

AN INVESTIGATION OF THE EFFECT OF A SHORT ICT TRAINING INTERVENTION ON TEACHERS' ABILITY TO INTEGRATE ICT INTO THEIR TEACHING PRACTICE

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A research report submitted to the Faculty of Humanities, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Education (in the field of Education Technology).

August 2013

ABSTRACT

In this study I wished to understand whether my short-term training intervention enabled teachers to design and implement a lesson in which technology is effectively integrated. Participants were 22 teachers, some of whom held positions on their school's management team, and 80 learners from 4 districts of the KwaZulu-Natal Department of Education. Teachers in the province have been trained in computer literacy; however, sadly, this did not automatically translate into classroom ICT integration. Overall, teachers do not integrate technology into their teaching. A number of reasons for this are identified. People involved in integrating technologies into the teaching and learning process have to be convinced of the value of the technologies, be comfortable with them, and be skilled in using them. Therefore, a short-term training intervention was designed to test whether it can benefit teachers by enhancing teaching and learning through communication and collaboration, by means of ICT. The results revealed that the teachers on the training programme gained knowledge of how to integrate ICT, that they collaborated, that their pedagogy also changed, and that their learners felt that their learning was improved. To ensure realistic and holistic solutions for policymakers, district and school officials, the factors that prevent teachers from making full use of ICT were also iterated. Detailed results and implications of the results are discussed.

Key words: Short term intervention; Educator training, ICT integration, ICT training Model

DECLARATION

I declare that this report is my own, unaided work. It is submitted in partial fulfilment of the requirement of the degree of Master of Education (in the field of Education Technology) at the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University

Robert Mfaniseni Khwela
16 August, 2013

ACKNOWLEDGEMENTS

This work would not have been possible were it not for the support I enjoyed from a number of people. The tricky part was to get participants participating in the study. I sincerely want to thank all those participants who were willing to participate and to grant me interviews.

My special appreciation goes to the following people

- Professor Ian Moll, for sharing his wisdom with me.
- My Supervisor, Dr Susan Cohen (Sue) for her frank criticism of my work, for being forever supportive and encouraging: I want to thank you Sue for all the support you have given me.
- My late father Enoch and my late father-in-law Bantu Mbele, my late mother, Anna Maria and my late brother, Tobias, my lovely wife Duduzile and children Snehlanhla, Sthembile and Dumisa, for their support in everything I do, especially studying.
- I give all thanks without reservation to my God the Almighty for His grace, giving me good health and motivation during the course of my studies and strength to complete this study.

Finally, my gratitude also goes to the “Intel Teach to the Future” programme which was sponsored by INTEL. The programme was of particular interest to us as educators in (2003) because we were in dire need of training in Information and Communication Technology (ICT). After having graduated as one of the facilitators I had ideas to set my own research direction. Even to those I could not mention here because of space, I mean all those people who made this work possible I want to say in isiZulu “*Ukwanda kwaliwa umthakathi!*” THANK YOU!

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CHAPTER 1

1.1 Introduction

Bialobrzeska and Cohen (2005) hold an unwavering belief that information and communication technologies (ICTs) provide powerful tools for learners. They suggest that these facilitate epistemological access, collaborative educational activities and consultation with experts; that they enable teams to share knowledge, and empower them to solve complex cognitive problems. This team of researchers has also argued, however, that a new learning environment may be created without the use of technology. They concede, furthermore, that, while technology indeed provides learners with powerful new tools to represent their knowledge in various textual forms: images, graphics, and video, this does not necessarily mean that learning does not occur without these resources. They see ICTs as tools to help teachers create a more learner-centric learning environment, in which the teacher, aided by ICTs can challenge pupils' understanding and thinking. This is similar to the view held by former Minister of Education, Naledi Pandor, who described "how the introduction of ICTs to our schools is creating new ways for students and teachers to engage in information selection, sorting and analysis," (Department of Education, 2004, p.6), which would be impossible if teaching were to take place without the use of ICTs. The Draft White Paper on e-Education (Department of Education, 2004) argues that, even in contexts where technology is accessible, creating effective learning environments with technology remains a challenge for teachers in many schools in South

Africa, because of the lack of proper training and guidance. Trucano (2005) stresses that training is key if benefits from investments in ICTs are to be maximised.

In South African schools, the quality of education is often compromised when learners are deprived of innovative and creative ways through which they may access new knowledge. We know now that ICT integration can help; however, ICTs on their own do not help: teachers need to know how to use them. Computer literacy is not enough; teachers must have appropriate pedagogy to make effective use of ICTs. On-going teacher training and support is critical to the successful utilisation of ICTs in education (Harvey and Purnell, 1995). Teacher training is clearly needed, and even short courses have been found to be effective. Lemke & Fadel, (2006); O'Dwyer, Russell, and Bebell, (2004) and Penuel, (2006) agree that short-term interventions in education are typically only one factor in a complex of inputs into educational achievement. They also recognise, however, that short-term interventions can increase teachers' needs, leading to their desire for further professional development. Karagiorgi & Symeou (2005); O'Mahony (2003) and Pelgrum (2001) have conducted studies in which findings clearly indicate that the challenges to effective technology integration in the classroom are immense. Research by Moursund and Bielefeldt (1999); Yildirim (2000) and Wepner; Zoimek, & Tao (2003) reveals that pedagogical practices that integrate ICT in the process of transmitting knowledge and skills are minimal at best, or, at worst, non-existent. These findings are similar to those expressed in the Draft White Paper on e-Education that in most South African schools there is a gap in the ability of learners and teachers to use these technologies effectively to create content of their own, collaborate and integrate ICTs into teaching and learning (Department of Education, 2004). For Anao (2003), and most crucial for South Africa, the lack of

skills by educators to fully utilise technology in curriculum implementation which manifests in heavy reliance on the traditional chalk and duster approach, still dominates in many schools' pedagogical practices.

Aduwa-Orgiegbaen & Iyamu (2005) support the notion that training is the only vehicle through which teachers may effectively be assisted in the use of technology, in order to enhance teaching, learning and assessment in their classrooms. As Carlson and Firpo put it, "teachers need effective tools, techniques, and assistance that can help them develop computer-based projects and activities especially designed to raise the level of teaching in required subjects, and to improve student learning" (2001, p.109).

The Draft White Paper on e-Education (Department of Education, 2004) acknowledges the magnitude of the task of delivering ICT to schools. It proposes that the integration of ICTs into schools should be phased in over a three-year period, with a final phase culminating in 2013. This is not without concerns, particularly around strategies to negotiate the various levels of ICT integration into education within the country's numerous provinces. Despite this, the Department of Education wishes to bridge the digital divide between different sections of South Africa, that is, rural and urban; it understandably supports laudable developmental initiatives in provinces, but provides minimum guidelines on how these initiatives should be structured.

I have designed a short-term teacher training programme, to establish whether training supports teachers in improving the quality of teaching and learning, as outlined in the Implementation Plan for Delivery Agreement for Outcome 1: Improve quality of basic education (Department of Education, 2010a). In my report I am going to

answer the question: Does this short-term intervention bring about change? The rationale or this study explains why I have undertaken to do this research and how it will be beneficial to teachers in improving their teaching and learning.

1.2 Rationale

In her words presented as the foreword in the Draft White Paper on e-Education the then South African Minister of Education, Naledi Pandor, asserted that: “Information and communication technologies (ICTs) are central to the changes taking place throughout the world.” (Department of Education, 2004, p.4). The same sentiments on the importance of computers are also echoed in the Department of Education Action Plan 2014. This Action Plan 2014 deals with what must be done to achieve quality basic education in the country. It has 27 goals: goals 1 to 13 deal with outputs the department wishes to achieve in relation to learning and enrolments. Goals 14 to 27 deal with what must be done to achieve 13 output goals. Specifically, goals 16, 22 and 27 are seen as providing the foundation upon which an e-society may be built. Goal 16 in particular emphasises the improvement of the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire career (Department of Education 2010b). If the concern by the former Minister for Education about teacher training is anything to go by, the impact of ICT use in schools, and student exposure to ICTs; and the nature of use and exposure on student employability in South Africa, has been deleterious to education. Projects such as the teacher laptop initiative were expected greatly to improve the level of computer literacy and usage among the teachers (Department of Education (2009). The question is, are the teachers ready for transition? Not really, because when ICTs in school were investigated by education departments there did not seem to be much drive in truly developing educational technology in hopes of changing teachers’ mindsets. Educational technology is viewed “as something that poses interesting and important questions for administration, curricular and pedagogy,” or for making South African

students ICT competent and literate (Department of Education, 2004, p.18). Given the unrealistic pressure of long-duration teacher training, a need arises for short, but effective teacher training, at least as a first step in equipping teachers to integrate ICTs. No such programme was found to be readily available for use in the province where I work. The Action Plan includes recommendations for the nature of training in ICT programmes. The Delivery Agreement for Outcome1, which is about the improvement of the quality of basic education, rates the need for well-trained teachers in ICTs as very high, and regards such training as one important way of revitalising the teaching profession(Department of Education, 2010a . Literature suggests that ICT integration is essential, beneficial, and helpful to learning; this does, however, not just happen on its own (Ballard 2000) and (Bianchi 1996), teachers must be trained. McEuen (2001), Harvey and Purnell (1995) state that teachers need to be trained not only in computer literacy, but also on how to integrate computer skills into their practice. In the Draft White Paper on e-Education the government outlines what must happen and when, in terms of professional development, but does not flesh out finer details, especially around the nature of the training intervention (Department of Education, 2004). Being an education specialist in the district, I felt the need for something to be done. In terms of my mandate, and having interacted with the literature, I have designed a programme which I think will support teachers in acquiring some of the skills needed to implement ICTs effectively into their practice. Given the challenges we face in the Provincial Department of Education, and the great inconsistency in the use of ICTs in schools, it would be unrealistic to attempt to undertake everything in a short period of time, but attempts can be made to prepare teachers to plan and design an effective learning environment and learning

experiences, supported by technology. Having designed a programme to achieve this end, and implemented it in a small number of schools, I felt the need to evaluate the ways in which teachers benefited from the programme in order to make changes to improve it, before developing it on a larger scale in the province of KwaZulu-Natal.

1.3 The Research Question

It is an internationally accepted phenomenon that ICTs provide powerful new tools with which to support communication between learning groups and beyond classrooms. Educators are required to demonstrate understanding of the opportunities and implications of the uses of ICTs for learning and teaching in the curriculum context. However, it has also been shown that appropriate use of ICTs by teachers is not automatic teachers require training in the pedagogical integration of ICTs into their work. It is on the bases of these two premises that this study asks the following key research question about a short training course I have designed for teachers

Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated?

In order to address the above key research question, the following secondary questions were formulated

- (i) Did the teachers feel that they had gained knowledge of how to integrate ICTs into their practice?
- (ii) Did they feel that they had changed their pedagogy as a result of the training?
- (iii) Did learners feel that learning had been improved by the integration of ICT?
- (iv) Which aspects of training did educators feel helped them most to design and implement the lesson?

1.4 Aims and Objectives of the Study

We have a Draft White Paper on e-Education that is advocating ICT integration; however, the same White Paper on e-Education also explained how, within the country, the numerous “provinces are at different levels of ICT integration” (Department of Education, 2004, p.11). There is an intention to have all schools using ICTs by 2013. Therefore, the aim of the study is to support government policy in ensuring ICT integration by 2013. Clearly this date is unrealistic; however, a start must be made. This Research Report investigates whether a short training programme designed specifically to meet needs of teachers in the context of KwaZulu-Natal does in fact help teachers develop skills required for ICT integration. Provincial findings will be shown to the provincial Department of Education’s senior officials, and the programme made more widely available by being taken to other parts of the province. Colleagues may then build on it for further training programmes to deepen and enhance teacher training, thus supporting the Draft White Paper on the use of ICTs.

1.5 Summary of the Chapter

My primary purpose was to introduce the reader to the study and to clarify the motivation for the study. The chapter suggested that the use of technology to enhance teaching and learning is essential. It also noted that ICT integration is a comprehensive process and that achieving it is a daunting task. The chapter mentioned that the consistent use of technology and its success in transforming teaching and learning does not only depend on the availability of technology, but also relies heavily on the confidence of educators in using it. In addition, I presented the research question which guides this study, and the rationale and aims underpinning the study. The next chapter offers the review of the literature on the subject of the study. It focuses on the ideas around making best of use of technology so as to enhance teaching and learning. This review is integrated in order to provide a framework against which to explore the problem statement.

Plan of the Research Report

The report will follow this sequence:

Chapter Two reviews literature on ICT training;

Chapter Three is a short chapter which describes the training on which this research is based;

Chapter Four views the design, methodology and tools used for collecting and analysing of data in the study;

Chapter Five deals with data interpretation and presentation of the findings; and

Chapter Six gives an overview of the study, accounts for limitations, and offers conclusions and recommendations.

CHAPTER 2. Literature Review

2.1 Introduction

Having discussed the context within which this study is conducted, in terms of abstract concepts shaping it, Chapter Two engages critically with the literature relating to the subject of this Research Report. Such engagement with literature is influenced by Mouton (1996) who notes the importance of taking into consideration the following: a wealth of literature reporting major research conducted in the field; the most widely accepted theoretical positions; and the most recent debates. Given the subject of the research, as noted in my research question, I intend to examine whether a short training intervention can improve teachers' ability to integrate ICT into their practice. Mofokeng and Mji (2010) of the Tshwane University of Technology argued that authorities should provide the necessary training if computers are to be part of the teaching and learning context in South Africa. Rackley's (2004) work probably offers one of the most influential ideas that account for making the most of technology in education. This work links improving school effectiveness to technology integration in the classroom context. Her study suggests that technology integration provides learners and students with skills that they need to be successful in an information-based society. She further argues that, not only does technology help these would-be future employees; it also benefits the teachers, if adequate training has been provided. PanAf cited in Ndlovu and Lawrence (2012, p.5) states that teachers in most South African public

schools attend ICT training but sessions constitute basic computer skills. PanAf argues that such acquired abilities have proved inadequate to equip teachers with ‘the’ skills they need to infuse ICTs into their subject teaching. In South Africa, teachers acquire most skills and knowledge through informal channels such as informal contact, training from other teachers and observations and not through more formal channels so it is true that large scale ICT training is vital (Howie & Blignaut 2009). The contributions of Sherry, Billig, Tavalin & Gibson (2000) and Forcier and Descy (2002) provide a number of implications which offer proof that technology does play a role in teaching, learning and assessment. Although nothing much is said about the necessity of training in these studies, their main finding is that technology gives teachers new strategies and methods to meet diverse learning and teaching needs of students, which would not be possible without necessary training intervention, as previous researchers suggest. To provide further clarity on these points an exploration of these views is outlined below.

2.2 ICT Enhancing Teaching and Learning through Training

Research shows that ICTs can help processes of teaching and learning but that teacher training is needed. Franklin & Bolick (2007) and Glenn’s (2002) research indicated that technology has been viewed as a lodestone for improving student academic performance, yet the progress is not convincing and slow. Limited knowledge of ways in which technology may be used in their professional practice is given as the reason for teachers’ level of ICT use (Jacobsen, Clifford and Friesen, 2002). Mofokeng & Mji (2010), in their study exploring South African teachers’ readiness to integrate computers in teaching mathematics and science in their classrooms, warn that authorities should provide the

requisite training if computers are to be part of the teaching and learning context in South Africa. Robinson & Latchem, (2003) state that modern developments in innovative technologies have provided new possibilities for teaching professionals, but at the same time have placed more demands on teachers, who now have to learn how to use and integrate these new technologies into their teaching. The need to integrate ICTs in schools, and student exposure to ICTs, have become a challenge to teachers, who must continuously retrain themselves and acquire new knowledge and skills, while maintaining their jobs (Carlson & Gadio, 2002). This calls for capacity building for sustainable development. In its publication “Ways to increase the Effectiveness of Capacity. Building for Sustainable Development” UNEP described capacity-building as ‘building abilities, relationships and values that will enable organisations, groups and individuals to improve their performance, and achieve their development objectives” (UNEP, 2006, p.2). This literature review critically examines teacher training and capacity-building processes that will strengthen ICT integration and assist teachers in developing lessons in which technology is effectively integrated. Blair (1995); DfEE (1997); DfES (2002, 2003); and Clarke (2004) identified the potential of new technologies that improve teaching and learning in schools. They concluded that the potential of new technology is something which is often overlooked and, in their eagerness to jump on the technology bandwagon, many education systems end up with technologies that are either not suitable for their needs or cannot be used optimally, owing to the lack of trained personnel. South Africa faces the same challenge because in most South African schools computer-based technologies are not yet explored, as teachers do not have access to computers for their daily teaching purposes and lack basic ICT competencies (Blignaut, 2002).

2.3 The Nature of the Training that should be offered, and ICT Integration

A great deal of discussion and debate still persists around the nature of the training that should be offered on ICT integration. Lessons are beginning to emerge, however, and the review that follows will identify and discuss some of the more important of these. The successful integration of any technology such as ICT into the classroom warrants careful planning, and depends largely on how well teachers have been trained to design and implement lessons in which technology is integrated, as well as how they make use of this in the teaching of subject matter (Jhurree, 2005). In South Africa and many African countries training is more essential because they are faced with the challenge of employing unqualified or under-qualified teachers to fill in spaces created in their effort to offer education services universally (Ndlovu & Lawrence (2010). Generally, ICT integration is a contentious issue, with two extremes observable. At one extreme, there are some who are not convinced that ICT will bring pedagogical benefits (Cuban, 1986; McRobbie and Thomas, 1998; Oppenheimer, 1997; Peat and Franklin, 2003). At the other extreme, advocates such as Edison (cited in Saettler, 1990, p 98), Negroponte (1995), the co-founder of the Massachusetts Institute of Technology Media Lab, and Papert (1996) claim that technology will change the educational landscape forever, and in ways that will engender a dramatic increase in the performance of learners. In between the two extremes, there are others who adopt a balanced approach. They are convinced that ICT, if properly integrated, has the potential to enhance the teaching and learning processes (Apkan, 2002; Bork, 2003; Dwyer, Ringstaff and Sandholtz, 1990). The most

highlighted challenge is that teachers do not know the meaning of integration; as a result they cannot integrate technology into their teaching. What makes matters even worse is that of all courses available for teachers, only 15% of South African schools have access to a course on pedagogical issues related to integrating ICT into teaching and learning (Law, Pelgrum and Plomp, 2008)

Morton (1996) adds that a common misconception is that educators know the answer to the question of what integration is. Consequently, teachers are often expected to integrate technology without having a working definition of the concept. Therefore, Morton (1996) lists misconceptions linked to ICT integration. He warns of the danger of regarding and seeing a computer as “tool” and that using this view promotes the notion of the “computer as add-on” which is not ICT integration. He also cautions that the notion of the “computer as add-on” misleads educational planners, by implying that computer technology is like any other tool, such as the blackboard or overhead projector, which may require little or no training and may not even need to be used. The negative impact of this misconception of regarding “computer as tool” enables curriculum developers to continue implementing traditional, subject-based, teacher-directed instructional plans where “the computer environment remains peripheral, an ‘add on’ in space and time” (Morton, p. 417). He further argues that taking the students to the computer lab once a week for 40 minutes is not necessarily integration, and neither is using the computer as an electronic worksheet or reward station for students who are finished with their other assignments. Consistent with Guhlin (1996) and Persky (1990), ICT integration in a lesson comes about when technology is integrated and used in a seamless manner to support and extend curriculum objectives and to engage students in meaningful learning. The researchers are of the view that technological training must

have an instructional focus that guides teachers to think first about their curriculum, and then helps them address the way in which to integrate technology into the curriculum. Focusing on skills development only as observed by Shelton & Jones (1996) is problematic, because it offers teachers little opportunity to transfer learning into their classrooms. The argument arises that, if technology is something one does separately, without integrating it into any lesson, it will not be part of the daily activities taking place in the classroom, consequently impeding the process of ICT integration. For researchers such as Hernández-Ramos (2005), technology integration should be defined, not simply as a question of access but rather as an integrated unit in a lesson, functioning to improve both educators' professional productivity, and to promote student learning. A fundamental challenge for many teachers is using computers to create innovative learning opportunities for students. Blignaut, Hinojosa, Els, and Brun (2006) remark that the pedagogical use of ICTs in classrooms has become a major research focus to help realise the South African Government's vision of equal educational opportunities through the integration and use of ICTs.

2.4 Aspects of Training that must be considered

2.4.1 Teachers' level of ICT competency

The training offered must be appropriate to teachers' level of ICT competency. Teachers are at different levels of competence. These levels have been described in various ways.

2.4.1.1 The Western Cape Provincial Government Gazette Model (2004)

describes five levels, namely:

Entry: level refers simply to being computer literate, where teachers are able to use computers, and can teach learners to use computers;

Adoption level: in which teachers are able to use various technologies, including the computer, to support traditional management, administration, teaching and learning;

Adaptation level: allows teachers to use technology to enrich the curriculum, and use integrated systems for management and administration;

Appropriation level: occurs when teachers are able to integrate technology into teaching and learning activities.

Innovation level: prepares teachers to develop entirely new learning environments that use technology as a flexible tool.

2.4.1.2 WorLD. Program Profile Model (2001) talks about Phases from 0 -5 with

Phase: 0. introducing the fundamentals of computer technology and helping participants acquire basic computer literacy

Phase: 1. Introduction to the Internet for Teaching and Learning

Phase: 3. Introduction to Tele-collaborative Learning Projects

Phase: 4: Curriculum and Technology Integration

Phase: 5. developing skills and understanding of how to evaluate and diffuse innovative classroom practices while addressing social and ethical concerns

2.4.1.3 A report on ICT curriculum and teacher development for schools Model

(UNESCO 2002) suggests a four-stage continuum of ICT integration

Emerging: In this initial phase, administrators, and teachers are beginning to explore the possibilities and consequences of using ICTs for school management, and adding ICTs to the curriculum

Applying: In this secondary phase, administrators and teachers can use ICT for tasks already carried out in school management and in the curriculum

Infusing: Teachers can explore new ways in which ICT changes their personal productivity and professional practice

Transforming: Teachers can teach ICT as a separate subject at the professional level and ICTs are incorporated into all vocational areas.

2.4.1.4 Rieber and Welliver's (1989) Transformation model describes the key

characteristics of these levels as follows

Familiarization stage, occurring when a teacher first encounters technology; the stage where the teacher focuses on how to use the hardware and software involved with the technology,

Utilization stage, where a teacher begins to apply technical skills to some of his or her current practices, such as maintaining a computerized grade book, using word processing for notes sent to parents, and creating class worksheets

Integration stage, where teachers begin to see the impact technology has on student learning, and therefore move towards using project-based activities that require students

to access the Internet to complete assignments; while guiding the activities by specifying the resources and Internet sites that may be used,

Reorientation stage: teachers are able to move from planning and presenting lessons to co-planning them with students, and guiding them to identify and accomplish goals

Evolution stage: teachers are capable of transforming technology, finding solutions in diverse and unlikely places. As teachers look to use technology in new ways, collaboration with educators outside of their immediate school or district becomes an important tool.

Clearly, therefore, before being offered any training, teachers must be assessed, in order to ascertain their level of competence in ICT integration. Training must fit the level of the teachers, in order to transform their current skills level into the highest possible skill level.

2.4.2 The Need for Support after Training

The Draft White Paper on e-Education also speaks about training and development that has been taking place, such as INTEL's "Teach to the Future" Teacher development programme, School Net SA, and Mindset, which develops educational technology resources (Department of Education, 2004). Each of these initiatives has good features. However, The *Intel Teach to the Future* programme, which was designed for ICT and curriculum integration in the General Education and Training (GET) and Further Education and Training (FET) bands in South Africa, attempted to conduct ICT training without follow-up support. The Intel® Teach 2008 Evaluation Report found that the efficacy of the training was limited, because of this lack of support after training, and the lack of screening of basic IT skills (Roberts, Mmekoa and

Mawoyo 2009). Other researchers agree on the significance of post-training follow-up. Atkins and Vasu (2000), Bradshaw (2002) and Feist (2003), for example, argue that teachers who receive training with future follow-up sessions are more likely to integrate technology into their lessons. For Kinnaman (1990), ignoring this view increases the likelihood of any teacher training project's failure in the long run. Similarly, Gudmundsdottir (2010) in his article *When does ICT support education in South Africa?* highlights the disadvantages of insufficient training and of lack of support for teachers in integrating ICT, particularly in disadvantaged schools.

2.4.3 The Duration of the Training

Unfortunately, the vast majority of research on teacher training in the 1990s (Hawkins & MacMillan, 1993; Kinnaman, 1990; Shelton & Jones 1996; & Harvey and Purnell, 1995) is not consistent on the ideal duration of the teacher training. This means that there are no clear guidelines on this point. However, with a few exceptions, current findings and exploratory analysis as cited on “Connecting Instructional Technology Professional Development to Teacher and Student Outcomes *JRTE | Vol. 43, No. 1, pp. 53–74*”, indicates that programmes with a minimum of 14 hours of professional development lead to positive and significant effects on student achievement (Davidson; Fields & Yang, 2009).

2.4.4 Training Must Be Cross-Curricular

The training must be cross curricular, not focused on selected subjects only. As already established, there is an overwhelming agreement that the integration of technology in

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teaching, learning and assessment is vital for the future of all education systems. However, issues relating to educational institutions' associating certain subjects with technology integration, tend to compromise very crucial advancements in the field. Certain researchers tend to single out the phenomenon of subjects taught in schools as one of the factors that serves to influence the use of computers (Heinssen, Glass & Knight 2001). Lockheed and Frakt's (2002) study found that the relationship between the amount of computer use in schools and subjects taught was not especially strong. ICT teacher training, "which impacts on teachers' instructional practices including content knowledge and of a longer duration" is aligned with school priorities and teacher responsibilities (Zehr, 1997, p. 24).

2.4.5 ICT Training Model

Most training interventions have a model. Guzman & Nussbaum (2009) recognise that the purpose behind technology integration is the improvement of teaching and learning, not the knowledge of the technology *per se*. Earle (2002) and Ertmer, Conklin, Lewandowski, Osika, Selo, and Wignall (2003) then again, commonly observe training processes that emphasise the instrumental or technological aspects, while ChanLin, Hong, Horng, Chang, and Chu (2006) note weak training interventions, where teachers raised concerns that they had not obtained the necessary competencies to deliver a high-quality professional performance with regard to ICT integration. Teacher-training scenarios such as these do not target the application of professional competencies that encourage the efficient and effective use of pedagogical knowledge as the foundation for the enrichment of teaching (Okojie, Olinzock, and Okojie-Boulder 2006). Smith &

Robinson (2003) further argue that such scenarios do not encourage the development of a critical and purposeful analysis of the possible relationships between technology and school. They conclude that because of this, training programmes are often not projects for professional development, and thus do not offer the necessary support to enable teachers fully to face the real demands of teaching. Guzman and Nussbaum (2009) suggest a set of professional competencies that should be targeted to the effective technology integration training processes. Drawing on the work of the authors they surveyed in the field, they define six domains of action. These domains are instrumental or technological, pedagogical or curricular, didactic or methodological, evaluative or investigative, communicational or relational and personal or attitudinal. They claim that these domains and associated competencies should be part of successful technology integration, as well as part of any technology-training model.

2.4.5.2 The Instrumental or Technological Domain

The first of the six domains is an instrumental or technological domain that embraces the idea that teachers need to develop technology-handling abilities, which is, the correct use both of hardware and specific software in an instructional context. Several writers emphasise the importance of this domain. Markauskaite, (2007) feels that training in this domain forms the very basis for the work to be done, stating explicitly that, as educators improve their technical capabilities, they also develop greater confidence in the processes required for technology integration. Albion (2003) states that, as subjects successfully appropriate the use of technical equipment, their level of comfort with its use increases, and so, therefore, does the possibility of achieving and consolidating an integration

project. A study by Demetriadis, Barbas, Molohides, Palaigeorgiou, Psillos and Vlahavas (2002) indicates that if educators do not have sufficient abilities for handling a computer it is unlikely that they will be able to incorporate technology into their classroom teaching, much less guarantee the pedagogical success of its implementation.

2.4.5.3 The Pedagogical or Curricular Domain

An aspect on which Guzman and Nussbaum (2009) found considerable convergence in the literature they analysed, was the need to include curricular variables into the teacher-training process. Cox, Abbott, Webb, Blakeley, Beauchamp and Rhodes (2004) state that, unless teachers develop the requisite pedagogical competencies, it will not be possible to implement technology projects that bring innovative scenarios to the schools; nor will it be feasible to configure actions that drive educational change. From this same perspective, others assert that a constituent factor in actions for integrating technology is a clear understanding on the part of teachers, of the pedagogical principles that sustain these actions. These principles should then orient them towards the optimisation of teaching and learning (Okojie et al. 2006; Hew & Brush 2007). Although there are certain basic technical requirements that teachers must meet, the technology proposition will not be integrated until the use of the technology has been planned and incorporated into a broader training proposition that succeeds in establishing a close connection between technology and the curriculum (Zhao, Pugh, Sheldon, and Byers 2002).

2.4.5.4 The Didactic or Methodological Domain

Another element that research has indicated as a constituent part of a teacher training programme has to do with methodological factors. These refer to the development of didactic knowledge that bolsters the inclusion of technology in the educational activities implemented in the classroom. In this sense, Li (2005) posits that any action seeking to undertake a process of technological infusion must provide the tools that enable teachers to generate learning environments connected with real, concrete experiences.

2.4.5.5 The Evaluative or Investigative Domain

Some researchers posit the existence of an evaluative domain that must also be incorporated into teacher training. This dimension centres on generating feedback both to the student-learning processes and the general functioning of the technology implementation. In either case, the evidence should be used for timely and efficient decision-making. As regards performance analysis, Mills and Tincher (2003) note that evaluative research is a central orientation of the support provided to students, in that it enables the conducting of explanatory studies, the identification of problems and the building of possible solutions. From this perspective, the evaluative or investigative domain attempts to estimate the extent to which teacher training is achieving the goals initially set for it, providing evidence for adopting the corresponding solutions when they are needed (Mills and Tincher (2003)).

2.4.5.6 The Communicational or Relational Domain

Some studies have introduced the relational sphere as an essential element to be incorporated into training actions. The basis for this position is that the educational interaction of the actors (whether between teacher and student or among students) takes on a different configuration when it occurs in a technological environment. In this context, the technology may be used for collaborative work (Mills & Tincher 2003), but this would require concrete abilities in order to achieve successful negotiation and consensus processes. They feel that the aspect of collaboration is of crucial importance if focus is on the mediational process conducted by the classroom teacher, whose communication competencies are what ensure that interaction and effective accompaniment of the students take place. According to Tweddell (2007), insufficient communication results in a lower-quality constructed learning environment, given that it limits the effectiveness of interaction. He further points out that obstacles posed by technology are easier to overcome than those posed by communication, and concludes by stating that effectiveness of interaction requires a deeper transformation in the beliefs of the teachers themselves.

2.4.5.7 The Personal or Attitudinal Domain

Finally, Guzman and Nussbaum (2009) allude to substantive claims pointing to the need for incorporating a personal element in the adoption of technology integration in the classroom. Their point is that the attitudinal factor is what ultimately makes the difference in the quality of implementation, given that the way a technology design is interpreted and put into practice depends on the subjectivity of the teacher handling the process.

Mention is made of a range of studies that have found that the personal dimension influences the representations of teachers, which in turn impacts on concrete pedagogical practices. Markauskaite (2007) for example, focuses on the teacher's self-perception, which generates ways of seeing, understanding and projecting the inclusion of technology in the classroom, and therefore conditions the ways of operating with it. They add that some of the personal elements that influence the incorporation of technology in the classroom are the teachers' beliefs, emotions, experiences and expectations. These elements must be formally taken into account in teacher training (Wood, Mueller, Willoughby, Specht, and Deyoung, 2005 and ChanLin et al. 2006). Taken from this perspective, the suggestion arises that a training approach aiming at reinterpreting the teaching and learning process is an essential condition for any training (ChanLin 2007).

This section of literature demonstrates the domains associated with a set of generic teaching competencies that operationalize the technology teacher-training processes involved. It must be noted, however, that this approach appears to be contrary to what teachers are used to since the introduction of Outcomes Based Education (OBE). Since its inception, OBE has always emphasised a competency-based approach to teaching and learning, which I think influences the way in which teachers integrate technology in their classrooms. The focus has always been on outcomes rather than on processes. Taylor (2004, p. 43) warns that, and points out "such a competence-based approach, if well founded, would provide goals for training, but would give no insight into the processes by which learning takes place. . . the focus is still on the destination rather than the path to be travelled". The teachers' teaching should be transformed by knowing the processes

involved. On the basis of this, the Draft White Paper on e-Education concludes “in a transformed teaching and learning environment, there is an inclusive and integrated practice where learners work collaboratively, develop shared practices, engage in meaningful contexts and develop creative thinking and problem-solving skills” (Department of Basic Education, 2004, p.16). In Sadler’s words, “If you decide you are going to teach something, you have got to think about how to make it effective” (Sadler 1994).

2.5 The Theory of Learning on which the Training Model is based

(Constructivism)

A key element in the design of a training programme is the learning theory on which the design is based. King’s (1968) definition of training and the way in which he contrasts views of behaviourist and cognitive approaches has had a direct bearing on this technology training. He defines training as “providing conditions in which people can learn effectively”; and that to learn is to gain knowledge, skill and ability (King 1968, p. 125). He contrasts both cognitive and behavioural approaches, and argues that cognitive methods provide verbal or written information, demonstrate relationships among concepts, or provide the rules for how to do something, while behavioural approaches stimulate learning through behaviour, which is best for skill development and attitude change. Blanchard and Thacker’s views of both approaches may be interpreted from the perspective that both approaches are good. Blanchard and Thacker (1998, p. 277) say “either behavioural or cognitive learning methods can effectively be

used to change attitudes, though they do so through different means”. This considers key learning from research and theoretical perspectives on the nature of the training intervention that will best support teachers in integrating ICTs into their classrooms. Dede (1998) and Jonassen (2000) assert that technology has a great potential to enhance student achievement and teacher learning, but only if it is used appropriately. They further sound a warning that, if teachers are effectively to teach with technology, they must focus on shifting their instructional practices from teacher-centred to a more student-centred learning, that is, a constructivist approach. Previous studies had already attempted to move away from behaviourism by speculating that technology could be used for more than just drill and skill activities (Papert, 1978, 1980; Pea, 1983; Thornburg, 1984). Carmichael, Burnett, Higginson, Moore, and Pollard (1985) indicate that the creative use of computers fostered the development of independent and original thinking, and that an environment that encouraged exploration leads to extensive social interaction among students. These beliefs generated more debates, because others believed in the behaviourist approach. Merrill, Drake, Lacy and Pratt (1996) felt that the consensus of stakeholders on constructivist learning is that it often equals poor learning, and raised doubts about whether students can play a meaningful participatory role, because according to them students are, for the most part, lazy. They went on to condemn persons who claimed that knowledge is founded on collaboration rather than on empirical science, or who claim that all truth is relative.

2.5.1 Building Knowledge and Constructivism in Learning

In the publication *Guidelines for Teacher Training and Professional Development in ICT*, the Department of Education recognises the need for Professional Teacher Development (Department of Education, 2007). Research suggests that Professional Teacher Development should be embedded in constructivist learning environments, be situated in real classroom contexts, and make provision for reflection opportunities, classroom observations, and peer collaboration (du Plessis and Webb, 2012). This requires change on the part of the teacher.

Change also plays a key role in the process of ICT adoption into curriculum and instruction (Spotts 1999; Zhao and Cziko 2001). To effectively integrate ICT tools into teaching and learning practices, teachers must not only learn how to use technology, but must also fundamentally change the way in which they teach (Fabry and Higgs 1997; Hagenson and Castle 2003; Schrum, Skeele, and Grant 2002; Spotts 1999; Zhao and Cziko 2001). Change, according to Prensky (2008), should embrace the new pedagogy of youngsters teaching themselves under the teacher's guidance. This is called student-centred practices. Lei and Zhao (2007) found that those students who used technology to manipulate data or to construct representations of their knowledge, experienced an increase in grade-point average over the course of a year. With constructivism, the vision is to transform traditional knowledge-instruction classrooms into knowledge-construction classrooms. Compared with traditional instructional systems approaches of designing instruction, constructivism is seen as making a different set of assumptions about learning, teaching and assessment, because it is informed by a different set of new

instructional principles. The constructivist approach to teaching with ICTs is learner centred; it "proposes that learning environments should support multiple perspectives or interpretations of reality, knowledge construction, context-rich, experience-based activities" (Jonassen, 1991, p. 28). Constructivism focuses on knowledge construction, not knowledge reproduction. Constructivist classroom problems are not exempted from challenges. Some of those challenges are teachers themselves: they are often suspicious of educational practices which differ from what they experienced (Matusevich, 1995). As a result, teachers start using technology for tasks that fall outside of their instruction (Forcier and Descy, 2002). In addition, too many teachers are unaware of all that is available, therefore awareness sessions must be held. What is also greatly needed is a major paradigm shift. To prepare for this paradigm shift, teachers must be trained to think about why they do what they do (Strommen and Lincoln, 1992). When contrasted with a behaviourist learner, a learner in constructivist theory is not considered as a controlled respondent to stimuli, as in the behaviourist rubric (Jonassen, 1990; Perkins, 1991). On the contrary, a learner is seen as someone who, according to (Solomon, 1994, p. 16), "actively constructs knowledge while striving to make sense of the world on the basis of personal filters: experiences, goals, curiosities and beliefs".

The vision is to transform traditional knowledge-instruction classrooms into knowledge-construction classrooms. Compared with traditional instructional systems approaches of designing instruction, constructivism is seen as making a different set of assumptions about learning, teaching and assessment, because it is informed by a different set of new instructional principles. Such a learner, arguably, needs a learning environment that involves technology tools which enhance communication and access to real-world examples, reflective thinking, and multiple perspectives, modelling or problem-solving by

experts to guide learning. It is within this context that constructivists point to the creation of instructional environments that are student-centred, student-directed, collaborative, and supported by the teacher's scaffolding of authentic tasks based on ideas of anchored instruction and cooperative learning. In this context, technology is seen as a tool that brings about learners' active learning (Spiro, Feltovich, Jacobson, and Coulson 1991) and as a knowledge-construction tool which should confront the learner with an artificially limited arena where phenomena to investigate occur (Perkins, 1991).

Alesandrini and Larson (2002) indicate that teachers, however, often learn without doing when it comes to learning about constructivism and related teaching methods. This is because many of them have not participated in a constructivist-type classroom or even seen it modelled, therefore, most teachers teach the same way they themselves were taught. The training that the teachers are exposed to should enable them to experience constructivism first hand, so that they may be equipped to plan and facilitate learning activities undergirded by the constructivist theory of learning and teaching. A further advantage of constructivism is that learning occurs within the context of exploration and discovery. This is because it constructs learning as a process of actively exploring new information, and constructing meaning from the new information, which is achieved through activities that challenge students to link current knowledge to previous knowledge and experience. Throughout the learning experience, meaning is constructed and reconstructed, based on the previous experiences of the learner. In other words, constructivists view knowledge as constructed by the learner in a particular context, and not pre-existent or given from an expert or authority. It is in the light of these considerations that the teacher's role provides structured activities that guide students step

by step to the construction and mastery of new knowledge, rather than some teacher-imposed goal designed to endorse certain versions of knowledge (Mann 1994). These are the principles that should guide the design and running of the training, to enable teachers to make the transition to a constructivist classroom where they are called on to function as facilitators, who can coach learners as they blaze their own paths toward personally meaningful goals. When contrasting constructivist and contemporary constructivist learning theory which is characterised by traits already alluded to, it appears that there is still common agreement about placing emphasis on the active social participation of the learner within the environment (Savery & Duffy, 1995; Windschitl, 2000). Henderson (1996) and Driscoll's (1994) interpretation and understanding of learning as a community activity facilitated by shared inquiry, emphasised the importance of collaboration and cooperation. This is also relevant in the use of technology to teach. Henderson (1996) and Driscoll (1994), for example, see collaboration going beyond cooperation, because of its strength. It requires learners to reflect upon and share their insights with the group. Similarly to learning through exploration, when it occurs during the constructivist process, students explore various solutions and learn through discovery. These developments allow learners to play an on-going, active, and critical role even in assessment processes.

The use of technology to facilitate these processes comes when there is a concern regarding teachers lacking the necessary skills to integrate technology into the classroom (Baylor and Ritchie 2002; Ertmer and Hruskocy 1999; Eteokleous 2008; Russell, Bebell, O'Dwyer, and O'Connor 2003; van Braak 2001). For example, Jonassen, Peck & Wilson, (1999) continued to stress that teachers needed to gain primary technology skills in their

instructional processes. They are of the view that teachers would be most successful using technology as a learning tool in vast domains of knowledge where they might not be experts, but might be able to “model their own learning process when they encounter phenomena they do not understand or questions they cannot answer” (Jonassen, Peck and Wilson 1999, p. 22).

The constructivist approach to teaching with ICTs, by itself, is not all that teachers should consider when seeking improving their ICT teaching skills. Accordingly, a good teacher should contextualise his designed lesson, and allow students to learn by using various resources, whether electronic or print to answer questions, allowing students to draw their own conclusions about the relevance or utility of the information presented by the teacher; hence Resource-Based Learning. Resource-based learning is one type of constructivist pedagogical theory. It may be described as a constructivist approach incorporating valuable instructional strategies that should be considered in the professional discussion of the development of pedagogy of teaching. The need to be conversant with basic resources exists for all educators. Because teachers select content and mode of delivery, such instruction is more aptly deemed resource-based instruction (Doiron & Davies, 1998), a pedagogy that is more teacher-centred. Resource-based learning is predicated upon the principle that individual learners will be drawn to the media and content which best match their own processing skills and learning styles (Farmer, 1999). The learning focus shifts from teachers using resources to facilitate instruction, to students directing the choice of resources. When the constructivist educator uses resource-based learning, instruction is teacher-planned, but student-directed. These

developmental stages must be modelled and practiced in a more conducive environment before their use.

Resource Based Learning (RBLE) suggests that there are four types of tools: searching, processing, manipulating, and communicating. Web search-engines such as Yahoo®, Google®, and AltaVista®, are listed as engines that offer the learner links to a broad range of resources, enabling access to primary and secondary sources in a variety of formats. Tools enable learners to organise and present their understanding in concrete ways (Jonassen & Reeves, 1996). When Quinlan, (1997) states that digital information systems such as the web continue to influence both the availability and use of resources; Jonassen & Reeves, (1996) further add that that tools enable learners to organise and present their understanding in concrete ways. The review of literature reminds us that educator training plays an important part in supporting the use of technology in the classroom, and therefore should be well structured, and be given high priority in education circles (Amburgey, 2001). Burns (2002) As quoted in *a teacher proposed heuristic for ICT professional teacher development and implementation in the South African context, October 2012, volume 11 Issue 4*, agrees and adds that the sharing of experiences, discussion of the use of specific instructional approaches or/and software within the classroom, and training embedded in real-life contents allow teachers to experience PTD as enjoyable and useful.

Critics of constructivist theory and practice raise the fear that, when students structure their own learning in constructivism, the result is trivial, rather than rigorous (Brooks & Grennon Brooks, 1999). Others condemn the constructivist method by pointing out that it

only works with older, very mature students. Prensky (2008) is critical of these constructivist critics, saying that they are preparing students for the past, not for the future.

2.6 Key factors that seem to influence the effectiveness of ICT integration

2.6.1 Managers

The willingness of managers to make the adjustments needed for ICTs to happen is an important factor in rationalising the effectiveness of ICT integration. Some researchers attempt to describe the way in which the conflict between technology integration and school administrators, which emerges in spite of what is considerable willingness to accommodate technology integration, may be resolved. Miles (1983) proposed that sound relationships between administrators and teachers should be nurtured and should be clear and supportive, so that the pressures and stresses of integrating something new may be managed as a team. Vanderlinde, van Braak and Hermans (2009) also note that changes should be made to the way in which an ICT school is organised, following the rules and regulations as laid down in the ICT policy. Sherry and Gibson (2002), recognise the same need, and encourage the use of tailor-made professional development to address it. These perspectives urge one, bearing this conflict in mind, to include not only the teacher as participant in training, but also the senior management teams (SMTs) in embracing the training intervention.

2.6.2 Influence of a School ICT policy on Technology Integration

According to Gudmundsdottir (2010) none of the schools in South Africa had any perfect formal plan or training program for newcomers (teachers) in terms of how to use the computers with the learners for curriculum delivery which clearly point to the absence of ICT policy known for addressing this challenge.

In a similar way, the question of ICT policy impact on integration does not really receive the attention it deserves in a school. The research studies provide rich material on technology integration and how it should be achieved, but, curiously, not much is said about the influence of a school ICT policy on technology integration. A review of the literature reveals that one of the necessary conditions for ICT integration at the school level is “having a shared vision and ICT policy plan” (Hew & Brush, 2007). This condition described here as ICT policy planning has recently gained attention from both a research perspective (Fishman & Zhang, 2003) and a policy perspective (Zhao & Conway, 2001). However, not much is known about the way in which schools can develop their local ICT policy capacity, or how to establish an ICT policy plan. For researchers such as Fishman and Zhang and van Braak, (2003), Frazier & Bailey, (2004) and Baylor & Ritchie, (2002) a school-based ICT policy plan is situated within the deeper definition of ICT policy planning, and is defined as a comprehensive school document, containing a variety of strategic and operational elements concerning the integration of ICT in teaching and learning. They view the policy plan as the overall philosophy of ICT use; and explore ways in which ICT will improve teaching and learning and act as a blueprint for the sequence of events a school hopes to achieve. They suggest that the content of an ICT policy plan should refer to the school’s expectations,

goals, and actions concerning the integration of ICT in education. Van Braak, (2003) further suggests that it should include elements such as vision building, professional development, ICT curricula, and ICT planning and evaluation. Additionally, Gülbahar (2007) notes that an ICT policy plan is thus not only about hardware and Internet connections, but particularly about how ICT is integrated within the instructional programme. The Draft White Paper on e-Education (Department of Education, 2004) suggests that a school ICT policy should be participative. It should fully engage with teaching and learning and should include equitable resource allocation. Other policy suggestions are the importance of regular and effective access to ICTs by all “end-users (learners, teachers, managers and administrators)” (Department of Education, 2004, p. 22). Another policy point emphasises the creation of a “standard of teacher development, content, connectivity and implementation mechanism” (Department of Education, 2004, p. 23).

ICT policy planning and the establishment of a school-based ICT policy plan can clearly act as a lever for successful ICT integration (Vanderlinde et al., 2009). In this context, Bryderup and Kowalski (2002) argue that creating an ICT policy plan is a crucial step toward the practical implementation of the integrated use of ICTs. Gülbahar (2007) states that ICT policy planning is a way of solving problems that emerges during the ICT integration process. Baylor and Ritchie (2002) indicate that schools which are successful in integrating ICTs are often guided by an ICT plan. Similarly, Tondeur, Van Keer, van Braak, and Valcke (2008) found that teachers in schools with an explicit ICT policy plan that emphasises shared goals tend to use ICTs more regularly in their

classrooms.

In order to be successful, an ICT plan:

- should be grounded in a shared vision of teaching and learning on the one hand, and ICT integration on the other hand (Fishman & Pinkard, 2001; Lim, Chai and Churchill 2011);
- must be related to particular curriculum content and the enhancement of student learning (Staples, Pugach, and Himes 2005 in Hew & Brush, 2007);
- must be frequently updated (Fishman & Pinkard, 2001), following the evaluation and monitoring of the implementation of the plan; and
- should be jointly constructed.

ICT policy planning requires collaboration (Fishman & Pinkard, 2001). When teachers participate in the process of policy planning and decision-making, they can become aware of the content of the ICT policy plan. Goals must be shared, and teachers must be involved in determining the means of attaining these goals (Picciano, 2006; Tondeur, Van Keer, van Braak and Valcke 2008). Vanderlinde, Braak and Dexter (2011) in their study, describe the content of ICT policy in five ICT-related policy domains:

- ICT vision development (the establishment of a school-based vision of ICT integration, linking the vision of ICT to the school's vision of education);
- Financial ICT policy;
- ICT's policy concerning the infrastructure (practical organisation of the ICT infrastructure, hardware and software issues);
- ICT's continuing professional development policy (the management of ICT- related

professional development activities, the organisation of school-based ICT in-service training courses); and

- ICT curriculum policy (management and implementation of ICT for teaching and learning).

Some may argue that there is no need for an ICT integration policy: a policy may limit creativity of individual teachers, or their freedom to choose whatever ICT training they wish. However, a sound policy would address the required ICT expectations, so that the provision of training can be matched to these.

2.7 Summary of the Chapter

This chapter highlighted technology training intervention as having the potential to give teachers new strategies and methods in assisting them to meet the diverse needs of all learners. Literature further reveals that teachers who receive training which includes future follow-up sessions, are likely to use technology for teaching and learning. Although research studies in education show that the effectiveness of technology can help student learning, its use is generally affected by certain barriers, some of which may be overcome by training intervention and the establishment of a school-based ICT policy. The review of the literature also supports the importance of administrative support in minimising the barriers to technology integration (Amenta-Shin, 2000; Baylor & Ritchie, 2002; Besalel, 2004; Cradler, 2002); administrators are also now discovering that having the technology available in the classroom does not guarantee that the technology is integrated into daily classroom activities. The confusion surrounding the duration of each technology training session was also discussed at length. Literature indicates that

programmes with a minimum of 14 hours of professional development lead to positive and significant effects on student achievement. Training must fit the level of the teacher. Teachers are at different levels of competence; the literature suggested the use of Rieber and Welliver's (1989) Instructional Transformation to help teachers meet this requirement.

A review of the literature regarding the integration of technology into the classroom suggests a need for a model, when attempting to design training for teachers. The model reviewed was a technology-integration training model. In this model, the literature identified a series of concrete conceptual knowledge, abilities or attitudes associated with technology integration. On the basis of this knowledge, the literature defined six domains of action representing the areas that should be targeted in technology-integration training processes. The literature also raised a concern that the creation of ICT policy does not enjoy the publicity it deserves in terms of technology integration, although it can act as a lever for successful ICT integration (Vanderlinde et al., 2009). The literature went on to suggest elements of successful ICT plans, and described the content of ICT policy in five ICT-related policy domains.

The literature review also contrasted constructivist theory and behavioural theory. It suggests that constructivist theory has a direct influence on technology integration because of its non-linearity. Literature also showed that, while teachers increase their confidence in using technology through training, reflection and collaboration, they also then integrate technology at a higher rate (Ballard, 2000 and Bianchi, 1996). However, the assumption and conviction that students who used computers and incorporated constructive strategies reported significantly higher scores than students who learn mathematics relying only on computer-based drill-and-practice programmes, awaits Literature Review

empirical verification.

The next chapter describes the training programme on which this research is based.

CHAPTER 3. The Training Programme

The training programme was divided into two phases: the five-day training course for teachers, in which they designed a lesson that integrated technology (Phase1), and an evaluation session (Phase 2) in which teachers delivered the lesson to their learners. The lesson plan template is attached as Appendix A. The five-day training took place during the July school holidays in 2011; and the evaluation session followed in term 3 of that year. More than 300 hundred teachers from four districts of KwaZulu-Natal Department of Education had already been trained in computer literacy. As this training intervention has brought some of them up to level three (*Integration*) on Rieber and Welliver's (1989) instructional transformation model, a certain number of teachers was considered eligible for this programme; which aimed to help them achieve the highest level five (*Evolution*) of the same model. However, because of the limited number of computers available with access to Internet at the training venue, and because they are part of the current ICT Solution Project by the MEC for education in KwaZulu-Natal, only 22 educators could be accommodated; allowing each teacher a dedicated computer.

3.1 Phase 1 (July school holidays)

The training programme otherwise known as phase one, strongly focuses on integration and collaborative learning. It was here where I wanted to see whether my training programme demonstrated what I think was a good training programme, following the dictates of the literature. I was aware that the training would not provide the proof of

whether teachers can collaborate or integrate. For me to make such claim it was necessary that I combined two data; one from the training programme; and the other from the observation schedule. In this section I was checking the perfection of what the training programme did against what I intended it to do. The early stages focused on introducing the theory on which the lesson design was to be based; and the tools to which participants would have access. It supported the teachers in developing a constructivist lesson which integrated the use of technology. During this phase, all participants were given a file which contained the material that they were going to use over the five days of training. Although some of the writers discussed in the literature review Hawkins & MacMillan, (1993); Kinnaman, (1990); Shelton & Jones (1996); & Harvey and Purnell, (1995) say that teacher development should focus on long-term professional development activities, the use of short-term training such as mine is supported by the view that a minimum of 14 hours of professional development can lead to positive and significant effects on student achievement (Davidson; Fields & Yang, 2009).

My training focus emphasised constructivism as a good approach for technology integration, because it supports cooperative learning. This type of learning occurs within the context of exploration and discovery. Constructivists point to the creation of instructional environments that are student-centred and student-directed. Becker (2000) states that teachers must adapt their teaching styles when using ICTs in lessons, so as to adopt a more constructive approach. In order to exemplify what is entailed in a constructivist approach, I used this approach throughout the 5 days of training. In this regard, I encouraged participants to create their own questions, to share these in small groups, and to develop technology-enhanced lessons in collaborative teams.

In this first phase, teachers used the lesson template provided (Appendix A) to:

- Develop a complete lesson;
- Design learning opportunities that apply technology;
- Identify and locate technology resources, evaluating them for accuracy and suitability for their lessons; and
- Plan strategies to manage student learning in a technology enhanced environment. The activities of each day are described below:

On day one, the emphasis was on ensuring that teachers were competent in the hardware and software to be used, as dictated by my literature review. On days one and two, teachers developed their lesson plans, and stored them in their portfolio folder for the duration of the training. They modified their lessons if and when necessary for the rest of the week. They were collecting information online, brainstorming, and viewing and discussing presentations in an effort to design a technology-integrated lesson. In developing the lesson plan, they worked in groups. I gave them information on how to create learner multimedia presentations, and how to view sample presentations online.

Towards the end of day one and during day two and half of day three, I facilitated the processes of collaboration, integrating technology into the curriculum. I illustrated the effective use of technology with learners, and discussed ways in which to provide learners with Internet access. For the rest of day three of the training, the teachers created and assessed learner sample multimedia presentations; and created tools with which to assess multimedia presentations. On day four, I focused my attention on the way in which they collaborated in implementing methods of teaching that emphasised independent

work by learners. I checked their method of integrating technology into the grade they teach; and the way in which they intended to support their learners in using technology for their schoolwork; assisting them when necessary. Ways of ensuring that learners focus on learning outcomes when using multimedia, Internet safety, and guidelines for publishing learner work, were also discussed. Teachers familiarised themselves with ways of creating scaffolds with which to support their learners. They learnt to manage, store and access learner computer files. Techniques on how to locate Internet resources that offer professional development; academic pricing, and freeware for teachers, were discussed on these days. Day four also examined ways of using and managing learner e- mail projects, revision of lesson plans, learner samples and support material. We discussed best practices for managing learner use of computerising a lab setting; teachers later prepared portfolios for showcasing on day five of this course.

On day five, participants were required to showcase their developed lessons. Peers and the facilitator then observed and critiqued each individual, to establish whether the lesson designed had effectively integrated technology. The showcase feedback form with the criteria used to assess whether the lesson designed showed effective integration of ICT, is attached as Appendix B.

Upon completion of this training programme, teachers were required to return to their schools, consider changes made in their lessons developed during the last day of the training, and prepare the revised lessons for teaching during the evaluation session when I visited them (Phase 2) in term 3 of that year. The responses to the showcase feedback forms were taken by teachers to their respective schools. The responses provided during the showcase should help to improve the lessons they develop before the evaluation

session takes place. Most importantly, I wished to check whether they had had exposure, and whether that would translate into changed pedagogy during my observation schedule.

3.2 Phase 2 (September school holidays)

During this phase teachers refined and then taught their learners the lesson they had developed during the training session. They were expected to use the information on the showcase feedback form provided on day 5 of phase1 to help them in this process. As ICT integration was a new concept to most of the participants, I felt that it was important to provide time for teachers to prepare for the evaluation session, and to try some tools and techniques from the training session used in their schools before the lessons were evaluated. This approach was necessary in order to reduce delays during the evaluation session, and to increase the chances of obtaining sufficient data.

The revised lessons to be taught to learners during the evaluation session were the extension of the training process, combined with suggestions from the showcase feedback. Teachers were exposed to a range of teaching strategies in phase one and experienced collaboration and integration. The second phase was designed to help me evaluate the success or failure of my programme on these important design elements. In addition, observation schedules of these revised lessons, together with questionnaires, teachers' and learners' interview provided data which answered my research question. This is discussed more fully in Chapter 4.

The next chapter is the methodology section. It describes the design, participants, instruments or measures, data collection and analysis procedures.

CHAPTER 4. Methodology

4.1 Introduction

Chapter Four presents an account of the research design and data-collection methods employed to gather data that help answer the key research question of this study. Henning et al. (2004, p.146) asserts that the function of a research design is to ensure that the “evidence obtained enables the researcher to answer the initial research question as unambiguously as possible”. In this chapter, I also describe the characteristics of the participants from whom information was gathered, and provide information on the number of participants and the way in which they were selected for the study. The chapter concludes with a discussion on the merits and limitations of the data-collection instruments, and the challenges I encountered during the data-collection process. The nature of any research design is such that it cannot be presented as a rigid, unchanging set of procedures for data collection. Contingencies often occur during the data-collection process, as in the nature of any research activity. These often force the researcher to respond to the dictates of the circumstances, provided these offer opportunities that further enrich the study. According to Yin (1994, p.19), the research design is “an action plan for getting from here to there, where “here” is an initial set of questions to be answered, and “there” is some set of (conclusions) answers.” I share these sentiments in my research question which is: Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated? The data I gathered was intended to help me find an answer to my question.

4.2 Research Paradigm

The research approach chosen for this study is qualitative rather than quantitative. A qualitative approach seemed suitable for this research, since the primary aim was not to count and statistically quantify the responses of participants, but to understand and interpret their responses. Unlike quantitative approaches, qualitative approaches are classified as non-numeric. It is in this context that data was collected to a large extent in the form of words rather than numbers. Keohane, King and Verba (1994, p. 5) do indicate that “the difference has been overemphasised by authors”, but that in some research it is impossible to employ a single approach (Bogdan & Biklen, 2003; Biesta & Burbules, 2003). For this reason, when the need arose, I did include some quantitative data gathered by means of the post-training questionnaire, but in so doing, I did not suggest that my study was quantitative. Colón, Taylor & Willis (2000) note that qualitative research techniques often rely on observation to collect unique data about the problem under study. They further stipulate that qualitative research usually consists of three components:

- Data, which can come from various sources;
 - Analytic or interpretive procedures that are used to arrive at findings or theories;
- and
- Written and verbal reports.

Since the intention and emphasis of this research was observation and looking closely at people's words, actions and records, in order to discover patterns which emerged from interviewing and providing questionnaires; it became evident to me that qualitative

research techniques were going to help me contextualise my findings, and recognise the value and depth of the individual content. The research reported on here, did not work from behavioural or information processing theories of learning, but stressed a subjectivist approach to studying social phenomena; and attached importance to a range of research techniques focusing mainly on qualitative analysis, e.g. interviews, participant observation, and accounts of individuals.

Dash (2005) mentions two main research paradigms: positivism, the 'traditional' research paradigm, which is essentially quantitative and the 'interpretivist' research paradigm which is essentially qualitative. As a researcher, my aim was to interpret how my educators' training intervention assisted educators in designing and implementing a technology-enhanced lesson. The appropriate research paradigm in my study is therefore interpretivist in nature. I justify my decision to use qualitative inquiry as opposed to quantitative methods as follows: I wished to explore and understand participants' experience and perceptions of the application following my research question: Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated?

4.3 Research Design

For the purposes of this study, I decided to use a case study. In Merriam's (1998, p.19) words: "a case study is employed to gain an in-depth understanding of the situation and meaning involved". For Creswell (1994, p. 12), a case study is "a single person, program, event, process, institution, organisation, social group or phenomenon being investigated within a specified time frame, using a combination of appropriate data collection

devices”. This is a method, according to Tellis (1997) that has been employed in varied sociological studies. The most attractive aspect of this research design is the process rather than the outcome; the context rather than a specific variable; discovery, rather than confirmation. The choice of case design was therefore appropriate for my study, for it “involved detailed, in-depth data collection involving multiple sources of information rich in context” (Creswell, 1998, p.61). The case in my study comprised a set of teachers who participated in the training programme, using the technology resources provided by the Department of Education, and their learners. The dynamic interaction between technology and school education, learners and school management teams (SMTs) was investigated by listening to individual perceptions and accounts during the course of the training intervention and after the training during the evaluation session. A qualitative approach was rendered useful because this is best suited for analysing detailed case data in order to frame issues and formulate emerging themes.

4.4 Selection of the Samples of Teachers and Learners

4.4.1 Population

The population, also referred to as a universe, is described by both Strydom and DeVos (1998, p. 190) and Strydom and Venter (2002, p.198), as “all potential participants who possess the attributes in which the researcher is interested”. In this study, it was educators who were using technology to enhance teaching and learning, who had had prior exposure to technology use, and who met the criteria as stipulated on level 3 (Integration) of the Rieber and Welliver’s Instructional transformation model (Rieber and Welliver, 1989). They were also part of the ICT Solution Pilot Project. Strydom et al. (2002, p.198) further point out that the population in the context of empirical research includes “all possible

individuals who possess the specific characteristics that research is involved with”. Tryfos (1996, p.12) added that “the population is an existing collection of real elements”. Certainly the 300 teachers had been trained, and the sample was the small number, 22, taken from the population of 300.

4.4.2 Boundary of Sample and Sampling Frame

A sample is a small part of the population. It is the element of the population that is considered for inclusion in the study. A sample is thus “a small set of the persons, events and organization units” (Strydom and DeVos, 1998, p. 191). It is defined as a model of the population or a subset of the population that is used to gain information on the entire population (Henry, 1998). The sample chosen is 22 teachers of the possible 300, who had the required level of competence.

4.4.3 Selection of Teachers

As mentioned, this study set out to discover whether my technology training intervention enabled teachers to design and implement a lesson in which technology was effectively integrated. I have been involved in computer literacy training for teachers over the past three years. At least 300 teachers have been trained in pure computer literacy. I noticed that, although teachers might be good at computer literacy that did not necessarily mean that they could integrate technology effectively into their teaching. Being at a certain level, level3 **integration** on Rieber and Welliver’s 1989 Instructional Transformation Model was the first of the criteria used as an entrance requirement to this training intervention. The computer literacy training intervention normally lasts for three days

and takes place in one of the Department of Education's computer labs, because some schools do not have this facility. In some cases, even when there is such a facility, the operating system is too old to help the teachers. For this training intervention, a sample of 22 teachers of the 300 was chosen. These were Natural Science, Technology, Maths and Language teachers spread across Intermediate and Senior Phases. Some of these teachers were only classroom teachers while others also held more senior positions in their school, such as head of department, deputy principal or principal. The participating teachers were selected from four different districts (uMlazi, Pinetown, uThungulu and uGu). These are the districts that are under my care and responsibility in terms of teacher development activities. The last criterion was that four schools (from which some of the teachers came) chosen for my Phase2 evaluation session are part of KwaZulu-Natal's MEC for Education's ICT Solution pilot project. The ICT Solution pilot project provides ICT basic classroom equipment to schools, and requires teachers to be trained on use of these gadgets. Teachers had had access to computers at schools and had also been trained in computer literacy which had translated to level 3 Integration on Rieber and Welliver's 1989 scale. Computers with access to Internet influenced the restriction to only 22 participants. The map with all 12 districts, together with those included in the sample, is attached as Appendix C. Table 1 below provides information on participants.

| Participants | Category 3 | Category 2 | Category 1 | Total |
|-----------------------------|-------------------|-------------------|-------------------|--------------|
| Female | 5 | 8 | 4 | 17 |
| Males | 2 | 3 | 0 | 5 |
| Principals | | | | |
| Male | 1 | | | 1 |
| Female | 2 | | | 2 |
| Deputy Principals: | | | | |
| Male | 0 | 0 | 0 | 0 |
| Female | 1 | 0 | 0 | 1 |
| Heads Of Departments | | | | |
| Male | | 1 | | 1 |
| Female | 1 | 4 | | 5 |
| Teachers | | | | |
| Male | 1 | 2 | 0 | 3 |
| Female | 2 | 3 | 4 | 9 |

Table 1 Gender and post level of participating teachers

4.4.4 Selection of the Learners

Learners from Grades 10-12 are excluded from taking Computer Literacy as a subject, because they take subjects called Computer Application Technology (CAT) and Information Technology (IT). Therefore, in this study, learners were selected only from the Intermediate and Senior Phases. There were 82 learners spread across four schools from which all 22 teachers came. This learner selection was essentially for the evaluation session in term 3 of the school calendar. All these learners belong to schools which are

part of the ICT Solution Pilot Project, as mentioned above, and are also in the process of nurturing the development of learner ICT competence in the context of educational use of ICT as a tool. At school number one there were 20 computer class learners; at school number two, 20 learners; at school number three, 20 learners; and at school number four, 22 learners. These learners were competent in basic word processing, spread sheet skills, e-mail skills and web search techniques. The six learners selected were also part of the focus group interview, in which I took the first two volunteers from three schools.

Table 2 below shows learners and schools selected:

| School | Number of learners in class |
|--------|-----------------------------|
| 1 | 20 |
| 2 | 20 |
| 3 | 20 |
| 4 | 22 |

Table 2 Numbers of learners selected for my sample

4.5 Data-Collection Techniques and tools

Data-collection techniques rely on many sources. Yin (1994) identifies documentation, archival records; interviews, direct observations, participant observation, and physical artefacts. I opted for observation and interviews as data-collection techniques because of their potential to provide the richest data. I conducted one teachers' focus group interview, and one focus group interview with learners, because evidence of experience and knowledge can easily be missed when only quantitative methods are used (Morse and Richards 2002). These were semi-structured interviews because, according to Morse and Richards (2002), open-ended questions allow an individual time and space in which to

discuss perceptions and knowledge. The inclusion of these interviews was an attempt to make meaning from individual accounts and experiences. The tools used to collect data were an observation schedule (Appendix D), an interview schedule for each of the two semi-structured interviews (Appendix E and Appendix F and a questionnaire (Appendix G)

I will now discuss these techniques and tools in more detail.

4.5.1 Observation

I employed observation as a data-gathering technique during both phases of the training, in the actual training sessions and the lesson evaluation. During the training session my observation was covert because of its benefits. In covert observation, people are more likely to behave naturally as they do not know that they are being observed. Taylor-Powell & Steele (1996) further point out that observation provides the opportunity to document activities, behaviour and physical aspects, without having to depend upon people's willingness and ability to respond to questions. I also gathered information as a facilitator; I collected and recorded as much information as possible. During the training I assumed the roles of participant, observer and facilitator. The facilitator checks the training pace, whether techniques are working and summarises periodically, and at the end of lesson (Cyr and Haskell 2007). Both observation and facilitation roles began from day one and extended to the last day of the training. During the early stages of the training my role was that of interacting with participants, and explaining certain concepts, since this exercise was different from computer literacy exercise.

What was observed?

During the first phase of the training I observed the process of developing the lesson, which took place over the entire 5 days of training; the preparation and the showcasing of the lesson for critique and peer review. While teachers were working, I observed how they integrated ICT into the lesson they were developing, and how they applied knowledge and skills gained during the course of the workshop. Data were further collected by recognising and noting the teachers' behaviour and attitude during the evaluation session. Creswell (2003) suggests that an observational protocol for recording should be used. To record my observations I thus used a single page with a dividing line down the middle to separate what I observed, as well to be able to make my notes. The observation during the training session was not necessarily for data-collection purposes. All 22 teachers' lessons were presented and critiqued during the training session, because everyone was supposed to take a lesson back to school and use it as a stepping stone to designing their normal daily ICT lessons in their respective schools.

The second phase (in term 3) of my observation was the teaching of the revised lessons to learners at school. Two teachers excused themselves from participating in this session, because they had other pressing commitments; hence the number dropped to 20. These 20 teachers were the same teachers who had been part of the first session. From this group I selected 6 teachers for my interview, because these six form part of the current ICT Solution Project for the MEC of Education in KwaZulu-Natal. The project has provided the schools with data projectors, desktop computers, laptops and interactive whiteboards. To allow the teachers to collaborate effectively, 4 schools which were within close

proximity to each other, were included, divided into 4 groups of 5, each group to present one lesson. I therefore observed 4 lessons. This observation was the continuation of what had transpired from the training session. It had the effect of allowing me to make a claim about my training intervention. As an observer I recorded the following activities using the check boxes and written notes:

Class organization and how students were working: I wanted to see whether learners were working alone or collaboratively, in pairs or as a whole class. The expectation was that the teachers should be able to use grouping in a flexible way, so as to take advantage of the particular lesson and technology available.

Teacher role, what this was: I recorded whether the teacher was directing learning, and whether he or she did most or all of the talking.

Students' use of research tools: Considering whether they gather information from internet search engines and internet websites. To see whether students used technology research tools to locate information independently or collaboratively; and to discover whether students selected information under the teacher's guidance.

During the evaluation session I used the observation recording sheet shown in (Appendix D) to record my observations. This observation schedule centred on discovering whether the lesson designed displayed the necessary processes of collaboration and effective integration of ICT.

4.5.2 Interviews

4.5.2.1 Focus Group Interviews (Teachers)

In addition to observation, I used an interview as a means of collecting data. This is in keeping with the view of Bogdan and Biklen (2003), that interviews may be used either as the primary strategy for data collection, or in conjunction with observation, document analysis, or other techniques. McMillan and Schumacher (2010) are of the view that a variation of an interview is the focus-group interview. A focus group allows the researcher to collect qualitative data. However, unlike interviews in which data is collected by one-on-one interactions, focus groups provide data about a researcher's topic through small group discussions. Focus groups became an excellent method of obtaining opinions on programmes and the research topic. The focus group allows the respondents to interact with the researcher in a social way (Holstein & Gubrium 2003). Babbie (1998, p. 248) attests to the "use of focus group that it helps to bring out aspects that the research may not obtain from interviews with individual respondents". Merriam (1998) further adds that a focus group interview results in a rich and holistic description of a phenomenon offering insight.

In my research, I used an interview schedule (see Appendix E for teachers and Appendix F for learners). Hesse-Biber and Leavy (2006, p. 126) describe an interview schedule as "a set of topical areas and questions that the interviewer brings to the interview". The intention of the schedule I selected was to organise and highlight key areas which I

needed to explore regarding the impact of technology after the training intervention. Creswell (1998, p. 123) mentions that the researcher should “determine the place to conduct interviews”. The researcher ensured that the focus-group interviews were conducted in a convenient location with some degree of privacy. A conference room in one of the districts was an appropriate place at which to conduct focus group discussions. Because of its situation it was quiet, and free from any form of interruption. The focus-group discussions took place after the completion of the evaluation sessions. I outlined the purpose and format of the discussion at the beginning of the session in order to set the group at ease. I held a focus group discussion which had targeted six teachers whose schools had received ICT equipment, as outlined in the KwaZulu-Natal’s MEC for Education ICT Solution pilot project. These were the same teachers who were part of the training programme. As a researcher, I facilitated the discussion by posing the following questions

- **Did you feel that you gained knowledge of how to integrate ICTs into your practice?**
- **What aspects of training do you feel helped you most to design and implement the lesson?**
- **Do you feel your pedagogy has changed as a result of this training? If so, why?**

The intention was to establish whether my training intervention would assist teachers in planning and implementing a lesson in which ICT was effectively integrated. The protocol suggested by Creswell (2003, p.190), where an interview protocol includes a “heading, instruction and key research question”, was adopted. This included having

freedom to choose the sequence and wording of the questions as the interview progressed (McMillan and Schumacher1989). During these focus group discussions, I allowed the flow of ideas, so as to allow participants to provide as much information as possible. This was important in the study because it enabled me to draw conclusions as dictated by my main research question. I also used probing techniques to solicit views, ideas, and other information.

4.5.2.2 Learners' Focus Group Interview

The six learners selected for an interview belonged to schools which were also registered on the MEC's ICT Solution pilot project. I had an interview with learners during the day after the evaluation sessions. The learners' discussions were not compulsory; however, they were encouraged to contribute. The learners' interview question was:

Do you feel your learning was improved by the integration of ICT?

According to Patton (1990, p. 348) "a tape recorder is indispensable". I recorded the teachers' focus group interview discussions. In response to Lincoln and Guba's (1985) caution, I also made notes using pen and paper in case of technical failure. The teachers' and learners' focus group discussions were transcribed verbatim and analysed.

4.5.2.3 Questionnaire

A third mode of data collection was a questionnaire which was given to teachers to complete after the training session. (See Appendix G). Unlike the showcase feedback form (See Appendix B), which was also given to teachers on the last day of

the training, to allow them to return to their schools and use responses given to strengthen their developed lesson before the evaluation session took place, the questionnaire was strictly for data collection. Using the post-training questionnaire, I wanted to evaluate whether the teachers received the opportunity to practice collaboration, experiencing collaborative learning and integration. The questionnaire took the participants twenty to twenty-five minutes to complete. I personally ensured that all twenty-two forms were collected, in order to guarantee a good return.

The related literature on the effects of the post-training evaluation is consistent. It emphasises that measuring the training effectiveness through evaluation underpins “the success of any organisation” (Philips, 1997, p.40); Sheppard, 1999 & Stone and Watson, 1999). Stone & Watson (1999) focus on post-training evaluation as something that provides answers to the questions of “do we implement or repeat a program or not?” and “if so, what modifications should be made?” Consistent with the view that these questions are important, Pearlstein, (2008) found that for evaluation to yield good results, it is essential to word the question correctly. Pearlstein (2008) regards asking several questions and deciding what to do with the answers as the wrong way to evaluate, as opposed to thinking out questions that the researcher needs to answer, and identifying the information needed to answer those questions appropriately.

The post-training questionnaire was administered to teachers immediately after the training session. As stated above, of the 22 teachers eligible for completing the questionnaire, 22 returned the questionnaire. Teachers were asked to complete the questionnaire without collaborating with colleagues. Teachers received identical questionnaires. The core of each question was used to compare pre- and post-

implementation questionnaire scores. I use the term core, because the comparison also provided me with one way in which to evaluate how strong the design elements included in the programme was perceived to be. This is what will be discussed at length in the following chapter.

In addition to questions which provided comparisons, there were three other questions that appeared in the post-training questionnaire (questions 1, 3 and 4). These were questions on opinions, which also focused on important elements to be included in the ICT training intervention. For example, one question asked teachers to choose the areas (due to their involvement in my training intervention) that they felt described the technology intervention in which they had participated. Such data provided the opportunities to evaluate whether there were weak areas or elements that needed strengthening before the lesson evaluation.

I chose both open and closed questions for my questionnaire because, according to Miller (2011), both closed and open questions are appropriate in different contexts, and provide different kinds of information. Stacey (1969) adds that closed questions are those where alternative replies are known, while open-ended questions are those which explore a process.

With all this in mind, I gathered as much data as possible, which would presumably, after the intervention, respond to my main research question: Does my technology-training integration enable teachers to design and implement a lesson in which technology is effectively integrated?

4.6 Data Analysis

Data analysis is the process of moving from raw data to evidence-based interpretations that are the foundation for a published report (Creswell, 1998). In qualitative studies, the goal of data analysis is to find themes, trends and similarities within the group that explain the study (Greeff, 2002). De Vos (2002, p. 340) describes data analysis as a process of bringing “order, structure and meaning to the mass of collected data”. In the context of this study, data was analysed by using simple content analysis, as outlined by (Strauss & Corbin, 1990 and 1998). Simple content analysis is a technique of gathering and analysing the content of a text, where content refers to words, meanings, symbols, ideas and themes that can be communicated (Neuman, 2000). The orderly steps used for analysis were those outlined in (Lincoln and Guba 1985). All data, including that from interviews, participant observations, and the post-training questionnaire, were divided into individual units consisting of complete thoughts. The data was then coded. Once coded, these individual units of data were analysed and grouped by category. Each category was assigned a label, thereby distinguishing different categories. This will be thoroughly described in the next chapter.

4.7 Methodological Norms

Various means of data collection, which included observation, interviews, and a questionnaire, were used to collect data. The same sources were used to measure the reliability and validity of the study. Without having to entertain the debate on reliability and validity, where the literature indicates the reliability and validity being rooted in a positivist perspective, and advising that this should be redefined for their use in a

naturalistic approach (Golafshani, 2003), as a researcher I was only interested in how these two impacted on the study.

4.7.1 Reliability

Durrheim (1999) defines reliability as the dependability of a measurement instrument, the extent to which the instrument yields the same results on repeated trial. Merriam (1998, p. 206) further adds that reliability is conceptualised in terms of how reliable, accurate and precise the research tools or instruments are: “whether the results are consistent with the collected data.” To try to align the study with reliability, the research questions, which are one of the important features of the research, as well as interview questions, were peer-reviewed, so as to counteract any level of ambiguity and to ensure that I was on the right track. For example, one of the secondary research questions (which aspect of training do you feel helped you most to design and implement the lesson?) and its expectation was made open to the participants. The questions on the feedback form were used in some of the interview questions. Given the fact that, when participants feel threatened, it becomes very difficult to solicit any information; before they could be part of this study, participants were informed about what to expect. Furthermore, they were allowed to express themselves in the interviews in any language with which they were conversant.

4.7.2 Validity

Validity concerns the accuracy of the questions asked, the data collected and the explanations offered. Generally, it relates to the “data and the analysis used in the research” (Denscombe, 2002, p.100). Although some qualitative researchers have argued that the term validity is not applicable to qualitative research, at the same time, they have realised the need for some kind of qualifying check for their research. Creswell & Miller, (2000) suggest that the validity is affected by the researcher’s perception of validity in the study and his or her choice of paradigm assumption. Researchers such as Davies & Dodd (2002); Lincoln & Guba (1985); Seale (1999) and Stenbacka (2001) have developed their own concepts of validity, and have often generated or adopted what they consider to be more appropriate terms, such as quality, rigour, and trustworthiness. I used multiple-data collection techniques (observation and interview), and a post-training questionnaire as an instrument) to allow triangulation of the findings. The fact that the researcher used several methods in obtaining data is an indication that the results could be used as a yardstick to measure validity and accuracy. Triangulation allowed the researcher to achieve a higher degree of validity, credibility, and research utility (Sarantakos, 2005).

4.8 Ethical Considerations

4.8.1 Informed Consent

In order to prevent any form of harm to the participants and to obviate bias, I upheld the ethical guidelines that sought to protect the study participants. According to Strydom *et al.* (2002, p. 62), “[e]thics are a set of moral principles that are suggested by an

individual or group, are subsequently widely accepted, and offer rules and behavioural expectations about the most correct conduct towards experimental participants and respondents, employers, sponsors, and other researchers, assistants and students.” In order to ensure that the researcher’s actions are deemed ethical, participants must provide informed consent to participate (Henning et al., 2004). Strydom *et al.* argue that participants’ informed consent is required at two levels, namely, the utilisation of the research findings; their privacy, and sensitivity; and how these will be protected. Participants were given a letter (Appendix H) in which the points below were made clear to them. Consent forms stating the reason for conducting this research were signed by all relevant stakeholders, including the one for educators and for learners’ parents.

4.8.2 Risks

Participants were informed that it was unlikely that they would experience any physical, psychological, or social risks. If they felt uncomfortable or experienced any problems owing to participation in the project, they were free to withdraw at any time, without any negative consequences.

4.8.3 Participants’ rights

Participation in this study was voluntary, and participants were free to withdraw at any time. Participation or withdrawal was not going to affect any rights to which participants were entitled. This information is given in the content of the consent form.

4.8.4 Benefits

There would be no material benefit to teachers who participated in the project; however, they would develop their competence in using ICTs in teaching. Current and future students were going to benefit from the insights they were to gain, and the district was to benefit from their increased knowledge base.

4.8.5 Confidentiality

The participants were told that no information about the research would be shared outside of the research team and that the information that I collected from the research would be kept confidential. Participation in the study was confidential, and all information was written in such a manner that participants could not be identified. Both their first and last names were replaced by pseudonyms in the transcription, all notes, and the final report. All video tapes and audiotapes were destroyed once the transcription was complete. In the interview, participants were referred to as respondents 1-6 and learner 1-6, respectively.

4.8.6 Financial Implication

Participants would not incur any costs, nor would they receive any remuneration for their participation in the study.

4.9 Wits University Ethics Committee Approval (Appendix I)

The research proposal was reviewed and approved by WITS University's Ethics Committee, whose task it is to ensure that research participants are protected from harm.

Should participants wish to find more about WITS University Ethics Committee, the contact details shown below were provided

ADDRESS:

27 St. Andrews Road

Parktown

2193

TELEPHONE NUMBER: 011 7173359

Since South Africa has 11 official languages, participants were allowed to express themselves in a language with which they were conversant. They did just that, while others opted to code switch now and then. I was comfortable with the developments because I am also well acquainted with their home language (isiZulu).

4.10 DoE Provincial Research Permission: (Appendix J)

In the province of KwaZulu-Natal, any individual wishing to pursue any line of study must seek permission from the Head of Department. They must complete an application form in which they outline their proposed research title, provide a brief proposal outline and description of their methodology, including sampling procedures. After I had followed these procedures, the Department of Education gave me permission to conduct the study.

4.11 Summary of the Chapter

This chapter served to elucidate the manner in which I designed and conducted the research. Included in this chapter was a description of the participants; data collection

instruments; and the methodology that was used was also outlined. Chapter Five presents and discusses the research findings from the data collection of the observation, interviews and post-training questionnaire. It thereafter presents and discusses my interpretation of findings, as they relate to the research question that underpins this investigation: Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated?

CHAPTER 5. Presentation and Analysis of Data

5.1 INTRODUCTION

The aim of this chapter is to present the data that were gathered and which address the main research question and the five secondary research questions stated in Chapter One. To analyse the data I followed Strauss and Corbin's (1990) method of sample-content analysis. Lee and Fielding (2004, p. 533) suggest that data gathered from the field in the form of interviews and observation should be transcribed into textual form. Following this advice, the data was transcribed exactly as expressed by the participants. There were instances where the information needed translation, because some participants code-switched during the interview. I took the transcribed data back to them to verify whether what was written was what they had said and meant. All participants agreed that I had captured their responses accurately.

5.2 Findings from each of data-collection instruments

5.2.1 Post-training Questionnaire

As noted in Chapter Four, all teachers were asked to complete the questionnaire (Appendix G) at the end of the training programme, and all twenty-two participants in the training did so. The questionnaire was designed to gauge participants' views of the value of the programme in helping them develop the knowledge and skills needed independently to integrate ICTs effectively into their teaching practice. The questions on

the questionnaire and the weighting of responses on each of the statements related to each question are shown in Tables 3; 4; 5 and 6 below. Discussion is provided after the presentation of the data related to each question. The questions are organised into four topics. The first question looks at the technology training intervention in which the teachers participated; the second question relates to teachers' readiness to undertake ICT activities; the third is a rating of their ICT skills; and the fourth is a rating of their ability to use ICT skills in the classroom. I conducted analysis on the post training questionnaire data, because it also held comparisons. Such comparisons would be valuable; assisting to support conclusions on the main research question, once the training was completed.

Data collected from the first question is displayed in Table 3 below:

Question 1: To what extent do the following statements describe the technology training intervention you participated in? In other words, how strongly are these design elements perceived to be included in the programme?

These were intended characteristics of the training programme. There was strong focus on integration and collaboration. This question asked participants to describe the technology training intervention they had participated in. In this section I was checking the match of what the training programme had accomplished against what I had intended to achieve, because these elements are important. I wanted this information because it was important that I equip teachers appropriately.

| | Not at all | Small Extent | Moderate Extent | Great Extent |
|--|-------------------|---------------------|------------------------|---------------------|
| Focused on integration | | 1 | 10 | 11 |
| Provided teaching strategies | | | 14 | 8 |
| Illustrated effective uses of technology | | | 13 | 9 |
| Provided opportunities to collaborate | | | 16 | 6 |

Table 3 Responses to Question 1

Training Focused on Integration

In this question I looked at how teachers rated the statements given to them. 95% of teachers said that the programme did focus on integration to at least a moderate extent, while only 5% said that it focused on integration only to a small extent.

This finding means that this element was recognised by teachers as being present in the training programme. This confirmed that I had included this element in the programme. It suggested that teachers would have developed understanding and competence in this area. I had achieved my intention in terms of the design of the training programme; I hope that teachers would have learnt something from it and that this would stand them in good stead in the future.

Provided Teaching Strategies

Even though data from this part of the question revealed that 63% of teachers (Moderate Extent) viewed my training intervention as providing teaching strategies, only 37 % considered that my intervention did so to a greater extent.

The questionnaire findings indicated that the teachers had more or less similar perceptions about the intervention provision of teaching strategies. This was a good sign in that the literature emphasised that the training should demonstrate ICT teaching strategies for improving teaching integration (Abuhmaid, 2011). This was an indication that teaching strategies provided in the training intervention could lead to changes in the strategies teachers employed, such as teacher stand up lecturing; and the strategies could increase the repertoire of these participants.

Illustrated Effective Uses of Technology

Teachers, who reported positively, 59% (Moderate Extent), thought that the training intervention illustrated effective uses of technology; while 41 % considered that the training intervention illustrated effective uses of technology (Great Extent)

In this respect it seemed that my training programme had succeeded in changing teachers' perceptions; and I hoped that in future the classrooms would be transformed into learning communities, making it "possible for many more people to be a part of the learning process in an open and continuing dialogue." (Riel, 1998, p. 9). This change of behaviour was important in the sense that changed perception is a positive characteristic and attribute of a good training programme.

Provided Opportunities to Collaborate

To accommodate the significant role of the computer in the classroom there must be a number of changes in the role of the teacher. The teacher must be a facilitator of cooperative learning, by involving students in real problem-solving. It is interesting to note that 73% (Moderate Extent) of the teachers were confident that the training intervention provided opportunities to collaborate. On the other hand, only 27% (Great Extent) showed that the training provided opportunities to collaborate.

Given the importance of collaboration in ICT integration I felt that this aspect was a shortcoming in my intervention. If my intervention were to be replicated, it would be imperative for this aspect to receive more attention.

Overall, the responses showed that all but one of the participants felt that the programme had focused on integration at least to a moderate extent; had provided teaching strategies at least to a moderate extent; had illustrated the use of technology; and had provided opportunities to collaborate to this extent. This suggests that, apart from one person who had responded that the programme had focused on integration only to a small extent, participants recognized as integral to the programme the key elements around which I had designed it. The focus on integration was clearly strength of the programme, with 11 respondents of the 22 feeling that to a great extent that this had been a focus. Although I had attempted to build in opportunities for collaboration, only 6 teachers felt that the programme had done this to a great extent. Given the central role of collaborative learning highlighted in the literature by writers such as Baker, Gearhart and Herman (1994) this is clearly an aspect of the programme which should be strengthened in future.

Similarly, it may be that there is a need to build into the programme a wider range of teaching strategies and examples of the effective use of technology. Question 2 considered the extent to which teachers had felt equipped to offer certain key activities to their learners both before and after the training. The data shows these findings, and also the differences in the responses to the before and after components of the question.

Question 2: How well prepared do you feel you are able to do the following activities with your learners?

| | Before the Training | | | | | After the training | | | | CHANGE IN RATINGS | | | |
|---|---------------------|----|----|----|--|--------------------|----|----|----|-------------------|-----|-----|-----|
| | NW | SW | MW | VW | | N W | SW | MW | VW | NW | SW | MW | VW |
| Implement method of teaching & independent work by learners | 1 | 13 | 8 | | | 1 | 10 | 11 | | -1 | -12 | +2 | +11 |
| Integrate technology into subject | 1 | 15 | 6 | | | 1 | 15 | 6 | | -1 | -14 | +9 | +6 |
| Support learners using technology. | 1 | 15 | 6 | | | 1 | 15 | 6 | | -1 | -14 | +9 | +6 |
| Evaluate learners' technology-based work | 1 | 16 | 5 | | | 1 | 16 | 5 | | -1 | -15 | +11 | +5 |

Table 4 Responses to Question 2

NB: NW (not well); SW (somewhat well); MW (moderately well); VW (very well)

The key elements noted here were the positive shifts in all categories; and the fact that there was no one who, after the training felt he or she could do any of these tasks ‘not well’. At least 5 people responded ‘very well’ to each sub question; with 11 in this category for the first, whereas before, no one had felt that he or she could do anything of these tasks ‘very well’; therefore the training was perceived by everyone to have made a positive difference to their competence in these four aspects. Areas where impact was perceived to have been greatest were noted. The responses affirm that the

course was perceived as having value in developing competence in these four key components of ICT integration.

Teacher

“Yes, I am now able to utilise various sites and check the authenticity of websites. Fortunately I was already using ICT, but the training opened my eyes even to using software I was not using or familiar with”

The positive ratings for these aspects of the training were important, because they were an indication that teachers felt that they had knowledge of these processes; these being key elements for teachers to be able to integrate.

Question 3: Will the ideas and skills you learned from the technology training intervention help you successfully integrate technology into your learners’ activities?

| Probably not | Definitely not | Probably | Definitely |
|-------------------------|-----------------------|-----------------|-------------------|
| | | 10 | 12 |
| Optional comment | | | |

Table 5 Responses to Question 3

Question 3 is related to participants’ views as to whether they had learnt to integrate ICT activities into learners’ activities. More than half felt they definitely had; no one felt they had not. This suggested that the perception was that the programme had achieved this intention. Further, the factor of the skills of the teacher in using the hardware and the software is critical, with the teacher needing to feel confident and in control (Cradler & Bridgforth, 2002). Positive results from the data showed that teachers believed that the

skills learnt from the training intervention would help them to integrate technology into their learners' activities.

As a researcher, I found consistency within the published literature and data response I obtained from these teachers, which predicted successful ICT training intervention. The data in table 5, specifically 'probably' (45.4%) and 'definitely' (54.5%), did not only provide quantifiable measures, it also captured something important in relation to the original secondary research question, namely, "Did the teachers feel they gained knowledge of how to integrate ICTs into their practice?" The teachers did indeed acquire the knowledge and skills which could enable them to design a lesson in which technology is effectively integrated; thus integrating technology into their learners' activities. Linking these responses to the secondary research question (1), 12 participants replied 'definitely'; the rest said 'probably'. This suggested that my teacher intervention had helped them to acquire knowledge. Participants acknowledged that they had gained confidence since acquiring this learning. They comprehended the knowledge and felt that it would stand them in good stead in the classroom. Table 6 below shows teachers' rating of their ICT skills before and after the training programme.

| | Before the Training | | | | | After the training | | | | CHANGE IN RATINGS | | | |
|---|---------------------|----|----|----|--|--------------------|----|----|----|-------------------|-----|-----|-----|
| | NW | SW | MW | VW | | N W | SW | MW | VW | NW | SW | MW | VW |
| Implement method of teaching & independent work by learners | 1 | 13 | 8 | | | 1 | 10 | 11 | | -1 | -12 | +2 | +11 |
| Integrate technology into subject | 1 | 15 | 6 | | | 1 | 15 | 6 | | -1 | -14 | +9 | +6 |
| Support learners using technology. | 1 | 15 | 6 | | | 1 | 15 | 6 | | -1 | -14 | +9 | +6 |
| Evaluate learners' technology-based work | 1 | 16 | 5 | | | 1 | 16 | 5 | | -1 | -15 | +11 | +5 |

Table 6 Rating of teachers' ICT skills

NB: P=poor; F=fair; G=good and E=excellent.

This had to do with participants' competence in using ICT skills. My programme also gave participants the opportunity of developing these skills. The literature emphasises that teachers must be confident, and competent in using all ICT tools and techniques.

It would have been unfair to consider only the data in tables 3 to 5 as a yardstick by which to measure teachers' level of ICT competency after the intervention. The data in table 6 revealed the shift in teachers' feelings post training. Their skills were now excellent, while before the training no one rated their skills excellent. One important aspect shown in the table was that the programme did much to develop skills; fifteen participants rated themselves as having poor skills on 3 of the 5 aspects I asked about before the training, while no one felt they had poor skills after the training. It must be noted that this had not been the main focus of the training; however, it was clearly an essential component.

The results of the data on Phase 1 (the training session) were insufficient to allow me to make a claim about whether my technology training intervention enabled teachers to design and implement a lesson in which technology is effectively integrated. This had to be complemented by Phase 2 (evaluation session).

5.2.2 Lesson Observation Schedule

The lesson observation sheet enabled me to present and analyse data from my evaluation session, as shown in table below. Only four lessons were observed; the reason for this is fully accounted for in the methodology section.

The table shows that in all four lessons that I observed, the teachers were able to plan good integration of technology into the lessons. He or she illustrated effective uses of technology with learners. The fact that, as shown in the table, teachers supported learners in using technology in their schoolwork, suggested that teachers also generally perceived that the training programme was strong in these aspects. This meant that the training programme had been successful in developing these aspects of teachers' competence in ICT integration. My observation led me to believe that anything to do with lesson preparation had been fully successful. However, differences occurred among the teachers when actual lesson implementation took place; especially when they had to illustrate effective uses of technology, collaboration, learner independent learning and evaluation. In the case of independent learning by learner, the dominant role of the teacher had not completely diminished. Literature rates collaboration very highly. I noticed that, even though the aspect of collaboration was dealt with in the training, only 6 of the 22 participants said that the programme offered to a great extent, opportunities for collaboration. This indicates an aspect of the programme that needs strengthening. The collaboration aspects needed training time of more than four days. Were my study to be replicated, it should more adequately address the issue of collaboration. The lesson plan focused on integration of technology. Teachers implemented the lesson as planned. In 3 of 4 lessons they said that they could use technology effectively with learners, and that they could support learners who use technology in their schoolwork. This they demonstrated. The training programme was strong in these aspects. Some participants still felt that they did not have opportunities to collaborate, which was the part which still indicated training programme weakness.

For teachers to show understanding and to put into practice the ICT concepts learnt in the training programme, they were required to design a quality lesson. To determine how well the teachers understood the ICT concepts, I observed a lesson that the teachers had prepared before presenting. For the purpose of this observation, I defined a lesson in which there was consciously planned integration of technology; one that encouraged collaboration, learner independent learning, and which used evaluation of learners' technology-based work. All teachers used a standard lesson-plan template, provided in my training intervention programme; there was therefore no variation in lesson plan format. The checklist I used to evaluate the lessons displayed a dichotomous scale of Yes/No.

The observation was followed by interviews with teachers and learners.

| Criterion | Descriptor: (Yes /No) | |
|--|-----------------------|------|
| | Yes | No |
| Lesson plan focused on integration of technology into curriculum | X, X, X, X | |
| Teacher illustrated effective uses of technology with learners | X, X, X, | X |
| Teacher provided opportunities for learners to collaborate with one another | X, X | X, X |
| Teacher implemented methods of teaching that emphasised independent work by learners | X, X | X, X |
| Teacher supported learners in use of technology in their schoolwork | X, X, X, | X |
| Teacher evaluated technology-based work that his/her learners produced | X, X | X, X |

Table 7 Number of positive and negative responses to observation

5.2.3 Teachers' and learners' focus group interviews

There were two types of interviews, the teachers' interview and the learners' interview. Only 20 of the 22 participants in the training were interviewed because two could not honour the session. Teachers who participated in the focus group interview were teachers who had collaborated and developed a lesson. Only 6 learners were chosen for the focus group interview. These were learners from classes whose teachers had been on the training, drawn from the classes where I had observed a lesson being implemented. They were also registered on the MEC's ICT Solution pilot project.

The interviews were organised so that I could probe other aspects of the training programme, and also strengthen the findings from both the questionnaire and lesson observation sheet covered in Question 1, to enable further evaluation of the training programme package. Because they provide information on the same issue, findings of both types will be combined and discussed as a whole. The open-ended questions utilised during the focus group discussions centred on discovering what the teachers' perceptions were regarding the effect the training programme had on helping them to design and implement the lesson. Throughout the interviews, clarification was continually sought so as to ensure that the participants' perspective was understood. Some of the responses led to in depth discussions on certain questions, while others responses were fairly short. In these interviews, the comments could slot into more than one sub category at a time. This was because many of the comments contained multiple issues within a single comment. Therefore, because this study could not address all issues that surfaced during the interviews, I found it necessary to reorganise and further refine the categories as shown in

data analysis. The discussion below will elaborate on this.

5.3 Categories Derived from Data Analysis

As indicated in Chapter One, this study revolved around the question: Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated? The data came from two interviews, the questionnaire and the observation. The Draft White Paper on e-Education (Department of Education, 2004) is clear on the type of ICT training intervention that must be provided to teachers. It should be a programme that urgently addresses the competencies of teachers to use ICT for their personal work and in their classrooms. This requires a change in teaching methodology and learning, and for teachers and learners to have access to opportunities of creating and presenting new knowledge. I first read the interview and notes from my observation sheet. While reading the interview, I ensured that my language was directed to the level of the participant. In order to code the data correctly, I tried to understand the key words, phrases and ideas from the data; also looking for similarities, consistencies, differences and contradictions Henning, Van Rensburg and Smit (2004) I used a highlighter to identify categories, sub-categories and themes. I analysed the data to the point where it was clear that categories and sub-categories were no longer changing.

Main categories that emerged from the analysis of teachers' responses

- Impact of my training intervention on teachers' roles and teachers' pedagogy; and
- Barriers to effective use of ICT.

Main categories that emerged from the analysis of learners' responses

- Impact of my training intervention on learning and learners' roles.

5.3.1 Impact on Teachers' Roles and Teachers' Pedagogy

The potential of information and communication technology (ICT) to enhance teaching and learning was recognised in my post-training questionnaire and my lesson observation. Links have been made between ICT use and constructivist, collaborative, and inquiry based learning, and also to pedagogical change (Scrimshaw, 2004). The literature suggests that teachers should be in the forefront of using ICTs to improve their teaching. This section shows evidence concerning the change in teaching practices of teachers, and explains the more direct effects of ICT on teachers' motivation, skills and confidence, which in turn affected teaching processes after my training intervention.

5.3.1.1 Impact on Teachers' ICT knowledge and Skills

Teachers taking part in my training intervention were openly positive regarding the use of technology. They were convinced that the knowledge gained was improving teaching and learning in their lessons. The interview descriptions clearly underpinned the positive effect on teachers and the learning situation of the knowledge gained in my training intervention.

Teacher

“Yes, hands-on training was given to us, thereby strengthening our knowledge and skills which will enable us to equip learners with the same skills”.

Teachers taking part in the interactive environment were overwhelmingly positive regarding the use of technology. The overall feeling was that the use of ICT was important because they readily perceived that it would provide an even better learning environment, in their mentioning of these search engines

Teacher

“New websites such as Twiddla, Scratch were very helpful”.

The teachers indicated that ICTs can have a positive impact on energising and enhancing their skills and ability. Teachers recognised that their skills had improved and that they enjoyed what they had learnt about websites. This is the important part of the training, mentioned also in the literature. In reflecting on the questionnaire, this aspect had not appeared strong, however, a change of attitude had taken place.

5.3.1.2 Impact on Pedagogy

Still on the issue of perceived impact of ICT on teachers' ICT knowledge and skills, and the impact of this on their pedagogy, one teacher appeared to be unhappy, despite the positive perception of other teachers. The quotation reflected her views on the impact on pedagogy of her training.

Teacher

“I gained knowledge to a limited extent. The training was not to the level of beginners...the pedagogy has not changed that much for reasons cited at the beginning of my response”.

Moreover, after the intervention, another response from the teachers' interview showed that modelling the use of technology has a clear advantage in inculcating teachers' confidence

Teacher

“What one can do is to model the use of technology in a classroom and ask a teacher who are interested to come and observe you in the classroom because they'll see it first-hand how you interact, and see how you use technology as a scaffold.”

Underwood et al. (2006) comment about ICT post training change, adding that transformed teaching is more difficult to achieve, because changes that take full advantage of ICT will only happen slowly over time, and only if teachers continue to experiment with new approaches.

Increased enthusiasm by teachers, and increasingly realised time gains through use of ICT, and more knowledge sharing between teachers, pedagogical gains that directly influence student learning, were visible during the interviews. That kind of development appeared in this teacher's opinion

Teacher

“Exposure to the various ICT interactive tools has shown me how teaching can be made more interesting”.

One of the areas of impact of the training intervention was identified as the change in the roles of teachers. Teachers indicated a willingness to access more information, leading to increased interest in teaching and experimentation, as suggested by (Cradler & Bridgforth 2002); while authors such as Robinson & Latchem (2003) state that modern developments in innovative technologies have provided new possibilities for teaching professionals

Teacher

“My pedagogy has also changed. Although my learners have been using ICT in the classroom, additional programmes such as Twiddla can now be introduced and used in my classes.”

All teachers’ evidence after the intervention pointed to the advantages of ICTs in school as one of the elements that motivate learners to learn. Apparently, teachers’ responses assumed that connectivity is a given, that it was always there; until I noted an observation from one teacher’s interview response. The indirect question this participant asked was:

will there be sustained motivation for learners to learn if there is lack of internet access?
The issue of internet access or connectivity is of concern as one reads between the lines of participants’ responses

Teacher

“Yes, I now have a broad idea of how smart board, social networks and specialised (subject focused e.g. GeoGebra) software could be used. Potentially

my pedagogy has changed because I can now draw on a broader range of methods to deliver a lesson. I worry though that the enabling environment might not always be there, e.g. the computer will require an Internet”.

The ideas and comments that are highlighted under this category are statements that link to a change in teachers’ methodology once the training was finished

Teacher

“My methodology will be enhanced by the proper use of technology and initiatives we were exposed to in this workshop”.

5.3.1.3 Impact on Teachers’ Ability to Plan

Research shows that lesson planning is crucial when using ICT. The effect of the training intervention on teachers’ ability to plan was obvious when the following research question was asked

➤ What aspects of training did educators feel helped them most to design and implement the lesson?

Teacher

“Preparation on technologies lesson planning is the key. Just now I underwent a five-day intensive training programme and learnt so many things that

were superficial before, because you have to save, to go and read, you learn how to acknowledge the source, which was a kind of drenching workshop. After days it was as if you had been there for the whole year, but you were so enriched with a skill and with everything you had learnt.”

One teacher emphasised the importance of drill:

Teacher

“Practise and practise; and once teachers have learnt a skill; this can never be taken away from him or her. We must allow teachers to make their own meaning during and after the workshop.”

Another participant stressed the importance of an enabling environment, interaction and collaboration:

Teacher

“An enabling environment for teachers to engage in computer use or technology, interaction in the classroom whereby we were involved in discussion, helped me.”

If these aspects of training that helped teachers design and implement the lesson are anything to go by, the post training intervention time would help the balance of control; and the roles are likely to shift towards student participation with the use of ICT to support learning processes, as one teacher noted

Teacher

“Technology is a powerful persuasive kind of way of expressing learning; learners will learn beyond what I taught them. Technology use and integrated into teaching and learning, especially learning on the student side will now constitute a framework that can enhance learning for the student”.

5.3.2 Impact of my Training Intervention on Learning and Learners’ Roles

ICT is most effectively applied when viewed as integral to teaching and learning by both learners and teachers (Department of Education, 2004).

5.3.2.1 Impact on Learning

The weight of evidence showed that there was a significant positive impact when using ICT on teaching and learning. The data collected showed that pupils and teachers considered that teachers’ use of ICT after the training intervention had a positive impact on pupils’ learning.

Teacher

“I designed a set of slides to show what eats what in a food chain and the learner there could see visual pictures, it brought reality into the class they could see the locust, they could see the grass and so the computer there did enhance my teaching because I scaffold the learning using this powerful visual purposeful persuasive element in that technology to enhance the reality because if I draw

the locust on the board it was going to take long”

This corresponds with the findings from the learner interview.

Learner

“This is very likely that our learning will be improved since we, as learners, are always excited by the ICTs whether formally or informally”

This finding indicated that learners found lessons more exciting and effective than before, which added an advantage in teaching and learning situation, learners not always being easily motivated to learn. In line with this observation, teachers from this training intervention were becoming more and more convinced that the educational achievement of pupils can improve through the use of ICT, even in deep rural areas

Teacher

“I realized the visuals can also assist learners in terms of the bundus (deep rural areas) where may be the question paper will be set talking about the train which the learners have never seen before where the learner is expected to answer the question, so if the educator can use visuals or video which have that train or whatever that is being ask in the question paper it will make it easy for the learner to understand better because of this exposure”

Overall evidence and feeling from both teachers’ and learners’ interviews shows that the correct use of ICT improved learning; however, these opinions cannot be taken at face value, because other factors contribute to learning, such as student attitude and motivation, as discussed below.

5.3.3 Impact on Learners and Learner Roles

Drawing conclusions from the observations sections above, it was clear that motivation and concentration were variables that influenced the learning and learner roles after the intervention.

5.3.3.1 Motivation and skills

The learner showered the use of Twiddla with praises.

Learner

“...lesson was interesting and therefore we were encouraged and our learning was enhanced. The less active learners if ever there were these, were also involved when we used Twiddla”

The overwhelming responses after the intervention featured internet access, which must be prioritised by the national Department of Education. This would be living up to its promise of e-Education, in which it states that it will connect learners and teachers to better information, ideas and to one another via effective combinations of pedagogy and technology (Department of Education, 2004). The effect of motivation on the use of ICT after the intervention was a common factor in teachers' and learners' comments in both interactions. This may be linked to a shift in pupils' attitudes, learner roles, and to their greater involvement in learning. When the learners were asked;

➤ **Do you feel your learning was improved by the integration of ICT?** The learner

responded.

Learner

“Absolutely; my learning was improved because we are digital natives it’s easy to follow. Today I even noticed that my teacher was full of confidence”

Another learner added:

Learner

“...lessons will be more exciting and more effective. My learning will forever be improving with more and more use of these ICTS)”

The influence of the intervention is seen as transforming the classroom into a learning community; making it possible for many more people to be a part of the learning process in an open and continuing dialogue. The interactive content on social networks such as Twiddla, Twitter, GeoGebra in Maths, and Scratch was engaging for both learners and teachers during the lessons. The excitement and change in learners’ roles was also expressed when teachers had to respond to question such as

➤ **What aspects of training did educators feel helped them most to design and implement the lesson?**

Teacher

“Exposure to social networks-Twiddla, Facebook, Twitter, Drop box, Smart Board, Microsoft Surface and relevant software e.g. GeoGebra for maths. This exposure to the various ICT interactive tools has shown me how teaching can be made more interesting”

Learners themselves considered that they paid more attention in class after their teachers’ training intervention. ICT was seen as increasing pupils’ confidence and motivation, by making school work more enjoyable. Their attitude and roles had also changed. Learners were able to reflect on what they had done and how they had done it, which had been a missing link in our teaching and learning school scenarios.

Learner

“You know, there was much, much improvement in the way teaching and learning was perceived and the ways how we use ICT for learning. If we face a challenge we were able to engage our teacher then we get a response at once”

Teachers also noted the value of ICTs in allowing learners to work at their own pace. All teachers on my programme were given exposure to different interactive social networks. They had the following reflections:

Teacher

“For me it was Twiddla, Twitter, PowerPoint and Facebook that allowed my learners to work at their own pace; there’ll be no unnecessary interference”

These feelings were corroborated by one teacher who further stated that, after this ICT training

Teacher

“ICT will be used to provide learning experiences when and where they are needed, allowing students to progress at their own pace.’ Technology can be used successfully by teachers to give students feedback that is more timely and more individual”

There were four LSEN learners included in one of the classes I observed. The comments received about learner independent learning centred on the advantages of the use of ICT in independent learning, even for LSEN learners, because individuals or groups of students may work independently of the teacher when ICT is used.

Another benefit of ICTs that teachers identified was the fact that they cater for visual impaired learner. Making reference to LSEN learners in our education system, one teacher noted

Teacher

“I have just realized afterwards (ukuthi amanye ama) that some learners (okuthiwa ama) are called visual impaired learners, so for them to learn best is to see something at a slow pace; so now you can show videos over and over again; (ubabukisa ivideo) they (bayakwazi ukuthi leyonto bayi) can absorb (kalula) easily at their own pace rather than seeing no visual and having to rely on hearing alone. I think in this way, technology helped a lot”

Another teacher felt that visual resources offered by ICTs were valuable in rural context in particular

Teacher

“Visuals can also assist learners in terms of the bundus (deep-rural areas) to work independently at his or her own time and pace. If the educator can use visuals or videos to explain whatever may be asked in the final exam question paper, it will make it easy for the learner to understand better because of this exposure”

This kind of learning experience can help learners with a range of skills and work techniques, assisting them to develop confidence to learn more and to perform better.

5.3.3.2 Team work

An ICT study conducted by ELearning Nordic (2006) states that teachers feel that dialogue and work between students is greater when they use ICTs. Even those shy

learners were confident when they were part of the team.

Teacher

“After this training intervention teamwork also enhanced the interaction in the classroom whereby the learners now had to be involved in discussion”

The study was aimed at establishing whether my training intervention would enable teachers to design and implement a lesson in which technology was effectively integrated. The data collected revealed that teachers felt that they had gained knowledge of how to integrate ICTs into their practice; and that learning had been improved. Clearly, a training programme such as the one I had designed can bring about change in teaching and learning. However, in their interviews, many teachers noted that training alone cannot bring about the required change in ICT integration. They highlighted several barriers that would stand in the way of successful integration, even when teachers had been trained. The barriers identified were broadly divided into three categories, namely Teacher level, School level and Systemic Level barriers

5.3.4 Teacher level barriers

5.3.4.1 Lack of ICT Skill

Cox, Preston and Cox (1999) state that teachers who do not realise the importance and advantages of using technology in their teaching are less likely to make use of ICT. The

training alone, however good it is, is not enough, if the lack of ICT skill is not addressed. The data collected from the interview revealed that the reason for teachers' not using ICT for teaching and learning purposes prior to my intervention was that they lacked ICT skills; there was also the question of mindset change. After the intervention, teachers realised the importance of mindset change and the value that ICTs can add to teaching. My training programme proved that teachers had become aware of the benefits of using ICT; and that strengthened the belief that they would integrate ICTs into their future teaching.

Teacher

“Technology is one of the scaffolds you can use to enhance your own teaching and assist the child making his own meaning; that’s the kind of paradigm shift we need to bring to other teachers - that they need not fear technology”.

5.3.4.2 Lack of motivation and confidence in using ICT

Before the training, teachers felt that their motivational level was low; assuming that limited knowledge makes teachers anxious and resistant to using ICT in the classroom, they had not felt confident. A change did, however, take place. The literature notes also that at times it is not a matter of lack of infrastructure, technical support, access, etc., rather, a lack of motivation and confidence, as one teacher spotted

Teacher

“The use of an enhanced approach to presenting a lesson encouraged me.

Preparing and presenting as a team was very important to me”

Dawes (2000), who wrote *The National Grid for Learning and the Professional Development of Teachers*, concludes that teachers who have little or no confidence in using computers in their work will try to avoid them altogether.

5.3.4.3 Inappropriate Training

There is a great deal of literature evidence to suggest that effective training is crucial if teachers are to implement ICT effectively in their teaching (Kirkwood, Der Kuyl, Parton and Grant 2000). If training is inadequate or inappropriate, then teachers will not be sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in and out of the classroom. Impact ICT Report (2006) states that effective training is crucial if teachers are to implement ICTs in an effective way in their teaching (Balanskat, Blamire, and Kefala 2006). On the contrary, when training is inadequate or inappropriate, teachers are not sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in the classroom.

Teacher

“In some cases you find that there are schools that have computer but not all the educators there are able to use those computers, simply because they don’t have the knowledge; they need to be trained so that they’ll be able to use those computers”

Another teacher added:

Teacher

“I am saying that teachers must be trained as in this model. I think they must be taken by the hand and given a walk in the whole 5 days until the teachers asks to try that on his or her own. Those kinds of workshop are very few and far apart for teachers. We need to have a sufficient number of facilitators who must be approachable”

5.3.5 Systemic Barriers

Sometimes the education system counteracts the effect of ICT interventions, even when educators are not ICT-resistant. One good example is this, where the DoE says, “Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013” (Department of Education, 2004). However, the Draft White Paper on e-Education on the other hand explains how, within the country, the numerous “provinces are still at different levels of ICT integration in education” (Department of Education, 2004).

5.3.5.1 Lack of Incentives for teachers to use ICT

Teachers feel that the DoE should at list give incentives to those who have completed an accredited course via the SETAs, even if not monetarily, but simply to acknowledge that

a teacher has tried to better him or herself

Teacher

“...this laptop initiative is good. It has the potential to change teachers’ thinking, even the mindset. Teachers can view technology in a positive light rather than see it as a thing for (abantu bathize) certain people, not for them. Also, incentives play a great role in motivating the teachers. Our DoE is too economical when it comes to this aspect. It needs to improve greatly”

5.3.6 School-level Barriers

The evidence has shown that my ICT training intervention was helpful. Drawing conclusions from the questionnaire, the data I obtained indicated that people who had felt they were badly off before the intervention, felt more confident after the training. Sadly, it must be noted that training alone is not sufficient. There must also be more change at school level. There are barriers that exist which training alone cannot address. The feeling of the teachers was that, even after receiving basic and pedagogical training in ICT; this was insufficient if teachers still had to face school-level barriers.

5.3.6.1 Limited Access to ICT Equipment

The inability of teachers and learners to access ICT resources is as a result of a number of other factors and not the lack of ICT infrastructure *per se*. As one participant in the training put it

Teacher

“...just a follow-up, but sometimes there is red tape, where at schools you realise that the department installs the computers, 35 of them; there is a lab, but because maybe the SMTs (Senior Management Teams) don’t understand the effect that can be brought about on the school if the teachers can use the computers effectively, you find that the computer lab is the domain for a particular individual. A particular teacher holds the key to the computer lab; the computer lab is open on a particular day for a particular period. Even if teachers want to use the room---even when there are those who have the know-how, they don’t have access to the lab”

In some schools, equipment is stored for ‘safety’ reasons;

Teacher

“Some schools have computers; some teachers have computers, but they are locked up somewhere because of what you have just said there; and that even the computer that is there or your own that you bring to school - there is no recognition from your management that you have an extra skill, where you are given the space to use or borrow the data projector”

5.3.6.2 Lack of high-quality hardware and suitable educational software.

This is a hindrance to further development of ICT education. This idea is supported by Guha (2000), who found that poorly designed software, and a lack of time for teachers to design their own software, often caused teachers to “give up” and choose not to make

use of ICT. In this case, no matter how good the training intervention may be, it cannot solve these challenges.

I set my training programme to demonstrate integration and collaborative learning. I wanted to know whether teachers would learn how to integrate ICTs into their lessons, especially during observation, which was preceded by the training programme. I included those aspects emphasised by the literature as being important in integration and collaborative learning. The teachers were asked to complete a questionnaire at the end of the training (Phase1). The intention of the training programme was to encourage teachers to experience collaboration and obtain exposure to a range of teaching strategies. The questionnaire confirmed from its first set of questions that teachers had collaborated and had observed a range of strategies. My training programme was a good one, although it did not explore whether teachers could already integrate and collaborate; teachers agreed to being shown how to do this. The second set of questions in the questionnaire was linked to the first one. It was about the key requirements for teachers to be able to integrate technology. It was noted from responses that nobody felt that they could do any of this **before** the training, but by the end they felt competent to work in this way. My perception was that they had gained competence on these aspects of the questionnaire with 'Somewhat' having translated to 'Very Well'. On answering the first research question

➤ **Did the teachers feel they had gained knowledge of how to integrate ICTs into their practice?**

The answer to this was in the affirmative. The data from this section confirmed that the teachers had indeed gained knowledge on how to integrate ICTs into their lessons. Of paramount importance was that by the end of the course, all teachers felt that they could perform this task at least 'Moderately Well'. Nobody said that they could perform tasks 'Not Well'. The same trend was found in the final two questions. Teachers felt that integration and collaboration had been experienced. They had gained confidence; they had learnt something; and they understood what they had gained.

Apropos the training programme (Phase1), teachers said that this illustrated the effective use of technology. During Phase1 I was checking the match of what the training programme had achieved against what it was purported to do. I wanted my programme to illustrate certain points. Teachers said that I had in fact illustrated these points; I therefore achieved what I had wanted to achieve in terms of the design of the training programme. During the training programme, teachers had experienced collaboration and integration. This did not, however, translate into conducting such behaviour with learners in class; I was merely modelling integration practices.

The second secondary research question asked:

➤ Did they (the teachers) feel that they had changed their pedagogy as a result of the training?

During Phase 1 it would have been inappropriate to make a claim that teachers' pedagogy had changed as a result of the training. That would only have been possible during my observation, perusing the lesson plan; what teachers did in the classroom, asking them to reflect on what they did in the classroom and listening to what the learners had to say. It

is also incorrect to assume that merely because one has undergone training, this would automatically translate to changed pedagogy. Lesson observation was an important element in making that claim. It focused on integration of technology, the way in which the teachers implemented the planned lesson. My lesson observation encouraged the belief that this section had been well absorbed. Differences occurred among the teachers, however, when lesson implementation took place. Collaborative learning appeared to be the weakest link needing strengthening in my training intervention.

Upon continued reflection and further presentation of and analysis of the post-training questionnaire, especially with reference to the secondary research question

➤ **Did the teachers feel they gained knowledge of how to integrate ICTs into their practice?**

I believed the responses were positive, given the knowledge that teachers had gained. My notes confirmed that knowledge had indeed been gained. I am looking at making improvements and adjustments. The key factor is that by the end of the course, 21 participants felt that they could perform actions at least 'Moderately Well'. Nobody said that they could 'Not (perform) Well'. Teachers had all learnt something. Someone who had answered 'Not Well' had moved at least to 'Somewhat Well'. There was nobody left at the first level. There had been a great shift. This evidence reflected that the teachers had gained knowledge because of what they said and felt before compared with what they felt after the training. Also, by observation, I concluded that my training intervention enabled teachers to design and implement a lesson in which technology was effectively integrated. I noticed during the lesson presentation that their pedagogy had changed, and that they had gained knowledge on how to integrate ICTs; thus answering

my first and second secondary research questions as stated above.

Further analysis from the interviews was conducted to strengthen these findings, as shown below. In order to analyse the data derived from the interviews, I read the interview notes and attended to the data before categorising it. Teachers' and learners' interview categories were separated.

5.3.7 Teachers' Perception

5.3.7.1 Impact on ICT skills

ICT can affect the energising and enhancing of teachers' ICT skills and ability. Teachers recognised that their skills had improved, and that they had enjoyed what they had learnt about websites. This is an important factor, mentioned by the training literature. Effects related to ICT software and the value attached to this. When looking back at the questionnaire, participants said that their skills had not been good then, but now, however, there seemed to be an improvement.

5.3.7.2 Impact on Pedagogy

The teachers responded to the second secondary research question. The information given here from this section of the interview indicated that their pedagogy had indeed changed. This confirmed the findings from the observation sheet and what had earlier transpired from the post-training questionnaire. Literature recommends that training should ensure that pedagogy changes. So that the teachers would be able to integrate technology into their lessons, they needed to make this change. To integrate ICT tools effectively into

teaching and learning practices, teachers must not only learn how to use technology, but must also fundamentally change the way they teach (Fabry and Higgs 1997).

5.3.7.3 Impact on Ability to Plan

Looking at the teachers' interview there was evidence that immediate increases in ICT use in day-to-day work of teachers, such as efficiency in planning and preparation of lessons could be possible after the training. This was an interesting development in the sense that the literature stresses teacher lesson-planning as vital when using ICTs. Collaboration, drill, practice and lesson-planning are important aspects of training they singled out as having helped them to design and implement a lesson and answered the last secondary research question in the process, namely

➤ Which aspects of training did educators feel helped them most to design and implement the lesson?

The literature implies that, where little planning has occurred, learner work is often unfocused; and can result in lower attainment. Learner attainment was not part of my research focus; nevertheless, it should be mentioned in passing.

The secondary research questioned asked:

➤ Did the teachers feel that they had had their pedagogy changed as a result of the training?

The teachers felt that their pedagogy had changed. It was noted, however, that the training and the existence of ICTs do not transform the teachers *per se*. Teachers noted

that ICTs can enable them to transform their practices, given an enabling environment; this was with reference to the barriers to effective use of ICTs.

5.3.8 Learners' Perceptions

5.3.8.1 Impact on Learners and Learning

On the question

➤ Did learners feel that learning had been improved by the integration of ICT?

These quotations show that teachers and learners acknowledged the value of using ICT in the classroom; which is something that had developed as a result of my intervention. As a result of the training, teachers felt that they would use ICT more often. Learners noted the change and the effect on the lessons, after their teachers had been on the training programme. The ICT was viewed as providing a particular benefit for learners in rural areas, which therefore makes remote areas more accessible. The learners' focus group interview also revealed that, after their teachers' training intervention, they had become motivated and attentive when computers and the Internet were used in class. The data showed that abstract concepts were made concrete; videos helped learners to comprehend information with greater clarity. The teacher methodology changed to involve learners more, encouraging participation and allowing them to work at their own pace. For this reason, they felt that the ICT integration had improved their learning.

In conclusion, the use of my short-term intervention to support meaningful learning provided significant information as to how best one may promote teaching and learning.

As the literature indicated, it is not possible for technology to replace the teacher. My

intervention proved to me that the teacher will always have a role in directing the choice of material and the way in which students learn, whether by controlling the instructions, or by providing the learning situations. The two must co-exist; nevertheless it was clear to me that for ICT to be effectively applied when viewed as integral to teaching and learning by both learners and teachers, the teachers' outlook had to change. The need for appropriate training, notable by its absence in certain instances, must be frequently raised, so that those technology-based environments may be realised; in this way enhancing constructive interaction between learners and instructors, enabling them to share meanings and to develop new, more powerful meanings.

5.4 Summary of the Chapter

This chapter presented and analysed the data obtained from observations, the questionnaire and interviews. I used categories to analyse and present data, for instance, the impact of my training intervention on teachers' roles and teachers' pedagogy; and the effect of my training intervention on learning and learners' roles. I noted that teachers acknowledge that training alone is not enough. There were barriers which have implications for integration of ICT into teaching and learning. A process that took teachers through learning about ICT (exploring what can be done with ICT), learning with ICT (using ICT to supplement normal processes or resources), and learning through the use of ICT (using ICT to support new ways of teaching and learning) enriched our learning environment. This feeling was expressed by many participants, who felt that they had gained knowledge of the way in which to integrate ICTs into their practice. Findings indicated that the majority of participants felt that their pedagogy had changed as a result of the training intervention; even learners felt that learning had been improved

by the integration of ICT. Teachers enjoyed collaborative learning and the use of social media; and benefited from the interactive use of social networks such as Twiddla, Facebook, Scratch and Drop Box. When constructing their own learning, they regarded these social networks as one of the aspects of training which helped them best in designing and implementing the lesson, embracing constructivism.

The overall findings of this chapter answered the research question: Does my technology-training intervention enable teachers to design and implement a lesson in which technology is effectively integrated? Data show the ways in which this research question relates to changed pedagogy, knowledge gained, collaboration, and improved teaching and learning by learners. The next chapter will present the summary, conclusion, recommendations for further research, and limitations of this study.

CHAPTER 6. Summary, Conclusion and Recommendations

6.1 Introduction

In the previous chapter, data were analysed, interpreted and presented. In this chapter, an overview of the study is given, conclusions are drawn, recommendations for further research are offered and limitations are identified.

6.2 Overview of the Study

In Chapter One I laid the foundation for the work to be done and gave some background to the research. The government's effort at incorporating information and communications technology into the curriculum must have been necessitated by the belief that ICT has the potential to revolutionise the teaching and learning environment; however, creating effective learning environments with technology remains a challenge for teachers in many schools in South Africa because of the lack of proper training and guidance (Department of Education, 2004). Chapter One also gave a detailed background and explained the context in which the study was undertaken, the rationale and the research question, "Does my technology training intervention enable teachers to design and implement a lesson in which technology is effectively integrated?"

To develop a framework for the research question of the way in which my technology training intervention enables teachers to design and implement a lesson in

which technology is effectively integrated in four districts of KwaZulu-Natal DoE; a review of literature was conducted in chapter two. Informed by the insights gained from my literature review, I embarked on my technology training intervention which was comprised of a training programme (Phase1) and an evaluation session (Phase2) as outlined in Chapter Three. Chapter four looked at the design and methodology and tools used for collecting and analysing of data in the study. Chapter Five presented the data and discussed these in relation to the research questions. I therefore feel the objectives of this Research Report have been realised.

6.3 Conclusion

The Department of Education's Draft White Paper on e-Education policy goal stipulates that participation in the information society means that, "Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013" (Department of Education, 2004, p.17). The achievement of the e-Education goal will require the development of e-schools characterised as institutions that have learners who utilise ICT to enhance learning and competent teachers who use ICT to enhance teaching and learning (Department of Education, 2004). Although the 2013 date seemed to be unrealistic to achieve and meet all these expectations, something had to be done. I designed a short training intervention specifically to meet needs of teachers in the context of my work core responsibilities, in order to help them

develop skills needed for ICT integration, thus supporting the Draft White Paper on the use of ICTs.

The objectives of this study have been realised. The kind of teachers that are envisaged by the Department of Education are those that are mediators of learning, who will provide learners firstly with a dynamic computer-using environment which includes effective communication, problem-solving approaches and responsible use of technology; and secondly, demonstrate proficiency in the use of computers in managing and critically interpreting information. From the combination of literature review and interpretation of data I conclude that the experiences of the teachers and learners who were part of my training intervention reveal that teachers gained knowledge of how to integrate ICT; they collaborated; their pedagogy changed; and learners' learning was improved. Some of the concerns raised, especially by teachers, relate to limited access to ICT equipment. Other concerns highlighted inappropriate teacher training and the moratorium on conducting or attending workshops during school hours. However, in the concluding remarks of the interview we accepted that creation, implementation and monitoring of a school-based ICT policy plan can certainly act as a lever for successful ICT integration. The teachers seemed to be content with the idea of a school-based ICT policy. They hoped the policy would address their concerns. Policy requires that technology be integrated into the overall vision of the school.

My personal observation leads me to conclude that, as a researcher, I have made a start within the limited time I had. I cannot, however, claim that through this short-term

training intervention I have addressed all the requirements of the e-Education policy goal which will turn our schools into centres of quality learning and teaching for the twenty-first century. It is to be hoped that my colleagues in other districts in the province will build on my initiative for further training programmes, so as to create new possibilities for learners and teachers to engage in new ways of information selection, gathering, sorting, and analysis; and to ensure that our children receive high-quality learning and teaching, which will establish the right conditions for ICT in education to flourish in the coming decades, thus supporting the Draft White Paper on e-Education (Department of Education, 2004).

6.4 Recommendations for Further Research

Based on the research findings as outlined in Chapter Four the following recommendations for future actions to achieve greater impact in both areas of teaching and learning were formulated:

Policymakers:

- Conduct a study on how to implement and hasten new forms of ICT continuing professional teacher development (CPTD) in a workplace and as part of a culture of lifelong learning and peer learning;
- Conduct a study to establish whether motivating and rewarding teachers to use ICT will yield good results;

Schools

- Conduct a study on how to integrate the ICT strategy into the school's overall strategies.
- Conduct a study on how to transform positive attitudes towards ICT into efficient, widespread practice.

6.5 Limitations of the Study

Given the number of districts and the sample size I used in this study, the findings as such cannot be generalised as a true reflection of other districts and other samples that might be chosen elsewhere. In other words, the districts chosen cannot be regarded as representative of those that were not there. There are still enormous differences between the districts.

This was a very small sample. The fact that only 4 lessons were observed and very few teachers and learners were interviewed also poses a limitation. I conducted only one observation. Too little such observation and feedback may impede teachers' development over time.

The study depended entirely on interviews, the post-training questionnaire and observations, to gauge the use of technology in enhancing teaching and learning. With opinion-based studies as in my Report Research, caution is needed when interpreting a

perceived impact as opposed to an actual impact of ICT. The study can be longitudinal or replicated quantitatively so as to include other data-collection techniques such as non-cognitive measures that can reveal some interesting characteristics to be generalised.

This research report has been conducted to measure the direct impact of ICT on learning and teaching. It has not been possible to identify a purely ICT effect disentangled from other elements of the learning environment.

6.6 Final Word

Following the evidence I gathered, I designed a programme. I implemented it, and then my data related to it suggested that teachers believed that they had gained knowledge, however, the aspect of collaboration remains poorly implemented. Were I to design this programme again, this would be the section which would attract more of my attention in attempting to strengthen it. This report was not about my training intervention *per se*, but about discovering which aspects of the training have been of most value, so that weak areas could be strengthened before the programme is run to full scale. The data informed me that all was going well; nevertheless there were gaps. Were to run the programme again I would ensure that I afforded more opportunity for collaboration, offering a second visit to schools (follow up) and I should run an afternoon session to strengthen the collaborative aspect. The intention has always been to keep the training short and effective.

Although it has been rightly said that what is wrong with education cannot be fixed with technology; there is no doubt that modern life is dominated by technology. There is

Technology, where the free flow of information via satellite and the Internet hold sway in global information dissemination of knowledge.

If the current profile and distribution of ICTs in schools is anything to go by, already, South Africa is on the wrong side of bridging the digital divide, because it has not made any significant efforts. Observation during the training intervention revealed that educators were not fully ready to use technology to enhance teaching and learning, however, positive changes were encouraging after the training and observation sessions.

The training intervention created opportunities for participants to express not only their understanding of, but their subjective feelings about, the changes and impact this training would have on their attempts to use technology to enhance teaching, learning and assessment.

There is no doubt that computers can aid the instructional process and facilitate students' learning. It is during times like these that the South African government, together with reputable and progressive companies, should develop a new and strong desire to equip schools with computer facilities and qualified personnel necessary to produce technologically proficient and efficient students, who will not only be globally competitive but also be locally responsive.

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APPENDICES

Appendix A: ICT lesson Plan Template

| | |
|---|-----------------|
| SUBJECT : | GRADE/PHASE : |
| TOPIC: | TIME ALLOCATED: |
| <p>LESSON DESCRIPTION: <i>(Write a concise description of what occurs in this lesson.)</i></p> <p>In this lesson, the students.....</p> | |
| <p>CLASSROOM LAYOUT AND GROUPING OF LEARNERS: <i>(Where will the learning take place? How will the room be organised with computers? How will the students be grouped (class group, individual, pairs, small groups, etc.....)?</i></p> | |
| <p>INSTRUCTIONAL OBJECTIVES: <i>(Identification of the specific learning outcomes expected to be achieved at the end of the lesson to the expected level of competency.)</i></p> | |
| <p>MATERIAL, RESOURCES AND TECHNOLOGY:</p> <ol style="list-style-type: none"> 1. Material and Resources for this lesson <ol style="list-style-type: none"> a. Material Item 1 b. Material Item 2 c. Material Item 3 d. Material Item 4 2. ICT Components for this lesson <ol style="list-style-type: none"> a. Computer b. Software c. Network d. Printer d. Scanner e. Other 3. Web Site for this Lesson <ol style="list-style-type: none"> a. Website 1 b. Website 2 c. Website 3 d. Website 4 | |
| <p>LEARNERS' PRESENT LEVEL OF PERFORMANCE AND KNOWLEDGE:</p> | |

(Do the learners have the adequate knowledge to complete the lesson successfully? What pre-requisite skills must the learners have to complete the lesson content? Include ICT skills.)

INSTRUCTIONAL PROCEDURES:

1. Motivation:
Explain the importance of the lesson to motivate the student. Relate lesson to previous lesson
or
2. real-life situation
3. *Activities: (the sequence activities to happen in this lesson. Describe the teaching method to employ in teaching and learning.)*
 - a. Step 1
 - b. Step 2
 - c. Step 3
 - d. Step 4
4. Conclusion:
Summary of the Lesson

EXPANDED OPPORTUNITIES:

1. Additional activities catering for different categories of learners e.g. LSEN learners
2. Remedial Activities
3. Formal Assessment Activities

ASSESSMENT AND EVALUATION:

This section should contain a description of the assessment processes, the criteria and competency descriptors levels. Describe your plan for providing feedback to your learners.

STUDENT PRODUCTS

What artefact (s) or products will result from the lesson? (such as a report, newsletter, diagram, slideshow, drawing, etc.)

Teacher's Name:

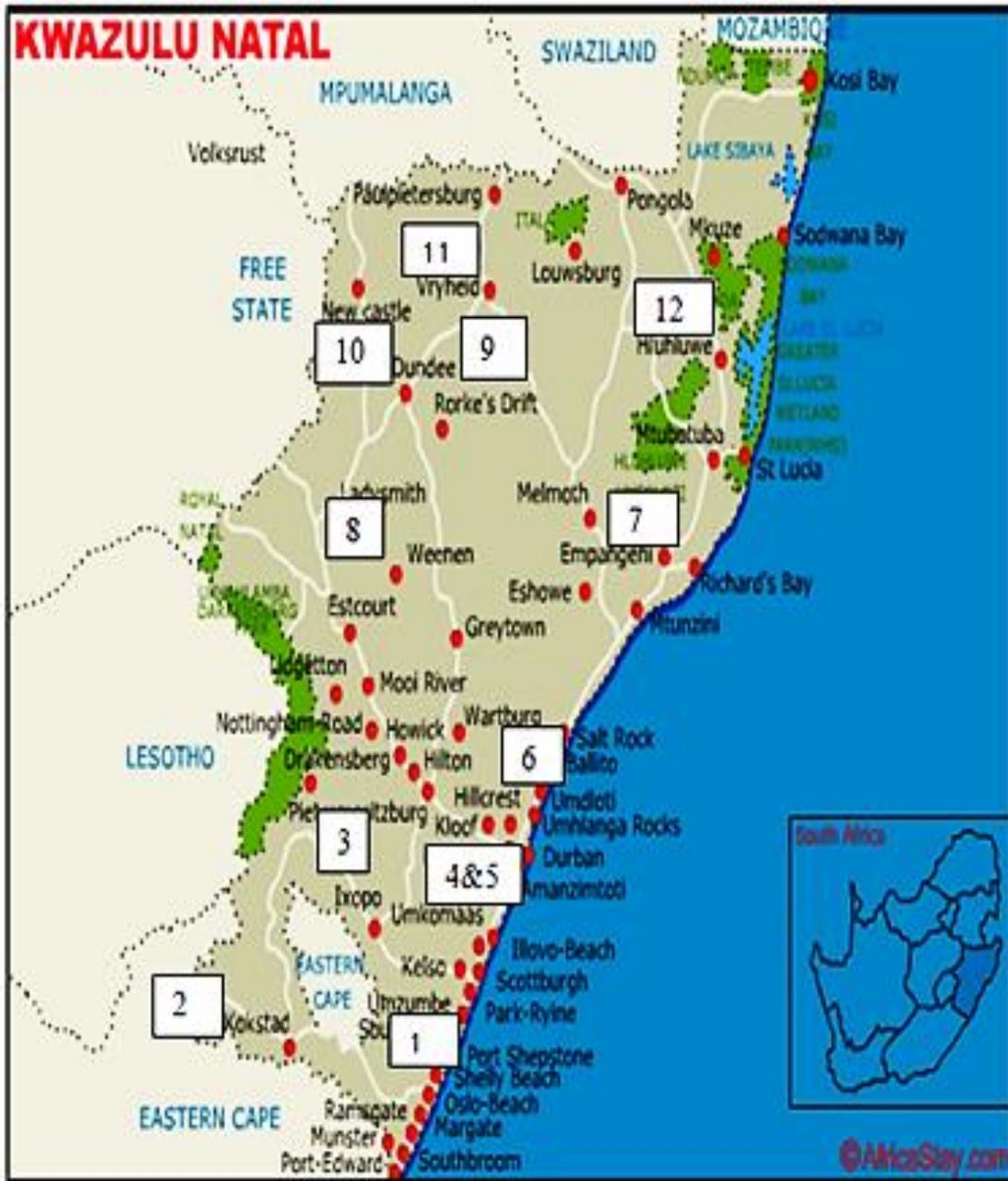
Reviewed and Approved:

Date:

Appendix B: Showcase feedback form

| Assessment Standard | Comment |
|---|--|
| 1. Integration of technology : (a) Lesson design and presentation | Things I like: Ideas for improvement: |
| (b) Technology effectively integrated | Things I like: Ideas for improvement: |

Appendix C: Map with all DoE districts in Kwazulu-Natal



1. uGu, 2. Sisonke, 3. uMgungundlovu, 4. Pinetown & 5. uMlazi, 6. iLembe,
 7. uThungulu, 8. uThukela, 9. uMzinyathi, 10. Amajuba, 11. Zululand and
 12. uMkhanyakude

Appendix D: Observation Schedule

| Observation Checklist for the Class Lesson Presentation | |
|--|---------------------|
| Criterion | Descriptor:(Yes/No) |
| 1. Lesson focused on integration of technology into curriculum | |
| 2. Lesson provided teaching strategies to apply with his/her learners | |
| 3. Teacher illustrated effective uses of technology with learners | |
| 4. Teacher provided opportunities for learners to collaborate with one another | |
| 5. Teacher implemented methods of teaching that emphasise independent work by learners | |
| 6. Teacher supported learners in the use of technology for their schoolwork | |
| 7. Teacher evaluated technology-based work that his/her learners produced | |

Appendix E: Teacher Interview Schedule

TEACHER INTERVIEW DATA AND TRANSCRIPT

DATE: 23 November 2012

FOCUS GROUP

Key Questions:

Did you feel that you gained knowledge of how to integrate ICTs into your practice?

What aspects of training do you feel helped you most to design and implement the lesson?

Do you feel your pedagogy has changed as a result of this training, and if so, why?

Semi-structured Interview:

- 3 We are starting now, as I have just indicated we need to be slow so that we can add follow-ups and questions, where necessary.
- 4 I think you can also code-switch if you don't have a good command of the English Language.
- 5 I am saying this deliberately. You can use English. If you cannot, don't stress; I'll simply translate as the session progresses. Right now, the main intention of this interview is to get responses for questions as listed in the paper in front of you. Questions become our focus point.
- 6 In your experience, after this ICT training what would be your feeling about the questions in their particular order?
- 7 Anyone can respond to the question; I am not going to point at anybody.

- 8 **RESPONDENT 1:** Most importantly, what I feel after this training is that technologies does to a great extent enhance my teaching and learning, because whenever there are gaps when I am teaching, technology now fills the gaps;
- 9 sometimes it's audio or audio-visual.
- 10 It will now fill the gaps that may be left by only my voice when I am teaching.
- 11 **RESPONDENT 2:** Added to that, when teaching, it'll draw learner attention, because it makes them listen attentively for something new you are teaching at that time.
- 12 It's something new which is substitutes for teacher's droning voice
- 13 and it can help as a resource at the same time, which can improve teaching, learning and assessment.
- 14 **RESPONDENT 3:** ...not substitute *per se* here—as a matter of fact, it supplements the educator's material;
- 15 I saw it make things easy, it assists educators when they present the lesson because learners will be able to listen attentively, and
- 16 focus on what the teacher is stressing at that time
- 17 **INTERVIEWER: Ok**
- 18 **RESPONDENT 3:** Under learning, it also helps learners in that, when the educator has brought a video,
- 19 or sometimes there is information or data they view on a video besides being taught theoretically, once they see what the educator is talking about it helps the learner to learn much more easily by visualizing.
- 20 Even when they are writing exams, it'll be easy for them to recall that information because it was there “physically”.

- 21 **INTERVIEWER:** when you talk there you said they'll see it "real", in technology terms are you referring to things such as simulations?
- 22 **RESPONDENT 3:** Yes
- 23 **RESPONDENT 4:** May I come in there?
- 24 **INTERVIEWER:** Certainly
- 25 **RESPONDENT 4:** There is this (Kuna lento le) something I see, (engibona ukuthi) that information (iba) becomes multifaceted; you find that when you say it verbally
- 26 (uthole ukuthi uma uyisho ngomlomo) you'll run out of time trying to explain something
- 27 but once (waba nayo i) I have technology access I can (uyakwazi i) now draw information from different angles and I can (zokwazi ukuyi) project items at one time, to say this is how other people are looking at things, (uyabo?) You see,
- 28 then you show(uveze) all the sides now(manje), you see? (uyabona?)
- 29 If there is a (kuba ne) debate within the class over something - in our section we do (thina senza i) literature –
- 30 you can show (uyakwazi ukuveza) the historical perspective of the drama; that's to say what I am teaching is accurate, drawing from different perspectives;
- 31 (ukuthi) this is what drives (edrayva) (le) this character to do this, because he is from (isuka) this background, rather than (kunokuba I mina ochazayo) my explaining.
- 32 It becomes monotonous if I try to explain everything (ngizama uku explainer yonke into)
- 33 especially if there are arguments within the class.
- 34 **INTERVIEWER:** I see.....

35 **RESPONDENT 4:** And secondly, (enye into) I have just realised afterwards (ukuthi amanye ama) that some learners are primarily (okuthiwa ama) impaired visual learners,

36 so for them to learn best is to see something at a slow pace; now if you show a video over and over again (ubabukisa ivideo) they (bayakwazi ukuthi leyonto bayi a) can absorb material more readily(e kalula) rather than relying on hearing alone.

37 I think in that sense technology helps a great deal.

38 **RESPONDENT 5:** May I also comment on my observations.

39 I designed a natural science lesson plan from this programme which trained a number of teachers.

40 My lesson was on a food chain. It was on conservation of plants and animals in your garden.

41 I designed a set of slides to show which creature ate which in a food chain;

42 the learners there could see visuals which brings reality into the class.

43 They could see the locust, they could see the grass;

44 so the computer did indeed enhance my teaching,

45 because I scaffold the learning, using this powerful, visual, purposeful persuasive element;

46 in that technology enhances the reality.

47 When I draw a locust on the board it takes me a long time;

48 But when using ICT and when the learners come in, I give them an entry point; for example, food chains.

49 They'll then discuss this; I'll then show them the reality.

- 50 Children can identify with locusts like the one they saw in the road to school;
- 51 they can identify with the other parts of the food chain and they can understand the deeper concepts of the food chain and conservation.
- 52 **RESPONDENT 4:** ...especially if you talking to learners whose mother tongue is not the LOLT (language of learning and teaching) in the school.
- 53 It helps a lot to have something to show; because sometimes when you are talking, there is a possibility of running short of vocabulary;
- 54 and there is a possibility of the teacher not explaining the way the material should be explained;
- 55 now, however, if you have a visual, the learner will understand and attach the relevant vocabulary that you have just used, to that visual.
- 56 He should then (uzoyi) understand it in its proper context,
- 57 rather than imagining two things, imagining what you are trying to see and also dealing with the language at that time.
- 58 **RESPONDENT 5:** I also thought--
- 59 **RESPONDENT 1:** May I come in there? Sorry about that.
- 60 I think also, that it enhances the interaction in the classroom, whereby learners now have to be involved in discussions
- 61 **INTERVIEWER:** and they start to work collaboratively
- 62 **RESPONDENT 1:** Yes, collaboratively.
- 63 If you are using only yourself as a teacher, you are tempted to be the centre of teaching and learning.

- 64 When, however, there is technology, learners are also engaged fully.
- 65 Learning is no longer teacher-centred now; technology is doing exactly what is supposed to do
- 66 to make the teaching and learning more learner-centred.
- 67 **RESPONDENT 5:** Learning was enhanced in that situation –
- 68 the learners then could see what has been looked at; hence the constructivism approach.
- 69 Learners making own meaning,
- 70 not teacher making meaning;
- 71 based on what learners can see, they can now be given challenging questions to respond to
- 72 and each learner has a chance to respond; unlike the route where one child shouts and then all shout.
- 73 Learning is enhanced; learners are making their own meaning.
- 74 As the previous speaker said, there is an issue of language.
- 75 If learners don't have a concept of science, which is another genre of language, they then can use their mother tongue, and call that 'locust' with whatever they wish to call it indigenously;
- 76 And meaning-making is not compromised.
- 77 **RESPONDENT 6:** The visuals can also assist learners in terms of the bundus (deep rural areas) where maybe the question paper will be set on trains, which the learners have never seen before, however, the learner is expected to answer the question.

- 78 If the educator can use visuals or a video which depicts a train or whatever is being asked in the question paper,
- 79 This will make it easy for the learner to understand better, because of this kind of exposure.
- 80 **INTERVIEWER:** I am happy about the section of teaching and learning; however, we haven't touch on the assessment part.
- 81 **RESPONDENT 4:** I think our responses touch on the issue of assessment as well
- 82 because this is intertwined with learning.
- 83 If technology assists with learning it'll also assist with assessment.
- 84 For example, if someone is given a technology lesson with visuals, if he/she sees a question paper with pictures, these two can be combined to make proper meaning and to put things in proper perspective.
- 85 I once saw a question paper showing a cricket player in a Physical science paper.
- 86 The question was on velocity.
- 87 Learners who had never been exposed to that type of visual in the learning stage could not handle this in the assessment stage; to them it was something new that they could not understand - the inclusion of cricket in the paper;
- 88 they could not associate velocity with the cricket ball.
- 89 For them it was a cricket question that they were not meant to answer.
- 90 Had it been dealt with in the formative stage of assessment, it wouldn't have caused problems for learners in the summative assessment.
- 91 **RESPONDENT 1:** Technology would tackle that well, because if you look at the previous example about the locust; in that instance, you are forming a baseline assessment.

- 92 You know that learners have seen the locust accurately depicted; they know the locust.
- 93 In your formative stage you are going to build on what they know.
- 94 **INTERVIEWER:** So in fact you can't separate the two
- 95 **RESPONDENT 1:** There is no way you can separate assessment from teaching, because it goes according to stages
- 96 **RESPONDENT 5:** There are two types of assessment, namely, assessment for grading, and assessment for learning.
- 97 The formative type is assessment for learning;
- 98 Learners can use those constituted parts and the linking parts for a food chain.
- 99 For instance, you can use ICTs, if for example, you show a picture of grass, a locust, a baboon and a snake,
- 100 They'll tell you which one eats which one and which way the arrow must point;
- 101 so as part of formative for multiple questioning in the first section of a science paper you can put various food chains there and ask the learner which one shows correct food chain.
- 102 Technology works for both assessment for grading and assessment for learning.
- 103 **INTERVIEWER:** From what I gather, it looks as though schools are not far from achieving the goal 16 (improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire careers) which is the expectation of DoE Action Plan 2014, Towards Realization of Schooling 2025
- 104 **RESPONDENT 6:** Yes, with the training of this nature.

- 105 But in some cases you find that there are schools that have computers, however, not all the educators that are there are able to use those computers, simply because they don't have the knowledge.
- 106 They need to be trained so that they are able to use those computers.
- 107 You find that there'll be company sponsoring the school or the government is assisting;
- 108 but the factor of educating the educators on the use of the computers is overlooked; therefore there must be a programme that can assist those educators in work shopping them;
- 109 for instance in COBALLT (**C**ontent **B**ased **L**anguage **L**earning and **T**eaching) sometimes when we have workshops we arrange to have a section that covers computers;
- 110 that's where we are sometimes surprised to discover that there are educators who have never used or even touched a computer before.
- 111 We start them from the basics.
- 112 Some will have a certain amount of knowledge; we'll then cover the advanced part.
- 113 I think teachers should be workshopped.
- 114 If there could be workshops that assisted educators it would be much easier.
- 115 Even those schools that do have computers, after we workshop these educators, they don't use the school computers.
- 116 We discover at a later stage when we have workshops that most of them have bought laptops and they know how to use them.
- 117 **INTERVIEWER:** The exposure becomes their advantage as it was the case with you in this training?
- 118 **RESPONDENT 6:** Yes

- 119 **RESPONDENT 4:** Just a follow-up; sometimes there is a great deal of red tape,
- 120 where at schools you realise that the department installs the computer; perhaps thirty
five (35)of them are in the lab,
- 121 but because maybe the SMTs (Senior Management Teams) don't understand the
impact that can be brought about in the school if the teachers can use the computers
effectively, you find that the computer lab is the domain for a particular individual;
- 122 it's a particular teacher who holds the key to the computer lab; the computer lab is
open on a particular day for a particular period, even if teachers want to use it at
other times---
- 123 Sometimes these are teachers who have the know-how---but they don't have the
access to the lab.
- 124 **INTERVIEWER:** Has that to do with moratorium?
- 125 **RESPONDENT 4:** Yes, there is moratorium.
- 126 **RESPONDENT 1:** Also – mindset; we must have that shifting.
- 127 In most of the educators we find that they associate computers with the younger
generation not with themselves;
- 128 you find that an educator who has a computer at home often cannot use it; he/she
says it's for the children, not for me.
- 129 Even at schools you find that; I have seen in one of the schools they had ENCARTA
as one of the computer programmes, however, not a single educator has used that
ENCARTA library, because they don't associate it with themselves; they associate it
with the young ones.
- 130 If you ask, they'll say it's for so and so.
- 131 If you want something go to the clerk; the clerk will do it for you.

- 132 There is no time where they involve themselves and say, please show me how you do this.
- 133 You see, we must have a shift away from technology not being for a certain group of people; it's for all of us to enhance the teaching and learning in our classrooms.
- 134 **RESPONDENT 6:** Right, on the other side of the coin, especially on deep rural areas, there can be educators who are computer literate, but there is no electricity in the schools.
- 135 They have the skills, but there is no electricity.
- 136 On the other side the issue of burglary or vandalism has a negative impact; because schools can purchase computers but the computers are often stolen.
- 137 Those are challenges that other schools might experience.
- 138 **RESPONDENT 5:** Some schools have computers; some teachers have computers but they are locked up somewhere, because of what you have just said there, and
- 139 even when the computer is there or you bring your own to school; there is no recognition from your management that you have an extra skill. You should be given the space to use or borrow the data projector.
- 140 If you have a laptop which you can use it for yourself; even if you want to show how that food chain work or you have a video to show which creature eats which other,
- 141 even that video advert on TV where there is a frog sitting on the pond and there is a wasp. Along comes a fish; an eagle comes and takes a fish; it's a lesson on a food chain.
- 142 There is a video for that in schools which can be played in class; however, the moratorium blocks this.

- 143 Even commercials on TV (fish eagle advert) they sell that “whisky” but children must not even watch these in front of parents, because whisky is “daddy’s stuff”, so in other words the teacher won’t use these innovative ways, because there is so much red tape, the fear and lack of security and damage and theft of their personal computers; they decide that they’d rather leave laptops at home;
- 144 Therefore all the skills that they have are not infused into their daily practice of teaching, because now if I take my laptop to school I’ll be given a long story just to get the data projector from the strong room so that I can go and have that lesson; there is no enabling environment for teachers to engage in computer use or technology in class because the school isn’t supportive of such efforts.
- 145 **RESPONDENT 4:** Sometimes it’s not even the issue of security alone; sometimes there is the issue of having to see a teacher working hard rather than working wiser.
- 146 There is still that notion that for a teacher to be seen working that teacher should be giving all the explanations verbally, drawing on the board by longhand
- 147 People do not realise that this is very time consuming- this teacher could have done it better had he brought in technology and worked smarter.
- 148 They want to be seen working hard, doing and drawing everything by hand.
- 149 **RESPONDENT 4:** I think that at the beginning, when computers were introduced amongst the teaching fraternity teachers associated it with the technology at the factory where people became redundant as a result of having technology. Maybe the old school of thought caught up with them. Teachers thought that if they used technology this would eventually become a substitute for them –
- 150 In other words there would come a time where learners would simply sit all by themselves and use technology. Maybe they are trying, some subconsciously to ensure that technology appears as dysfunctional as possible, so that it may never replace the teacher.
- 151 **RESPONDENT 5:** But if we need to help the teacher to improve the situation, the idea that I had is that the large number of teachers in the system were trained under the apartheid system, the product of apartheid training of teachers which largely allowed them to transfer information; to transmit information:

- 152 transmission mode, the tell mode where they must tell people things; not the mode where they can co-construct meaning with learners and the learner can make its own meaning.
- 153 In those days, teachers were told to make meaning for learners. The new policy says we must allow the learner to construct and make his own meaning;
- 154 The technology does not replace the teacher. We need to accept that technology is one of the scaffolds you can use to enhance your own teaching and assist the child in making his own meaning;
- 155 that's the kind of paradigm shift you need to bring to teachers, that they need not fear technology but they need to harness it, in order to improve learner participation, learner understanding, and learner making own meaning; in the end the learner will obtain better results.
- 156 **RESPONDENT 2:** The DoE has tried something in terms of laptop initiative to change the mindset of the educators so that they understand better.
- 157 This laptop initiative has the potential of changing teacher's thinking and the mindset.
- 158 Teachers can view technology in a positive light, rather than seeing it as something for (abantu bathize) certain people, not for others.
- 159 Also, incentives play a role in motivating the teachers. Our DoE is too economical when it comes to this aspect. It needs to improve greatly.
- 160 **RESPONDENT 5:** What we can also do is to model the use of technology in a classroom; then ask teachers who are interested to come and observe you in the classroom; they'll see first-hand how you interact, how you use technology as a scaffold.
- 161 I must add that for educators' mind shift, the curriculum must be responsive, children must respond to challenging questions on any subject in the curriculum;

- 162 Personally I feel acquisition is negative because it implies to acquire knowledge, acquire, how long you are going to acquire it, because tomorrow it's outdated; you need to 'derequire' it; get it out, because the new must come in but if you continually respond to the curriculum you are remaining up to date with current practices.
- 163 The peer-driven models where educators capacitate themselves are the way to go.
- 164 **INTERVIEWER:** Ok. Can we...
- 165 **RESPONDENT 5:** Sorry, may I finish this point please? Let's adopt the 'teach them how to fish, rather than fishing for them'.
- 166 Remember the peer-driven model I have just explained? Of course, research also supports that you need to have practice to become perfect in anything; we need to give teachers ample time to practice; once they know how to activate items, how to save, how to calculate, how to draw pictures and copy information from search engines, that skill can never be taken away from the teacher.
- 167 If the teacher forgets something which was made to make meaning for them, we must allow them to make their own meaning in the workshop of this nature, let us not tell them what to do; it's that information transfer and transmission mode that kills educators, which is usually done by teacher educator who are training them in a wrong way.
- 168 **RESPONDENT 5:** Preparation on technologies lesson planning is the key.
- 169 Recently I underwent a five day intensive training programme and learnt so many things that I knew only superficially before.
- 170 I learnt to save, to go and read, how to acknowledge the source that was a kind of drenching workshop; after some days it was as though you had been there for the whole year, but you were so enriched with a skill and with everything you had learnt.
- 171 Facilitator was there monitoring; he was called in every minute for guidance and support and troubleshooting. I am saying this is the way the teachers must be trained.
- 172 I think teachers must be taken by hand for the whole 5 days until they express the desire to try independently.

- 173 That kind of workshop is very scarce for teachers; we need to have a sufficient number of facilitators and they must be approachable.
- 174 **RESPONDENT 2:** Educators are not on the same level- those who are struggling require more time to finish and need more follow-ups as well.
- 175 **RESPONDENT 6:** after the staff development, officials must frequently visit those schools for support and follow-ups, to check whether the educators are encountering a problem; some may be stuck somewhere, not knowing how to solve those problems.
- 176 Assistance will motivate teachers to ensure that they learn as much as they can, seeing that the officials are always there to see how far they have gone or coping.
- 177 **RESPONDENT 5:** The school system does not support teacher's staff development –it's very punitive; colleagues in your Developmental Support Group (DSG) make strange comments. In schools, the DSG must be capacitated, and then teachers will improve dramatically. DSG is like a secrete body; teachers don't know what has or is discussed in the meetings
- 178 **RESPONDENT 4:** The danger of ignoring follow-up is immeasurable. Once the senior officials were taken for a technology workshop; however, on returning to school they didn't cascade the information, it was as though the information was not meant for low-level educators. Mindset---mindset, mindset!
- 179 **INTERVIEWER:** *what aspect of training do you feel helped you most to design and implement the lesson?*
- 180 **RESPONDENT 1:** Thinking deeply about the steps of preparing the lesson, appropriate ICT integration skills.
- 181 The use of an enhanced approach to presenting a lesson encouraged me. Preparing and presenting as a team was very important to me.
- 182 **RESPONDENT 2:** Understanding various sites and their use commanded respect from me
- 183 **RESPONDENT 4:** Website design, lesson design, availability of connectivity and the use of social networks (Facebook and YouTube

- 184 **RESPONDENT 3:** For me it was Twiddla, Twitter, PowerPoint and Facebook that allowed my learners to work at their own pace; there'll be no unnecessary interference. My pedagogy has indeed changed.
- 185 **RESPONDENT 5:** New websites such as Twiddla, Scratch, etc. research skills and designing a lesson plan using ICT tools
- 186 **RESPONDENT 6:** Exposure to social networks-Twiddla, Facebook, Twitter, Drop box, Smart board, Microsoft surfaces and relevant software e.g. GeoGebra for maths.
- 187 This exposure to the various ICT interactive tools has shown me how teaching can be made more interesting
- 188 **INTERVIEWER:** *that's great, but now, do you feel you gained knowledge of how to integrate ICT into your teaching practice? what about your pedagogy; do you feel it has changed as a result of this training?*
- 189 **RESPONDENT 5:** Yes, hands-on training was given to us, thereby strengthening our knowledge and skills, which will enable us to equip learners with the same skills.
- 190 My pedagogy has also changed. Although my learners have been using ICT in the classroom, additional programmes such as Twiddla can now be introduced and used in my classes
- 191 **RESPONDENT 2:** I gained knowledge to a limited extent. The training was not pitched to the level of beginners...the pedagogy has not changed that much for reasons cited above
- 192 **RESPONDENT 3:** Yes, I now have a broad idea of how Smart board, social networks and specialized (subject focused e.g. GeoGebra) software could be used.
- 193 Potentially, my pedagogy has changed, because I can now draw on a broader range of methods of delivering a lesson.
- 194 I worry though, that the enabling environment may not always be there. Computers require an Internet.

- 195 **RESPONDENT 6:** Yes, I am now able to utilize various sites and check the authenticity of websites. Fortunately I was already using ICT, but the training opened my eyes to using software I had not used and was not familiar with.
- 196 **RESPONDENT 1:** I gained invaluable knowledge about technological software, programmes, gadgets, and websites that one can access and integrate into preparation and presentation of a lesson. Appropriate approaches were needed for various concepts delivery. My methodology will be enhanced by the proper use of technology and the initiatives we were exposed to in this workshop.
- 197 **RESPONDENT 2:** Yes, in lessons we planned, we had to include the skills and software (as many as we could) that we had experienced in an interactive manner and in each lesson presentation, and then there would be comments and critiques.
- 198 Yes my pedagogy has changed in the sense that exposure to gadgets have opened up possibilities whose benefits were unthinkable before the workshop.
- 199 **RESPONDENT 6:** Technology is a powerful, persuasive kind of way of expressing learning. Learners learnt beyond what I taught them.
- 200 Technology use and integration into teaching and learning, especially learning on the student side does constitute a framework that can enhance learning for the student.
- 201 **INTERVIEWER:** Thank you for this opportunity, our interaction helped a lot and it was an eye opener.

Appendix F: Learner Interview Schedule

DATE: 23 November 2012

Learner Interview;

Key Question: Do you feel your learning was improved today by the integration of ICT?

- 1 Interviewer:** Namhlanje sithole ithuba lokufundiswa lapho ukufunda kwethu bekuhlanganiswa nezinsiza-kufundisa ze ICT. Kunombuzo engiwubuzayo odinga impendulo yenu. Okwakho ukuphamisa isandla lapho ufuna ukuphendula ukuze lomsebenzi wethu ungaxoveki uhambe ngendlela.

Interviewer: My translation: Today you have experienced one of the lesson where ICT was embedded in your teacher's teaching and your learning. This is the question I am asking is:

- 2** Kungabe lukhona ushintsho olubekhona namhlanje njengoba besisebenzisa amacomputers na?

Interviewer: Do you feel your learning was improved today by the integration of ICT?

- 3 Learner 1:** Kumnandi kakhulu ngoba thina siyisizukulwane sayo lemshini kuba lula ukuthi silandele, ngibone ngisho nothisha eba nomdlandla namhlanje.

(Absolutely because we are digital natives it's easy to follow. Today I even noticed that my teacher was full of confidence).

- 4 Learner 2:** kuzwakale kahle manje sibe sesigqunguzeleka sabanomdlandla wokufunda ukusebenzisa itwiddla kudale ukuthi kuvuke nobengasanakile uma kade ekhona

(Lesson was interesting and therefore we were encouraged and our learning was enhanced. The less active learners if ever there were, were also involved when we use twiddla)

- 5 Learner 5:** Izifundo kanye nokufunda kwethu sobuye kuphinde kufane. Okwami ukufunda kuzohlala kunenqubekela phambili uma kungafundiswa ngalendlela.

(Lessons will be more exciting and more effective. My learning will forever be improving with more and more use of these ICTS).

- 6 Learner 3:** Yaz, namhlanje kube nomehluko indlela esifunde ngayo nendlela uthisha wethu akade efundisa ngayo. If sixakeka siyakwazi ukubuza imibuzo uthisha asinike impendulo noma yona icomputer

(you know, there was much much improvement in the way teaching and learning was perceived and done. If we face a challenge we were able to engage our teacher then we get a response from either him or a computer at once)

- 7 Learner 6:** Bekungeke kungenzeki ukuthi ukufunda kungashintshi. Thina kuyasithokozisa ukusebenzisa lemishini. Sithokozile. Okwenze kwabalula ukuthi umehluko awukhulu kakhulu if wazi ukusebenzisa icellphone ngeke uhlahleke kakhulu ngala.

(This is very likely since we as learners are always excited by the ICTs. What made things a bit better is that we are used to cell phones. If you are familiar with the use of a cell phone you'll never go wrong with computers)

- 8 Learner 4:** Ukufunda kwethu ngendlela engibone ngayo kushintshile kusukela manje bengingajabula ukubona kugqugquzelwa ukusenza kothisha ngalendlela ngoba ngokwenzenjalo ukufunda kwethu kungashintsha nokufundisa kothisha kungashintsha.

(It has improved I wish the use of ICTs should be promoted in order to improve teaching and learning).

- 9 Interviewer:** Ngiyabonga kakhulu ngakho konke eningisize ngakho nangendlela esibambisane ngayo

Thank you for providing me with this information. You were very helpful and very cooperative

Appendix G: Questionnaire

1. . To what extent do the following statements describe the technology training intervention you participated in?

| | Not at all | Small Extent | Moderate Extent | Great Extent |
|--|------------|--------------|-----------------|--------------|
| Focused on integration | | | | |
| Provided teaching strategies | | | | |
| Illustrated effective uses of technology | | | | |
| Provided opportunities to collaborate | | | | |

2. How well prepared do you feel to do the following activities with your learners, both prior to and after the training? (Please select an answer in the Before column and one in the After column.)

| | BEFORE TRAINING | | | | | AFTER TRAINING | | | |
|---|------------------------|----|-----|--------|--|-----------------------|----|-----|--------|
| | Not at all | SW | MOD | V/WELL | | Not at all | SW | MOD | V/WELL |
| Implement method of teaching & independent work by learners | | | | | | | | | |
| Integrate technology into subject | | | | | | | | | |
| Support learners using technology. | | | | | | | | | |

NB: SW= somewhat, MOD=moderate & V/W=very well

3. Will the ideas and skills you learned from the technology training intervention help you successfully integrate technology into your learners' activities?

| Probable not | Definitely not | Probable yes | Definitely yes |
|---------------------|-----------------------|---------------------|-----------------------|
| | | | |
| Optional comment | | | |

4. How I rate my ability in ICT skills?

| | BEFORE TRAINING | | | | | AFTER TRAINING | | | |
|-----------------|------------------------|------|------|-----------|--|-----------------------|------|------|-----------|
| | poor | fair | good | excellent | | poor | fair | good | excellent |
| File Management | | | | | | | | | |
| MS Word | | | | | | | | | |
| Publisher | | | | | | | | | |
| PowerPoint | | | | | | | | | |
| Internet search | | | | | | | | | |

Appendix H: Educator Consent Form

Investigator: R.M.KHWELA
Introduction:

You are being asked to participate in a study I am completing for a MEd STUDIES at Wits University. My Supervisor is Claudette Muller, who may be contacted by phone at Tel: +27 11 7173359. I am conducting my study because I want to understand more about EDUCATORS'USE OF TECHNOLOGY TO ENHANCE THEIR TEACHING, LEARNING AND ASSESSMENT PRACTICES. You are being asked to participate because effective integration of ICT into Teaching, Learning and Assessment is becoming an essential competency for teachers. The purpose of my study is to answer this question: Does my training intervention enable teachers to design and implement a lesson in which technology is effectively integrated? Studies show that only a few educators feel very well prepared to integrate technology into the grade they teach.

2. PROCEDURES:

The research I plan will include interviews, a focus group and questionnaire of teachers who are teaching the Learning Area using or aspiring to use technology. As a participant in this study you will be asked to collaborate with other teachers and discuss ideas for both introducing and using technology in your class. You'll have an opportunity to develop a portfolio based either upon material you are teaching or plan to teach in future. I would like your permission to audiotape (videotape) and to transcribe the discussion so that I may study the discussion as part of my research class. The discussion will last approximately 30 minutes and will be conducted in a place chosen by me.

3. RISKS:

You are unlikely to experience any physical, psychological, or social risks. If you feel, however, that you become uncomfortable or experience any problems due to participation in this project, you may withdraw at any time and I will understand.

4. BENEFITS:

There will be direct benefit to you by your participation in this project. Your current and future students will benefit from the insights you'll gain and the District will benefit from your increased knowledge base.

5. ALTERNATIVES:

You have the alternative to choose not to participate in this research study. You are free to withdraw your participation at any time.

6. CONFIDENTIALITY:

Participation in this study is confidential and all information will be written in such a manner that you will not be identified. Both your first and last name will be replaced by a pseudonym in the transcription, all notes and the final report. All research material will be kept under the control of the researcher. Procedures to protect your identity will be followed in transcription and in all reports associated with this project. Information derived from this study will be used for research purposes within the context of my graduate research courses. Your identity will be kept confidential and any videotapes/audiotapes will be destroyed once the transcription is complete. Although I do not expect this to come up, I need to bring this to your attention that I am legally obligated to report any evidence of illegal activities, abuse or neglect.

7. FINANCIAL INFORMATION:

Probably you will not incur any costs, nor will you receive any reimbursements for your participation in this study.

8. PARTICIPANTS' RIGHTS:

Your participation in this study is voluntary and you are free to withdraw at any time. Participation or withdrawal will not affect any rights to which you are entitled.

9. CONTACT PERSONS:

The following contact details may be used to answer any questions about the research study. These details make me accessible both during the evenings and week-ends

Name: Robert Khwela

Phone: H/031-5093594 /Cell 0835159476

You may also call my Supervisor Dr Susan Cohen at Tel: +27 11 7173359 if you have additional questions.

CONSENT FORM:

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and have been answered to my satisfaction. If I have additional questions, I have been told who to contact. I agree to participate in the research study described above and will receive a copy of this consent form. I will receive a copy of this consent form after I sign it.

| | |
|--------------------|-------------|
| _____ | _____ |
| Signature Educator | Date |
| _____ | _____ |
| Investigator | Date |

Appendix I: WITS University Ethics Clearance



Wits School of Education

27 St Andrew Road, Parktown, Johannesburg, 2193 • Private Bag 3, Wits, 2050, South Africa
Tel: +27 11 717-3007 • Fax: +27 11 717-3009 • E-mail: enquiries@educ.wits.ac.za • Website: www.wits.ac.za

STUDENT NUMBER: 405987
Protocol number: 2010ECE140

31 August 2010

Mr. Robert Khwela
C838 Ntuzuma
DURBAN
4359

Dear Mr. Khwela

Application for Ethics Clearance: Master of Education

The Ethics Committee in Education of the Faculty of Humanities, acting on behalf of the Senate has considered your application for ethics clearance for your proposal entitled:

Educators' use of technology: Integration to enhance teaching, learning and assessment practices in 3 KZN districts

The following comments were made:

- Appendix 1: The word 'Subject' should be deleted and replaced with 'participant' (i.e. Participant Information sheet). There is a significant ethical difference between the two words.
- As participants will be keeping the Information Sheet (App. 2), the consent form (which the researcher will keep) needs to be placed on a separate page.

Recommendation:

Approve once the amendments have been forwarded to the committee

Yours sincerely

M. Mabeta
Matsie Mabeta
Wits School of Education

Cc: Supervisor: Ms. C Muller (via email)

Appendix J: DoE Provincial Research Permission

02-SEP-2010 08:46 From:

To: robert.khwela

P.1/4



kzn education
Department:
Education
KWAZULU-NATAL

ROBERT M. KHWELA
C 838 NTUZUMA
DURBAN
4369

Enquiries: Sibusiso Alwar
Date: 02/08/2010
Reference: 0063/2010

RESEARCH PROPOSAL: EDUCATOR'S USE OF TECHNOLOGY LITERACY AND TECHNOLOGY INTEGRATION TO ENHANCE TEACHING, LEARNING AND ASSESSMENT PRACTICES IN GET AND FET BANDS.

Your application to conduct the above-mentioned research in schools in the attached list has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educator programmes are not to be interrupted.
5. The investigation is to be conducted from 02 August 2010 to 02 August 2011.
6. Should you wish to extend the period of your survey at the school(s) please contact Mr Sibusiso Alwar at the contact numbers above.
7. A photocopy of this letter is submitted to the principal of the school where the intended research is to be conducted.
8. Your research will be limited to the schools submitted.
9. A brief summary of the content, findings and recommendations is provided to the Director: Resource Planning.

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION
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