals 1-3

Selection of Principals at School A, B and C

The main research question sought to identify how teachers appropriate education policy on ICT in their teaching repertoire. As indicated above purposeful sampling was stringently applied in this context to illuminate information rich sites and principal participants (Patton, 1990). Having accomplished the site and teacher participants, I turned my attention to identify the principals at each research site. This process of including the principal as a participant is an essential part of the data gathering according to Elmore's (1980, p. 604) backward mapping approach which states that "having established a relatively precise target [teachers] at the lowest level of the system, the analysis backs up through the structure of implementing agencies."

Typically at all public schools there is only one principal assigned to the school, even if the school is classified as being comprehensive (incorporating grade one to grade twelve). Thus at school A and school B the respective principals were selected by obvious consequent of the selection of the research sites. At school A, the principal was in his late fifties, designated as a 'coloured' according to population statistics. Mr Norton spoke in English but occasionally switched to a bit of Afrikaans whenever he could not find the appropriate English word. His office was constructed of prefabricated asbestos panels, as was most of the school (the building structure format for most schools of disadvantaged schools during the apartheid era). Mr Norton office was small and the paperwork on his desk filled almost every small space, the walls in his office displayed many unframed certificates, awards and photographs. He is resident in the same suburb as the school. His approach was very casual yet firm with his teachers.

At school B, the principal was in his mid-fifties, very neatly attired and very disciplined. His office was isolated from the main school, with his own private garden. Mr John's office was spick and span, with a place for everything and everything in its place. His table was uncluttered with one or two paperwork items and his lap top computer on his right hand side. A small corner with sofas was decorated for creating with a more casual atmosphere. On either side of the board behind his table were the national flag of South Africa and the school flag. In the centre of this display was a large frame that housed the

school blazer. On the wooden coat stand his graduation cloak hung immaculately. John is classified as a 'white' male by our race classification.

At the independent school, however, and in this case there was more than one principal even though they exist within the same building. The principal of the primary school being a newly appointed person referred me to interview the previous acting principal, since he felt that the acting principal would be more au fait with the existing school policies. In this case the acting principal was selected as a participant sample. Mr Williams is a 'white' male in his late 40's. He was very officious in his presentation, but extremely casual in his approach. His office desk had been cleared and devoid of any sign of paperwork.

Appendix C

Journal reflection C7

Context: Selection of district and province officials

The policy implementing agencies beyond the school boundaries within the South African school context are the local educational districts and higher up the hierarchy is the provincial educational department. In an attempt to foster thoroughness, the sub-questions in this study are equally important in trying to establish the ability of the hierarchical unit (district and province) within the education system to affect the behaviour of the teacher that is the target of the policy. The selection of a district and province officials as secondary participants was more evident due to the hierarchy that exist within the educational system. Each of the nine provinces has a central education department comprising of various directorates. The province is further sub-divided into education districts (according to geographical-municipal demarcation and boundaries), headed by a district director. Within the districts are various units such as curriculum delivery, learning and teaching support materials, labour, IDSO's, education learning area specialist and E-learning units. Only one person heads the E-learning unit at both district-level and at provincial-level (director) respectively, these persons will be sought to constitute the unit of analysis beyond the school based research sites.

Appendix C

Journal Reflection – C8

Context: Pilot study reflections Ref: 3.4

I transcribed the digital interviews from the pilot study, and sent it for comment to my supervisor. The findings from the pilot study made me feel very uncertain for a number of reasons. First, although the teachers responded to my questions very openly and honest, the teachers used the opportunity to use me a 'sounding board' for their general grievances about their real experiences and frustrations with regard to ICT use in the school. Issues such as the lack of training, denial by management to use the

computer centre, lack of software and numerous other issues surfaced. I wondered 'Is this a worthwhile study?' In discussion with my supervisor a number of issues regarding the transcripts were discussed. A number of possibilities emerged: First the results suggested that teachers may not aware be of policy, second that teachers were aware of policy but were not implementing it. Third, the possibility that policy was not enforced by principals. And, fourth my supervisor suggested that maybe my approach to questioning may not be correct. This was very disturbing, but was evident from the yes/no answers and not probing further.

Appendix C

Journal Reflection – C9

Context: Observational sheet structure Ref: 3.8

My classroom experiences in all three schools were rewarding and exciting. Teachers were very accommodating and keen to use ICT in the teaching-learning environment. Though difficult initially to be able to capture video, photographs and resort to taking field notes I gradually learned how to become effective at all three. Teachers, often would engage in conversation with me during the lesson (while learners were pre-occupied with work). The pre-designed observational sheets assisted in focussing on particular aspects of the lesson. In my field notes journal I made focussed observations of: Grade, Topic, duration, time and lesson progression; the use of technology; its effectiveness and learner involvement. Technical glitches and backup plans, ICT soft skills and curriculum delivery.

Appendix C

Journal Reflection – C10

Context: Use of digital technology

My experience with technology has made me very comfortable and reliant on ICT as a tool to organise myself. I also understand the risk with working with technology, and in this regard tend to be overcautious in encountering specific problems. With regard to my study, I am a traditionally a 'technology junky' and could not imagine doing research on ICT without a using technology affordances such as a digital voice recorder: Also, I prefer to keep eye contact with the interviewee to show that I am interested in what s/he says: Thirdly, I do not write fast enough to be able to transcribe and make notes of the participant's body language as well.

Appendix C

Journal Reflection – C11

Context: School B -Teacher 1: Extract from interview

One of the most challenging aspects of my field-based research was to gain the confidence of teachers that came aboard as participants. In the independent school and the former model C school, gaining entry was facilitated by the principals enthusiasm to be part of this study. However, in previously disadvantaged schools there has always been a history of teachers' disapproval of classroom visits, by management and principals. Evidently teachers in the township school, were wary of my intentions even though they were reassured of ethical issues. One teacher at the township school was very nervous in the initial interview, This is evident as one of my participants indicated "you know Mr Vandeyar, I am not very good at interviews." I gathered that he felt that the purpose of the interview was to determine correct or incorrect responses from him. I informed him that there is no right or wrong answers, but he constantly enquired whether his response was adequate. Gradually, over time I met him before his scheduled lessons, or between lessons and he eventually opened up and spoke freely about his concerns.

Appendix C

Journal Reflection – C12

Ref:3.7

Context: Reflection on recording

During one of my initial visits to a school I lost valuable data in the form of narratives of teachers in their informal discussions with me, my reflection of these spontaneous discussions could not capture the exact words of the participants. In order not to make the same mistake again, I attempted to make effective use of my reflective journal or voice record the information. Immediately on leaving the research site, I would sit in my car, reflect on the teachers comments and would make notes capturing key ideas to recapitulate asformal field notes.

Appendix C

Journal Reflection – C13

Reflection:

Context: Personal reflections as researcher - Autobiographical reflections of personal role in the study

From 1981 to 2006, I initially served as a teacher, mainly teaching children mathematics at the senior secondary phase. From the mid-1980's I developed a passion for using computers to teach and facilitate my administrative duties, by being placed as a computer literacy teacher without any formal training. I travelled the journey in education rising through all the hierarchy ranks at school level. During the mid-ninety's I lectured to in-service students at a college of education on the use of computers for administrative purposes. The last ten years school experience as a principal, I had the joy of teaching the curriculum to children using ICT. At this point I declare my bias in this research study and my behaviour to the participants may reveal implicitly or explicitly my passion for teaching and using ICT in teaching and learning. As a lecturer in computer integrated education, I had particular opinions about what teaching should be like in an ICT enabled environment. I was inquisitive to see how teachers use ICT in practice (Malterud, 2001). After leaving teaching for a period of three years, I assumed that all schools especially within the Tshwane province would be well adapted to the use of ICT, particularly to teach the curriculum.

An important role as a doctoral student researcher was to demonstrate independent research ability. Numerous tasks of data collection and data analysis were hence done as a sole researcher in this study. In this regard I was responsible for numerous activities as a researcher, from the design of all data collection instruments to the process of software coding and the analysis of the data. The period of research was punctuated with support from my supervisors as and when the need arose, particularly when I was concerned whether this was a 'worthwhile' study and to discuss the findings of the pilot study and the questions used in the interview protocol. The lack of collaboration or participation of multiple researchers places this study as idiosyncratic and my bias as central in the analysis and interpretation of the data.

I also remain constantly aware of my contribution to the construction of meaning throughout the research process, and acknowledge that I cannot remain 'outside my research study' while conducting research. Through personal reflexivity I take cognisance of that my own values, experience as a teacher, social identity, interest (in ICT) and belief systems (as a social constructivist) may shape the research. However, as one engages in the research study, I had to consider how the research may have affected and possibly change me (epistemological reflexivity), to reflect on my assumptions (and knowledge) that I construct in the course of the research. It is through an awareness of this reflexivity

that I enter the research arena as a contributor to the construction of meaning throughout the research process.

Finally, I turn to the work of Lincoln and Guba (1985), in which they suggests that a researcher must develop a skill appropriate as an instrument through which data will be collected. Although the data was processed using software tools, it remains the researcher's perceptive skill and prerogative to induce data analysis. I also draw on my personal experiences, my professional experiences and professional literature, to demonstrate those characteristics expected of a researcher in exercising theoretical sensitivity in the qualitative inquiry process. To reduce what Hoepfl (1997) calls 'observer status distortions', I attempted to clear my mind of comparative subjectivity as I moved between the research sites of extreme socio-cultural and socio-economic disparities. I will also ensure that vivid observations do not take precedence over the pallid observations by taking all observations within the context in which they occur (Hardy & Bryman, 2006).

Appendix C

Journal Reflection – C14

Reflection:

Context: Selection of schools – Padisago primary school

I became desperate and now tried to access at least one township school that was using ICT to teach the curriculum. Subsequently, I requested the help of the local district office (Tshwane South District) E-learning facilitator, who I thought will give me more fruitful referrals to schools that satisfied my sampling criteria. In this instance case I was referred to two township schools. One such school was Padisago primary school which is situated in the township of Soshanguve , approximately 40km from Pretoria. The school is thriving amidst the obvious poverty of its surroundings. The deputy principal met with me, and I gave him a copy of my lay summary (see addendum A). I was impressed with the school, from the moment I entered the gate, the school had made a conscious effort to rise above the poverty conditions that was just outside its gates. Through a lengthy discussion with the deputy principal, he agreed in principle for me to conduct my research, however one of their computer centres was being re-arranged and the GOL computer centre not yet functional. The deputy principal, in his enthusiasm to assist me in my research, requested that I prepare the curriculum lessons for ICT and he will get his teachers to deliver the actual lessons which I can then observe. I informed him that it is my intention to observe the way ICT is integration in the curriculum in its natural process and not through my facilitation or influence. He agreed to contact me when the computer centres would be functional, and that was the last I saw or heard of this school.

Appendix D1

Field note: Observational Sheet (Exemplar)

Context: School A- Teacher 1 **UNSTRUCTURED OBSERVATION SHEETS**

<table>
<tr><td colspan="5">Lesson observational scheduleFile Reference</td><td colspan="2">Video file reference</td><td></td></tr>
<tr><td colspan="8">Descriptive observation
Eliminate preconceptions and note detailed descriptions of everything that was taking place</td></tr>
<tr><td>Participant</td><td>Teacher 1</td><td rowspan="2">ICT equipment</td><td colspan="2">PCs with internet conectivity</td><td>Date</td><td>Duration</td><td>35min</td></tr>
<tr><td>School</td><td>School A</td><td colspan="2">Teacher PC</td><td>Grade</td><td>6</td><td>Phase</td><td>Intersen</td></tr>
<tr><td>Learning area</td><td>General Science</td><td>Topic</td><td colspan="5">Phases of matter</td></tr>
<tr><td colspan="8">Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)</td></tr>
<tr><td colspan="2">Observations/ Field Notes</td><td colspan="2">Special/ Pedagogic OrBest Practice</td><td>Time</td><td>Soft skills for curriculum delivery</td><td colspan="2">Policy Implementation: Policy Reference</td></tr>
<tr><td colspan="2" rowspan="4">Students were briefly introduced to lesson objectives. Students were allowed to work in groups due to access limitations. Students had to research</td><td colspan="2" rowspan="4">Student occupied teachers’ chair and used teachers’ computer to demonstrate to class on molecular model of solid Used word to draw</td><td>5 (introduction)</td><td>Windows; Word</td><td colspan="2">ICT skills</td></tr>
<tr><td>15-20 Research</td><td>Encarta</td><td colspan="2">Pedagogic application</td></tr>
<tr><td>10 Report back</td><td>Internet search</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>5 Student explanation</td><td></td></tr>
<tr><td colspan="8">Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)</td></tr>
<tr><td colspan="8">Gauteng Online infrastructure. More than forty students allocated to 25 PC’s. Classroom seemed crowded and not designed for effective use of ICT. Learners were crammed together and could not effectively use desk space effectively. A plasma screen is linked to teacher’s PC. Teacher exercised good discipline and control.</td></tr>
</table>

Appendix D2

Field note: Observational Sheet (Exemplar)

Context: School A- Teacher 2UNSTRUCTURED OBSERVATION SHEETS

<table>
<tr><td colspan="5">Lesson observational scheduleFile Reference</td><td colspan="2">Video file reference</td><td></td></tr>
<tr><td colspan="8">Descriptive observation
Eliminate preconceptions and note detailed descriptions of everything that was taking place</td></tr>
<tr><td>Participant</td><td>Teacher 2</td><td rowspan="2">ICT equipment</td><td>Interactive smart board</td><td>Date</td><td></td><td>Duration</td><td>35min</td></tr>
<tr><td>School</td><td>School A</td><td>Teacher PC</td><td>Grade</td><td>6</td><td>Phase</td><td>Intersen</td></tr>
<tr><td>Learning area</td><td>General Science</td><td>Topic</td><td colspan="5">Motors and machines</td></tr>
<tr><td colspan="8">Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)</td></tr>
<tr><td colspan="2">Observations/ Field Notes</td><td>Special/ Pedagogic OrBest Practice</td><td>Time</td><td colspan="2">Soft skills for curriculum delivery</td><td colspan="2">Policy Implementation: Policy Reference</td></tr>
<tr><td colspan="2" rowspan="4">Teacher driven lesson; workings of the motor, discussion of rubric for assessment of project.
Teacher displayed format rubric and class developed rubric with teacher.
Worksheet for field excursion discussed with learners</td><td rowspan="4">Use of simulation: graphic + sound, animations to bring to life workings of a motor .
Learners called to smart board to white board</td><td>5 (introduction previous work)</td><td colspan="2">Windows; Word</td><td colspan="2">ICT skills</td></tr>
<tr><td>15 minutes explanation</td><td colspan="2"></td><td colspan="2">Pedagogic application</td></tr>
<tr><td>10 learner activity</td><td colspan="2"></td><td colspan="2" rowspan="2">Recording of assessments</td></tr>
<tr><td>5 conclusion</td><td colspan="2"></td></tr>
<tr><td colspan="8">Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)</td></tr>
<tr><td colspan="8">Room converted to accommodate use of smartboard. Learners desk arranged perpendicular to board. Many chairs and table were broken or not of consistent type (stools, chairs, padded teacher chairs etc). Sunlight protruding through windows did not optimise classroom for smartboard use.</td></tr>
</table>

Appendix D3

Field note: Observational Sheet (Exemplar)

Context: School B- Teacher 1UNSTRUCTURED OBSERVATION SHEETS

<table>
<tr><td colspan="5">Lesson observational scheduleFile Reference</td><td colspan="2">Video file reference</td><td></td></tr>
<tr><td colspan="8">Descriptive observation
Eliminate preconceptions and note detailed descriptions of everything that was taking place</td></tr>
<tr><td>Participant</td><td>Teacher 1</td><td rowspan="2">ICT equipment</td><td>student PC’s</td><td>Date</td><td></td><td>Duration</td><td>40min</td></tr>
<tr><td>School</td><td>School B</td><td>Data projector</td><td>Grade</td><td>5</td><td>Phase</td><td>Intersen</td></tr>
<tr><td>Learning area</td><td>Life Orientation</td><td>Topic</td><td colspan="5">Religion</td></tr>
<tr><td colspan="8">Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)</td></tr>
<tr><td colspan="2">Observations/ Field Notes</td><td>Special/ Pedagogic OrBest Practice</td><td>Time</td><td colspan="2">Soft skills for curriculum delivery</td><td colspan="2">Policy Implementation: Policy Reference</td></tr>
<tr><td colspan="2" rowspan="4">Students were introduced to the curriculum-based software and were led (very effectively to the require research work). Students had to select a reading passage (with graphics illustration) related to a particular religion (not of their own). They had to read, summarise and develop a word presentation.</td><td rowspan="4"></td><td>Introduction 5 minutes (teacher display)</td><td colspan="2">Windows</td><td colspan="2">ICT skills</td></tr>
<tr><td>5-25 student independent work.</td><td colspan="2">Word</td><td colspan="2">Pedagogic application</td></tr>
<tr><td></td><td colspan="2">Access to curriculum resources on network</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>5 conclusion – written work</td><td colspan="2"></td></tr>
<tr><td colspan="8">Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)</td></tr>
<tr><td colspan="8">This computer centre is situated below the stage floor. The computer centre was developed by the school, and existing infrastructure was used to accommodate a computer centre. A teacher’s computer is situated alongside students’ PC’s but the teacher’s work is projected onto a screen. Each student has his/her own computer and is allowed to personalised the desktop.</td></tr>
</table>

Appendix D4

Field note: Observational Sheet (Exemplar)

Context: School B - Teacher 2 **UNSTRUCTURED OBSERVATION SHEETS**

<table>
<tr><td colspan="5">Lesson observational scheduleFile Reference</td><td colspan="2">Video file reference</td><td></td></tr>
<tr><td colspan="8">Descriptive observation
Eliminate preconceptions and note detailed descriptions of everything that was taking place</td></tr>
<tr><td>Participant</td><td>Teacher 2</td><td rowspan="2">ICT equipment</td><td colspan="2">Data projector</td><td>Date</td><td>Duration</td><td>40min</td></tr>
<tr><td>School</td><td>School B</td><td colspan="2">Teacher Laptop</td><td>Grade</td><td>5</td><td>Phase</td><td>Intersen</td></tr>
<tr><td>Learning area</td><td>Mathematics</td><td>Topic</td><td colspan="5">Fractions – Assessment</td></tr>
<tr><td colspan="8">Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)</td></tr>
<tr><td>Observations/ Field Notes</td><td colspan="2">Special/ Pedagogic OrBest Practice</td><td>Time</td><td colspan="2">Soft skills for curriculum delivery</td><td colspan="2">Policy Implementation: Policy Reference</td></tr>
<tr><td rowspan="4">Teacher initiated lesson on chalkboard then switched to present lesson from laptop with brief revision of fractions.
Learner were issued with test and PowerPoint presentation was designed with sound and music, with a clock. Learners had to complete entire test according to the PowerPoint timed presentation of sound: bomb explosions, clock and music.</td><td colspan="2" rowspan="4">Use of Powerpoint animation with music and graphics of popular international singer (EMENEM) to seemingly counting down.
Music inserts encouraged learners to almost sing and dance to tune.</td><td>5 min (Brief revision of fractions) – chalkboard</td><td colspan="2">Windows</td><td colspan="2">ICT skills</td></tr>
<tr><td>5-10 min. Teacher switched to powerpoint presentation to explain fractions.</td><td colspan="2">Powerpoint + animations + music</td><td colspan="2">Pedagogic application</td></tr>
<tr><td>learners involved in 3-D puzzle construction</td><td colspan="2"></td><td colspan="2" rowspan="2"></td></tr>
<tr><td>5 conclusion – written work</td><td colspan="2"></td></tr>
<tr><td colspan="8">Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)</td></tr>
<tr><td colspan="8">Classroom layout very conventional – All learners faced the chalkboard/screen. Teacher positioned herself in a learners desk in centre of class. Desk arranged in three columns (±10 learners per column). Classroom environment conducive to teaching and learning. Teacher had minimal effort in controlling discipline.</td></tr>
</table>

Appendix D5

Field note: Observational Sheet (Exemplar)

Context: School C - Teacher 1UNSTRUCTURED OBSERVATION SHEETS

<table>
<tr><td colspan="5">Lesson observational scheduleFile Reference</td><td colspan="2">Video file reference</td><td></td></tr>
<tr><td colspan="8">Descriptive observation
Eliminate preconceptions and note detailed descriptions of everything that was taking place</td></tr>
<tr><td>Participant</td><td>Teacher 1</td><td rowspan="2">ICT equipment</td><td colspan="2">Interactive smartboard data projector</td><td>Date</td><td>Duration</td><td>40min</td></tr>
<tr><td>School</td><td>School C</td><td colspan="2">Teacher Laptop</td><td>Grade</td><td>7</td><td>Phase</td><td>Intersen</td></tr>
<tr><td>Learning area</td><td>Afrikaans</td><td>Topic</td><td colspan="5">Project on the Hospital</td></tr>
<tr><td colspan="8">Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)</td></tr>
<tr><td colspan="2">Observations/ Field Notes</td><td>Special/ Pedagogic OrBest Practice</td><td>Time</td><td colspan="2">Soft skills for curriculum delivery</td><td colspan="2">Policy Implementation: Policy Reference</td></tr>
<tr><td colspan="2" rowspan="4">Teacher introduced topic again, revised the task outputs. Discussion about hospital experiences.
Teacher created an online survey, using the results to create a spreadsheet, which was use in powerpoint to create a graphs
Teacher allowed for students to use their own initiative and students not compelled to use ICT.
See Document analysis of learner outputs in respect to this activity</td><td rowspan="4">Teacher created his own website with:
Reading material (newspaper articles); access to his holiday photographs; project assignment details.
Allowed</td><td>10 min (Brief revision of project) – chalkboard</td><td colspan="2">Windows; Internet;</td><td colspan="2">ICT skills</td></tr>
<tr><td>10-20. Teacher used internet to create an online survey in which students made input via their PC’s to complete the survey.</td><td colspan="2">Spreadsheet; PowerPoint;</td><td colspan="2">Pedagogic application</td></tr>
<tr><td>10-minutes learner activity</td><td colspan="2"></td><td colspan="2" rowspan="2">Learners as researchers</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td colspan="8">Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)</td></tr>
<tr><td colspan="8">Lesson was delivered in the library resource centre. Students had access to the internet. Teacher demonstrated at smartboard, whilst students all had their own PC linked to teacher discussion. Realtime survey was done in class environment. Layout conducive to teaching and learning and groupwork.</td></tr>
</table>

Appendix D6

Field note: Observational Sheet (Exemplar)

Context: School C - Teacher 2 **UNSTRUCTURED OBSERVATION SHEETS**

Lesson observational scheduleFile Reference						**Video file reference**	
Descriptive observation Eliminate preconceptions and note detailed descriptions of everything that was taking place							
Participant	**Teacher 2**	**ICT equipment**	**Interactive smart board & projector**	**Date**		**Duration**	**40min**
School	**School C**		**Teacher PC**	**Grade**	**5**	**Phase**	**Intersen**
Learning area	**Mathematics**	**Topic**	**Multiplication**				

Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)				
Observations/ Field Notes	**Special/ Pedagogic OrBest Practice**	**Time**	**Soft skills for curriculum delivery**	**Policy Implementation: Policy Reference**
Although the planned lesson did not load teacher immediately switched seamlessly to alternative lesson. Learner driven lesson – learners were involved with various activities. Two learners were at the smart board competing with each other and against their own clocks for speed and accuracy. All other learners were given coloured coded 3-D cubes to construct and deconstruct. The classroom was abuzz with activity. Some students were identified for individual drill and practice at the smartboard. Last 5-10 minutes learner completed their written task	**Use of game for drill and practice. Learner called to smart board to co-ordinate dimensions of smart board. Learners very adept and comfortable with use of technology.**	**5 min (planned lesson failed to load from teacher PC)**	**Windows**	**ICT skills**
		5-25 min. Teacher switched to use of games in teaching multiplication		**Pedagogic application**
		learners involved in 3-D puzzle construction		
		5 conclusion – written work		

Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)
Classroom layout very conventional – All learners faced the chalkboard/smartboard. Desk arranged in three columns (8 learners per column) Classroom environment conducive to teaching and learning. Teacher had minimal effort in controlling discipline, as lesson was learner-centred

Appendix D7

Field note: Observational Sheet (Exemplar)

Context: School B - Teacher 2 **UNSTRUCTURED OBSERVATION SHEETS**

Lesson observational scheduleFile Reference						**Video file reference**	
Descriptive observation Eliminate preconceptions and note detailed descriptions of everything that was taking place							
Participant	**Teacher 2**	**ICT equipment**	**Laptops – Learners**	**Date**		**Duration**	**40min**
School	**School C**		**Digital Camera**	**Grade**	**7**	**Phase**	**Intersen**
Learning area	**Apple Project**	**Topic**	**Project on the History of South Africa _ integrating Leraning areas**				
Focussed observation (pedagogy, policy, learner involvement, ICT skills, time management and specific ICT use in the classroom.)							

Observations/ Field Notes	**Special/ Pedagogic OrBest Practice**	**Time**	**Soft skills for curriculum delivery**	**Policy Implementation: Policy Reference**
This was a project based lesson. Learners were developing a movie based on South African history . Learners were grouped into 3-4 Leaners per group	**Teacher provided all technical and software skills. Learners had to devised their own themes**	**This lessons was ongoing for the past 3- weeks**	**Windows; Internet;**	**ICT skills**
		Learners had to stay in after school hours and develop their project.	**Spreadsheet; PowerPoint;**	**Digital Photography skils**
		10-minutes learner activity	**Apple movie maker**	**Learners as researchers**

Selective Observation (Classroom layout, discipline, teacher control and classroom management issues.)
Lesson was delivered in teachers classroom . Learners had access to digital camera and appropriate software. Teacher assisted with software technocal skills when required. All groups had their won lap tops supplied by Appel as a Appel-school project. Layout conducive to teaching and learning and groupwork.

Appendix D8

Researcher participant diary

Date		**Learning area**							
Topic							**ICT Tools**		
Reference to resource documents in planning									
Objectives in the use of ICT to enhance learning/teaching							**Reflections of Lesson**	**Nature of support required in respect of ICT**	

Reference	**School:**	**A**		**B**		**C**		**Teacher**	

Appendix D9

Informal Conversational Interviews

Context: (Post interview) School B – Teacher 2 – Assisting other teachers in the use of ICT

Jo: A teacher just asked me now, she doing food in English, so she wants to know, how can she "ín show and tell", she wanted to know what can she use in ICT to show the kids.

Interviewer: I think some of them have just got a gift, I know when it comes to powerpoint at times I have to ask my daughter or to help me out.

Jo: Yes, so I said go in to U-Tube type in "kids making food", "kids, making salad", there pops up a video, "now you cut the carrots, ..." [responds with the other teachers voice] – that's exactly what I want...thats exactly what I want. I said exactly, is'nt it wonderful to use the internet for learning, otherwise I must go and take a book and photocopy, it it going to improve the quality of their education, if she shows them that video, the quality of speeches she's going to get, it going to be much higher. Because they gona know exactly what they must do. Now that they got the idea they can make a sandwich, a salad, an ice-cream banana split.

Interviewer: Is it a video that its been shown?

Jo: On U-Tube, she asked me what can I do to show them what they must do. Mostly its American. Kisd explain how to make a sandwich, "now you take your butter..." That's exactly what I want them to do.

Interviewer: It's ideal for show and tell

Jo: Another teacher asked for ancient Egypt, it's a view of pyramids. I never been to Egypt.

Interviewer: To see it from different sides?

Jo: To go into the colosseum, an inside tour of the colosseum, How can we not improve our education? How can you tell them how it works?

Interviewer: Jo, if you have to tell me what's lacking from the department in terms of supporting this type of teaching? You and Vanie seems to be the anchor in this school.

Jo: and Johan

Interviewer: Certainly this is what you would want?

Jo: Like I said I am frustrated because of resources. [Explains about hardware resources]because I will use it more. Give us training to teachers. Just basic, what is your topic. You type in your topic, and a suggestion they[district] give suggestions, you type in ancient Egypt and they send suggestions back. But resources mostly

Informal Conversational Interviews

Context: School A – Teacher 1 (Pre-lesson discussion)

Interviewer: I see exceptional people like you and John, and other schools that I hev been to, they are using ICT to teach the curriculum.

Teacher 1: Yes, Yes. You must actually make it work. It takes time, it takes effort, it takes a lot of planning you know.

Interviewer: That is much of my concern. As much as you are putting in all that effort, on your own. I am trying to understand what more do teachers want. Is this sufficient? Area you happy with the lessons? Do you think there is more support you can get to improve, you talked about your content, to improve your teaching strategy in terms of your ICT skills, John spoke about training as well, you mentioned it as well, workshops?

Teacher1: But Mr Vandeyar, In terms of IQMS, On the School improvement plan (SIP), it is stated there that my need is IT and at this level, so the department knows, know exactly what my needs are.

Interviewer: In terms of ICT?

Teacher1: In terms of ICT itself and bringing in the curriculum you know. But Mr Vandeyar, I attend a lot of meetings [interrupts to call learners into classroom]. I attended a lot of e-learning, bit no one talks about how the teacher must use ICT in the curriculum. No one!

Interviewer: Not even at district level? Are these district meetings?

Teacher1: They don't talk about it at all, they just say, "you must make use of ICT, make use of ICT, it stops there"

Interviewer: But you want specifics? Do you think they have the ability to show you how to do that?

Teacher1: No Mr..., I am being honest. I don't think they have the ability. Let me give you a scenario. I did a computer course, and most of the guys that did the course were from the department, and they actually had to help us.

Interviewer: I understand

Teacher1: But what I know and what they know, I am not trying to be funny. There won't be a possibility, they don't talk about these things, nothing.

Interviewer: So they come to these meetings and say you should be using ICT, but there no demonstration, they don't show a particular lesson?

Teacher1: Nothing, Nothing. They don't know how to do it, Mr Vandeyar, really. I actually want to invite the science (CES) Zelna and give a lesson, but I am actually afraid..

Interviewer: Why would that be the case?

Teacher1: Then she's going to use me. OK I will do it, but afterwards its going to be.. I a lot I need to do I need to learn. Afterwards I will help, but at this moment , I need to develop myself to grow. I am doing things now but I don't know if it is right or wrong, so.

Interviewer: So you need to develop your level of confidence?

Teacher 1: Yes. Yes, yes

Appendix G

Data analysis phases for various data sources