

The integration of Information and Communication Technology in the Curriculum of North West Province schools: Mafikeng High Schools

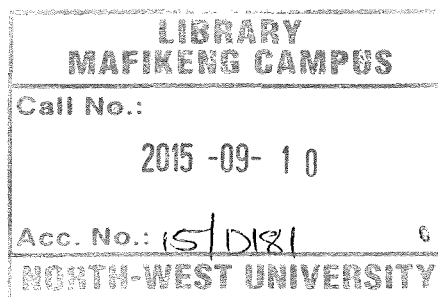
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A mini-dissertation submitted in partial fulfilment of the requirements for the degree
Master of Business Administration in the Faculty of Commerce and Administration of the
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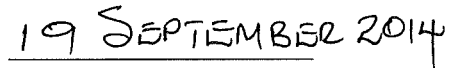


Declaration

I, Evelyn Mashudu Mmolawa, declare that this dissertation for the degree Master of Business Administration in the North-West University is hereby submitted, has not been submitted by me for a degree at this or any other university. That is, it is my own work in design and execution and all material contained herein has been acknowledged.



Evelyn Mashudu Mmolawa



Date:

Dedication

I dedicate this to my parents

Thina Joseph Motau

Nomacala Clara Motau

If it were not for the way you cared for me from the day I was born, I would
not have reached this level.

Thank you so much

Vhabebi vhang

I love you!

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I owe this MBA to Phillip Lucky Sekonyane who was taken from us 13 years ago; he would have loved to see me walk the stage of North-West University receiving this degree. May his soul rest in peace.

Abstract

The integration of Information and Communication Technology (ICT) in and for education is rapidly expanding in many countries and is now seen worldwide as both a necessity and an opportunity for improving and enhancing education offered to citizens across the globe (UNESCO, 2006). The education system does not only pursue the integration of ICT into the curriculum because of its popularity in the market system, but because of the role it is perceived to play in the changing curriculum. According to the White Paper 7 on e-Education policy (2004:17) every South African learner should be able to use ICT tools confidently and creatively to develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community by 2013. The central role played by teachers in teaching and learning requires them to have a holistic understanding of ICT integration. Furthermore they should be able to analyse when integration is appropriate according to what is expected from the learner in the teaching and learning process. The study sought to address this research question: what are teachers' perceptions regarding integrating ICT with the curriculum in the classroom? Drawing on the evidence from a survey of eighteen/twenty one high schools in the Mafikeng Area Office of North West, the findings show that teachers use ICT tools to differing degrees, depending on their perspectives relative to ICT and their levels of professional experience. The significant ideas of how teachers perceive the integration of ICT tools into the curriculum emerge from what they view as benefits of using ICT and what they view as challenges when integrating ICT into the curriculum. In order to integrate ICT meaningfully into the teaching and learning activities teachers need both commitment and the technological skills. Contrary to expectation, the degree of ICT integration within the curriculum did not correspond directly with the availability of sufficient hardware, software or internet connectivity at the participating schools.

Table of Contents

Declaration	ii
Dedication	iii
Acknowledgement	iv
Abstract	v

Chapter 1 Introduction and background

1.1 Introduction	1
1.2 Background and content	1
1.3 Problem statement	2
1.4 Research objectives	3
1.5 Research design and methodology	3
1.6 Layout of the study	4
1.7 Conclusion	4

Chapter 2 Literature Review

2.1 Introduction	6
2.2 ICT in education	6
2.2.1 ICT - definition	7
2.2.2 Role of the teacher	7
2.3 Challenges and obstacles	8
2.4 ICT and learning	11
2.5 ICT based lessons	13
2.6 ICT co-ordinators	15
2.7 ICT – IT/IS Policies	18
2.8 Teacher Involvement	20
2.9 Advantages of ICT integration	22
2.10 IT/IS - ICT in schools	24
2.11 Research questions	26
2.12 Conclusion	26

Chapter 3 Research Methodology

3.1 Introduction	28
3.2 Research approach and design	28

3.2.1 Qualitative and Quantitative Research	29
3.3 Research setting	29
3.4 Target population and size	30
3.4.1 Population	30
3.4.2 Sampling procedure and size	30
3.5 Data collection	31
3.5.1 Data collection instrument	31
3.5.2 Data collection procedure	32
3.6 Construct Validity	32
3.6.1 Statistical conclusion validity	33
3.6.2 Internal validity	33
3.6.3 Construct validity	34
3.6.4 Current validity	34
3.7 Conclusion	35
 Chapter 4 Data Analysis	
4.1 Introduction	36
4.2 Background	36
4.3 Response rate	36
4.4 Demographics	37
4.5 Results of investigation	39
4.6 Measure of association	46
4.7 Correlation	46
4.8 Conclusion	47
 Chapter 5 Conclusion and Recommendations	
5.1 Introduction	49
5.2 Research design and methodology	49
5.3 Summary of findings	50
5.4 Teacher's areas of strength	51
5.5 Strengths of ICT integration	51
5.6 Weaknesses of ICT integration	52
5.7 Limitations	53
5.8 Recommendations	53

5.9 Suggestions for further research	55
5.10 Conclusions	55
List of References	57
Appendices	
Appendix A – Table of Construction	68
Appendix B –Questionnaire	71
Appendix C – Correlations	75
Appendix D – Permission Letter to the Area Office Manager	81
Appendix E – Permission Letter to the School	82
Appendix F – Matrix	83

List of Figures

Figure 4.1 – Gender of respondents	37
Figure 4.2 – Ages of respondents	38
Figure 4.3 – Ethnic groups of Respondents	38
Figure 4.4 – Academic qualifications	39
Figure 4.5 – How often are teachers delivering ICT empowered lessons?	40
Figure 4.6 – Are subject objectives integrated with ICT components?	40
Figure 4.7 – How are teachers skills rated with ICT components?	41
Figure 4.8 – Challenges in integrating ICT in teaching and learning activities?	41
Figure 4.9 – Teachers’ views on how ICT has been used in schools today?	42
Figure 4.10 – How do teachers use ICT tools in their classes?	42
Figure 4.11 – Does integration reduce teachers’ administration burden?	43
Figure 4.12 – Has internet proved to be useful source of ideas and information for teachers?	43
Figure 4.13 – Are teachers trained in ICT skills at pre-service or in-service?	44
Figure 4.14 – How often do teachers get support for distance training?	44
Figure 4.15 – Were teachers trained in technical support for their schools?	45
Figure 4.16 – Does the NW DoE support ICT implementation in schools?	45

List of Abbreviations

AO	-	Area Office
BECTA	-	British Educational, Communications and Technology Agency
DoE	-	Department of Education
FET	-	Further Education and Training
GET	-	General Education and Training
ICT	-	Information and Communication Technology
IS	-	Information Systems
IT	-	Information Technology
NEIMS	-	National Infrastructure Management System
NW DoE	-	North West Department of Education
PBL	-	Problem Based Learning
SMT	-	School Management Team
SMS	-	Student Management System
TEP	-	Teacher Education Programme
TV	-	Television
UK	-	United Kingdom
UNESCO	-	United Nations Educational, Scientific and Cultural Organisation
WWW	-	World Wide Web

Chapter 1

Overview of the Study

1.1 Introduction

The relatively recent introduction of new technology into mainstream schooling has been broadly expected to penetrate and transform teaching and learning across the curricula (Hennessy et al., 2005). This work will examine how teachers integrate Information and Communication Technology (ICT) into everyday classroom instructional activities. ICT encompasses tools such as desktop and portable computers, projection technology, calculators, data logging and digital recording equipment, software applications (generic software, multimedia resources) and information systems (intranet and internet) available in schools at the time of research (Hennessy et al., 2005). These tools help students to collect, organise and sort the gathered data and to write, edit and present reports on their findings.

To search for articles for this proposal, the following keywords were used: integration of Information Communication Technology (ICT) into the school curriculum. A search engine such as Google scholar was used whilst databases such as Science Direct, Emerald and UWorld were used to access articles.

The concept of ‘integration’ is understood differently by those who perceive themselves as ‘integrating’ ICT into the curriculum. According to Morrison et al., (1999) “integration” is successful when students use ICT tools for their learning, thus giving them a chance to engage deeply and critically with ICT tools. In this study, integration is examined in its broadest sense as an umbrella term or being at the heart of the curriculum (Kennewell, Parkinson & Tanner 2000:7). This means integration is examined not only with respect to how it can benefit learners, but how it is integrated by teachers across the subjects in the higher (secondary) grades.

1.2 Background and context

Developments about and widespread use of ICT influence all fields of life, one of which is education. Many countries have changed the objectives of their education system and have

directed much of their attention to the development of ICT skills in schools (Ezzianne, 2007). The North West Department of Education (NWDoE) sees ICT as potential tools for change and innovation in education and thus makes investments in ICT. The NWDoE attempts to disseminate ICT inschools to overcome problems and to enable innovation in education (NWDoE Annual Report, 2010/11). Schools' responses to this have brought about changes which include changes in the curriculum, in the way teachers teach and in the presentation of the curriculum, in the use of resources and the way current classrooms are arranged. While countries like South Africa, Namibia, Zambia and others, have invested heavily in ICT in education, the progress in the integration of ICT into the teaching of subjects has often been unsatisfactory. How to encourage integration remains a serious question for policy-makers and for teachers.

This study examines the extent to which teachers integrate ICT into everyday classroom teaching and learning activities in Mafikeng high schools. The study advocates that ICT integration is linked to teacher participation. Teachers play one of the most active roles in the teaching and learning processes, they represent the persons for using ICT in various educational settings productively (Usun, 2009). The data obtained will help disclose an association between the availability and the use of ICT tools in schools. Finally, it intends to question the use of ICT in the process of improving teaching and learning.

1.3 Problem statement

Worldwide, integrating ICT in teaching and learning is high on the educational reform agenda. Often ICT is seen as an indispensable tool towards fully participating in the knowledge society. ICT tools need to be seen as "an essential aspect of teaching's cultural toolkit in the twenty-first century" (Leach, 2005). This study is done to find out what goes wrong when attempting to grasp what factors are influencing or constraining integration of ICT in education in general and the use of ICT for teaching and learning practice in particular.

In a framework addressing challenges to classroom technology use, Groff and Mouza (2008) distinguish between critical factors including legislative level factors, district and school level factors, factors associated with teachers and factors inherent to the technology itself. Muntaz (2000) distinguishes three interlocking factors: institution, resources and teachers. Ten Brummelhuis (2001) categorises factors into those which can be manipulated

and those which cannot be manipulated. At school level, important contextual factors include the socio-cultural setting of a school and structural characteristics like government ICT policy, ICT infrastructure and school type. At the level of the teacher, two types of barriers are common: external or first-order barriers, such as limited resources or lack of technological support, and internal or second-order barriers, which include teachers' attitudes to ICT (Jones, 2003).

This study can provide answers to why there are still unaffected classrooms in North West Department of Education (NWDoE) with changed environments around teachers and learners. In some instances the reason can be that teachers are reluctant to move with this ICT integration call. Since the teachers are mandated to incorporate the use of ICT tools in the delivery of the curriculum, there is a need to determine whether that use is making a meaningful contribution to the teaching and learning of various subjects within the curriculum.

1.4 Research objectives

This study seeks to establish how the high school teachers in Mafikeng Area Office (AO) integrate ICT tools into the curriculum and how they cope with the challenges in integrating ICTs into the curriculum.

The objectives in this research are to measure the extent to which the school leadership influences the use of ICT, to identify the nature of experiences teachers have had during the use of ICT in their teaching and learning activities. In addition, the study will assess the level of readiness teachers were in before integrating ICT in their teaching and learning activities. Lastly the study seeks to find out what influenced the National Department of Education in undertaking ICT integration in schools.

1.5 Research design and methodology

A research design provides an overview of the whole research process. After carefully reading books and articles pertaining to the integration of ICT in schools, a matrix has been completed in order to eliminate areas already researched on and to identify areas of further research. Thereafter articles and journals have been read for further information.

This study examines the integration of ICT into North West Province schools, focusing on schools in Mafikeng. It was appropriate therefore, to collect qualitative data using a questionnaire.

In terms of methodology, a survey was conducted in the sampled schools. Cohen and Manion (2000) suggest that a survey in a research aims to gather information at a particular point in time to describe the nature of the conditions for determining the relationship that exists between specific events. Data were collected using questionnaires which were designed and the answers were carefully analysed using computer software and the help of a statistician. The sample of the study consisted of teachers working in government high schools and members of school management teams (SMT) from Mafikeng AO.

1.6 Layout of the study

The study is divided into five chapters, of which chapter one covers the background of the study, including the problem statement.

Chapter two reviews the literature, and this gives a clear idea and provides a context of the study. It reviews the literature addressing the question of how successfully ICT is being integrated in Mafikeng high schools.

Chapter three discusses research procedures, describes the methodology, target population for the study, the methods of data collection, the data collection, and how the data are analysed.

Chapter four describes the analysis of data using various statistical techniques.

Chapter five discusses the interpretation of the research findings and summarises the study. Recommendations as a result of data collected and analysis will be made.

1.7 Conclusion

In conclusion, this chapter has presented some background information on the integration of ICT into the school curriculum. The aims of the study were explained and the research questions to be investigated identified. The study was conducted scientifically by

addressing all aspects as described above. Since the study seeks to consider matters from a range of schools, some important matters of ICT concepts are clarified. The end product is hopefully a sound framework. The Matrix system is adopted in Chapter two to lay a foundation for the literature review of fifty articles and many other resources.

The literature review is presented in the next chapter. A brief synopsis of the current research findings on the effects of ICT integration on teaching and learning as well as a brief examination of the factors that affect ICT use in the classroom is presented in this chapter. The chapter also studies in detail the literature of different authors.

Chapter 2

Literature Review

2.1 Introduction

The focus of this section is to review related literature and present existing studies relative to what has been found, who has done it and when and where latest research studies were completed. Not much of ICT integration in South African schools has been researched. Due to this, international literature was reviewed.

Worldwide, integrating ICT in teaching and learning is high on the educational reform agenda. Often ICT is seen as an indispensable tool to fully participate in the knowledge society. ICT need to be seen as an essential aspect of teaching's cultural toolkit in the twenty-first century, affording new and transformative model of development. (Leach, 2005). ICT in education is an area which is in turmoil and in which many participants play a role. Forces that operate at the school and in the classroom level may be influential in bringing about changes that are beyond the direct control of ministries of education. Therefore, it is important for educational decision-making to periodically assess the actual situation in educational practice (Pelgrum, 2001). Moreover, ICT itself is constantly and rapidly evolving. Hardware and software are changing very quickly and schools are confronted with technological developments, such as web 2.0.

The study focuses on how teachers integrate ICT in everyday classroom activities. The information acquired is divided into: ICT in education; Challenges and obstacles of ICT integration into the school curriculum; ICT and learning; ICT based lessons; ICT co-ordinators; ICT and IT/IS Policies; Teacher involvement and advantages of integrating ICT in classroom teaching and learning activities.

2.2 ICT in education

According to (Kennewell et al., 2000), before examining ICT within pedagogy, the concept 'ICT' is discussed to assist in determining the position of ICT within pedagogy.

2.2.1 ICT - Definition

The Qualification and Curriculum Authority in the United Kingdom (Kennewell et al., 2000) define ICT as the “the range of tools and techniques relating to computer-based hardware and software; to communications including both directed and broadcasted; to information sources such as CDROM and the internet; and to associated technologies such as robots, video conferencing and digital TV.” This means ICT is an extension of Information Technology (IT) that includes hardware, software and internet connectivity.

To elaborate more upon the underlying purposes of using ICT in education, ICT can be defined as a tool for teaching and learning that relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. This means that ICT is a dynamic resource or tool that can be used for different purposes in the pedagogical environment (UNESCO, 2003).

Minister Asmal (2003) in his foreword on Draft White Paper on e-Education states:

Information and Communication Technologies (ICT) are central to the changes taking place throughout the world. Digital media has revolutionized the information society and teaching process. This has opened up new learning opportunities and provided access to educational resources well beyond those traditionally available (Asmal, 2003).

2.2.2 Role of the teacher

Lajoie and Derry (1993) “believe that the teacher, whether human or machine, has roles to play while students are engaged in learning activities”. Hartly (2007) maintains that instead of replacing the teacher, “the teacher and the technology work together, one is not pitted against the other”. Magliaro et al. (2005) recognise that the teacher remains responsible of choosing the learning objectives that must be mastered by learners and further selects appropriate programs which present information from lower level tasks to higher level tasks.

Although the computer is able to provide tutoring to the learners, it is the teachers’ role to monitor the learners’ progress on tasks (Kennewell et al., 2000). This means the teacher has to observe the learners’ performance during the tutoring process.

2.3 Challenges and obstacles

Politicians, policy-makers, school leaders, teachers and parents are beginning to develop more critical understandings of the issues associated with integrating ICT in schools. This may be due to the high costs associated with supplying and maintaining these technologies, as well as the slow uptake of ICT by teachers (Hayes, 2005). In South Africa, the introduction of computers in public schools is a National Department of Education's priority. The Department of Education (2004) indicates that ICT tools are seen as resources that can reduce poverty in developing countries by overcoming obstacles of social and geographical isolation and increase access to education. The ICT in rural schools is seen more as political, as in most instances the aim is to address equity with regard to access to opportunities for improving people quality of life (Department of Education, 2004).

Despite the good promises that ICT resources are making, some schools have enormous challenges in the integration of ICTs into their teaching and learning. In the South African context they are seen to be addressing access, equity and imbalances of the past system, which was overcrowded classrooms of schools, incompetent teachers and unfair distribution of resources across the colour line (Department of Education, 2004).

South Africa faces considerable educational challenges on the whole and in particular with integration of ICT into schools. Class sizes in South Africa are steadily increasing, but resourcing of classroom remains a challenge. The Department of Education's (DoE) National Education Infrastructure Management System (NEIMS) qualifies the physical infrastructure for education in all schools in South Africa. The NEIMS (2007) assessment report indicated that of the 25 145 public ordinary schools, 57% comprise 30-34 learners per teacher, and 5% have more than 45 learners per teacher (Department of Education, 2007). The concept of "learners per teacher" is highly contested in South Africa, and it is the more accurate gauge. A consequence of large classes is a decrease in available teaching and learning facilities and resources as well as overcrowded classrooms.

The Department of Education indicated that every teacher and learner in GET and FET must have access to ICT infrastructure. At the provincial level, the DoE will establish a desired level of technology resources (hardware and software) for each GET and FET

institution. At the very least, every GET and FET institution will have access to technology (Department of Education, 2004)

Hew and Brush (2007) modelled the barriers and strategies that influence the integration of ICT for instructional purposes into the curriculum. The model contains direct and indirect barriers influencing ICT integration. Direct barriers include: the teachers' attitude and beliefs towards using ICT; the teachers' knowledge and skills; the institution - the leadership and the school plans; resources – availability and access to ICT, support to teachers. Hew and Brush (2007) further highlight that in this model, ICT integration is indirectly influenced by the subject culture and assessment activities measuring student learning. In this model, the authors also present strategies to overcome the identified barriers: having a shared vision on learning and teaching, overcoming the scarcity of resources, changing teacher attitudes and beliefs and reconsidering assessment activities.

The perceptions of educational practitioners regarding obstacles that seriously impede the realisation of ICT related goals of schools, reported from a Worldwide Educational Assessment, shows what the main ICT-related obstacles are. The most frequently mentioned material conditions were the insufficient peripherals, not enough copies of software and insufficient numbers of computers that can simultaneously access the World Wide Web (WWW) and also that teachers did not have sufficient knowledge and skills regarding ICT. Apparently most countries did not yet succeeded in realising sufficient facilities to keep teachers up-to-date with new technologies. Other non-material obstacles were: the difficulty of integrating ICT instruction, scheduling enough computer time for learners, insufficient teacher time and the lack of supervisory and technical staff (Pelgrum, 2001).

Many barriers must be overcome to bring about successful integration of ICT within school classrooms. Ertner (1999) described a simple model of two types of barriers, first and second order, that are commonly cited as issues in ICT integration. First order barriers refer to missing or inadequately provided resources such as equipment, training and support. These are barriers that are easily removed once money is provided. Second order barriers are the ones that impact on fundamental change and are typically rooted in teachers' core beliefs and are therefore the most significant and resistant to change. These beliefs revolve around issues relating to teacher-student roles, teaching methods, organisational and management styles and assessment types. Teachers knowledge of

practice, underpinned by beliefs are difficult to articulate as they are often times tacit and implicit within the practice of teachers (Berry et al., 2009).

Successful ICT integration is clearly related to the thinking processes of classroom teachers, such as teacher beliefs, teacher efficacies and teacher attitudes toward ICT (Lundeburg et al., 2003). The results underpin the importance of an integrated and concurrent understanding of teachers' thinking processes. In order to improve the innovation of classroom activities, teachers' thinking processes should be challenged. As Ludenberg et al., (2003) suggested that action research can be carried out to develop pre-service teachers' confidence knowledge and beliefs about technology.

Muntaz (2000) points out that a lack of computers and software can seriously limit what teachers can do in the classroom with regards to integration of ICT. Access to ICT is obviously a first step in the integration process. ICT competence or skills and ICT confidence are crucial barriers to the integration of ICT in schools. A significant determinant of teachers' level of engagement in ICT is their level of confidence in using technologies. Teachers who have little or no confidence in using computers in their work will try to avoid them altogether (Muntaz, 2000).

The value of increased community and parent involvement is a well-documented antecedent for successful education reform; however, teachers find it especially challenging to increase involvement with parents and members of diverse communities (Epstein & Sanders, 2006). One solution may be the effective use of ICT to increase family and community involvement (BECTA, 2008; Shaw & Shaw, 1999). Findings also stress the need for school ICT integration efforts to be coordinated with learners' home computer use, as Kafai and Sutton (1999) recommended. Schools can capitalise on parental interest in student ICT learning, to increase the quality of parental involvement in learners' school and out-of-school activities. Through learner projects and homework assignments that utilise family resources and invite parental participation, schools may increase parental involvement of the potential benefits and risks of new technologies and help parents make informed decisions about their children's ICT activities at home.

2.4 ICT and learning

Over the last two decades, the effective use of ICT has become an important topic in education. Studies have shown that ICT can enhance teaching and learning outcomes in different subject areas such as Science and Mathematics education (Culp et al., 2005) and language learning (Zhao, 2003). As a result, most curriculum documents emphasise the importance of ICT and encourage school teachers to use them. However teachers need to be specifically trained to effectively integrate ICT in their teaching (Batane, 2004). Because of the diversity of ICT as well as their applications in educational situations, a thorough working knowledge of all these technologies is expected of teachers in their teaching and learning processes (Katz & Macklin, 2007).

Using Problem Based Learning (PBL), interest in this approach to learning has been maintained because fundamental ideas underlying PBL have related directly to constructivist idea about teaching and learning, and to ongoing debate about the nature of professional practice. PBL has presented a coherent and practical approach to learning which incorporates ‘active’ rather than ‘passive’ approaches to the development of critical thinking skills, experiential and social learning in the form of collaborative inquiry based on engaging with authentic problems, and more dynamic interactions between teachers and learners based on respect for students’ prior learning and experience (Hendry et al., 1999).

Gulsecen and Kubar’s (2006) study on a Teacher Education Programme (TEP) in Turkey found that Problem Based Learning (PBL) could be an effective motivator for ICT learning, while a study done in Australia (Gill & Dalgarno, 2008) indicate that both curriculum and personal factors such as attitude, motivation and confidence are important for pre-service teachers’ ICT learning. The authors suggest that examination of the TEP is needed to answer the question such as on how the technology course can address pedagogy and also how the methods course can incorporate technology.

Although the attention paid to the importance of ICT in teacher education programmes has been strong, there is a growing body of research to indicate that even those teachers who consider ICT important and are ready to learn to use them in their classrooms easily revert to their old and secure style of teaching without ICT. The problem is that when teachers do not use their newly-gained knowledge and skills, their knowledge atrophies (Goodwin, 2010) and deskilling happens (Hagreaves, 2003).

Considering the role the teacher education institutes are expected to fulfil, it is important that a teacher educator provides his students with good examples. ICT is not just regarded as a tool which can be added to or used as a replacement of existing teaching methods. ICT should be used to develop student's skills for corporation, communication, problem solving and life long learning (Plomp et al., 1996).

Although computers have become widely available in Dutch teacher education institutes, the use of ICT for learning purposes by teacher educators is still very limited (Ten Brummelhuis, 2001). A national survey on the implementation of ICT shows that two-thirds of teachers of these institutions are very positive about the value of ICT for education. However, only half of the teacher educators use ICT regularly in their courses. These teachers use ICT mainly to prepare lessons and to conduct administration tasks (Ten Brummelhuis, 2001).

For the adaptation of theoretical knowledge to practice, it is necessary to define the role technology in teaching-learning and administrative processes and to understand the advantages and disadvantages of technology usage in that process. Some important contributions of technology usage in schools are to support traditional classroom settings (Rosenfeld & Martinez-Ponz, 2005), to open the classroom to the outside world (Gibson & Oberg, 2004) and to enhance student achievement (Krenkler & Willis-Furry, 2005).

Regarding teaching and learning activities in general, ICT is not frequently used at schools, however, they also show that teachers and learners tend to use ICT more often in specific activities which represent an opportunity to encourage ICT use in schools. Results also show those activities in which ICT is not integrated, but that could guide the development of methodologies and soft-ware applications to support these activities (OECD, 2009).

According to Baggot La Velle et al., (2004), a school subject can be regarded both as a paradigm attribute to teachers' conceptions of the subject they teach, which includes their views of themselves as specialists in this field, and also as pedagogy, that is, the ideas and procedures surrounding the organisation of teaching and learning in the classroom (teaching practice). In order to understand what happens in educational practice in schools, the place in which the cultural reproduction and production take place when new technology is introduced into the educational context, a leading European curriculum

theoretician, Bernstein (1996/2000) emphasises the relation between knowledge and power, and the connection between form and content. Since new technology entails new forms of teaching, this also means that it influences the content of what is communicated. Bernstein's theories are important for pointing out the power relations that always exist in the teaching context. He draws attention to the influence of the power relations between teachers and learners on the content and form of the teaching.

2.5 ICT-Based Lessons

ICT increases student motivation - what is seen in many arguments for why ICT should be used in schools. There are a lot of assumptions that where students are interested in using ICT, they found it more pleasant, more appealing and more motivating to study with computers than the traditional means. ICT is just one component of the teaching process, but it is particularly important because of the special features brought to learning and application of other subjects in the school curriculum, such as: speed, capacity and range of access to information, automatic processing of data, ease of amendment of work carried out and immediate feedback to the learner (Kennewell et al., 2000).

In a survey of the use of ICT and media in Swedish schools, Jedeskog (2005) finds that teachers of certain subjects such as mathematics, science subjects and Swedish accept ICT more easily and he indicates authority losses for schools as an institution. In a comparative study among lower secondary classes in the USA, England and Wales, McEachron et al. (2003) show how different school subjects' so-called 'universal and characteristic' structures influence both the classroom environment and the educational interaction between learners and teachers.

A large and extensive English project, Inter Active Education: teaching and learning in the information age (John & Sutherland, 2005) focused on various different communities of practice connected to different subject areas: English, mathematics, natural sciences, modern languages, music, history and geography. Sutherland, (2004) started out from the question of how embedded ICT is in these different school subjects. The result shows that many of the teachers on natural science subjects work in a cultural context counteracting the use of ICT in their teaching. Many teachers of English and foreign languages have also developed productive way of integrating ICT in their teaching, whereas the work with ICT in history and geography was more varied.

Taking an economics lesson that uses an ICT-based simulation package to investigate the relationships among the economic indicators as an activity system, the elements in the learning environment fit into the various components and their relationships of the expanded version of the mediational triangle. The subject is the individual student and the primary object, negotiated with and set by the teacher, is to engage in higher order thinking processes of hypothesising and analysing the relationships among the variables found in the simulation package. However in order to achieve the primary object of engaging in higher order thinking, the learner autonomy of students has to be supported by orienting activities in the ICT-based learning environment. Learner autonomy is then a necessary but not sufficient condition to achieve the primary object (Cole, 1995).

The individual learner is expected to be an economist at work, gathering, representing, interpreting and analysing data. The teacher takes on more of a mediator role than he or she will take in a non-ICT environment. Therefore, taking an activity system as a unit of analysis allows one to observe the actual processes by which orienting activities support learner autonomy in the ICT-based learning environment. It is a starting point for a sociocultural approach towards the study of ICT in schools: “real activities of real people” over time (Cole, 1995:159).

A shift has also taken place with regard to the use of ICT in science education. The first application, in the late 1960s, focussed on cognitive benefits to the learner. For example, the transmission of predefined content knowledge today, the goals of science education found in modern curricula centre on inquiry-based learning where developments in ICT have been most beneficial (Linn, 2003; Hennessy & Osborn, 2003). As a result, schools have included the use of ICT in their educational programs, to help students learn effectively. The emergence of Internet technologies has prompted the Australian and New Zealand governments to collaboratively fund projects aimed at developing a body of high-quality curriculum content for their school, distributed online (Schibeci et al., 2008).

Teachers are gaining access to ICT, professional development is available and digital curriculum resources are accessible and are continually being developed. The digital classroom is a reality. However, teachers’ability to use these digital tools in their classrooms, that is, the digital pedagogies required for the effective implementation of ICT have not been adopted by the majority of teachers (Scimshaw, 2004) and there still exists a

division between the input of the early adopters and the reality of a more widespread implementation of ICT.

To summarise, when media and ICT are introduced into teaching, the traditional textbook loses its role in the teaching. Not only do textbooks seem to be dated from the point of view of content, the learners also seem to have obvious difficulties in approaching textbooks and written texts. Instead they search for knowledge on the internet. At the same time another recontextualisation agent, the teacher, loses control over communication in the classroom and hence of the framing too. At several levels and for different reasons the regulative discourse is challenged along the way (Bernstein, 1996/2000).

2.6 ICT co-ordinators

The ICT coordinator plays an important role in the integration management of ICT in schools (Marcovitz, 2000). With a good understanding of this process, an ICT coordinator can help change schools in a positive way (Marcovitz, 2000). In this respect, Strudler (1994) concludes that ICT cannot facilitate learning and instruction without the support of an ICT coordinator as a change agent.

Over the years many different roles have been assigned to the ICT coordinator, from technologist to leader (Lai & Pratt, 2004). At a macro-level, the roles have been influenced by societal and economic demands that were reflected in the curriculum prescribed by educational policies (Vanderlinde et al., 2009). For instance, the implementation of a technology curriculum meant for the ICT coordinators that a more managerial role or a role as change agent was needed (Vanderlinde et al., 2009). At a micro-level, the roles of the ICT coordinators have been influenced by those who work, teach and learn in schools, depending on the local needs and resources. For example, in the study of Lai and Pratt (2004) a lack of time allocation to the job of ICT coordinator and ineffective professional development constrained the ICT coordinator in planning and supporting colleagues.

Over the last few decades, the roles of ICT coordinators have changed considerably. ICT coordinators dealt with practical problems associated with the installation and use of computers. Nowadays, besides this role, the ICT coordinator is assumed to take on many different responsibilities which can be divided into two categories; planning and implementation (Moursund, 1992).

Planning includes tasks such as facilitating changes in the curriculum and making sure that there are means available to implement the curriculum. Implementation means that the ICT coordinator facilitates innovation, maintains the hardware and the software, offers training to teachers, administrative staff and parents, develops curricula and provides technical support (Moursund, 1992). Additionally Moursund (1992) defines the ICT coordinator as a change agent, someone who facilitates the change in ICT use in schools.

Hancock (1990) defines the role of ICT coordinator from a different perspective. He defines the ICT coordinator as a mentor for students, as a role model for the teachers and a strategic person who supports the administrative staff and the board. The role of mentor consists of giving support to students when there are hardware or software problems. As a role model, the ICT coordinator shows teachers how they can use computers in support of the instruction process. According to Hancock (1990) a school needs someone to act as a catalyst for computer use, a role that is best fulfilled by the ICT coordinator.

The work of Marcovitz (2000) is relevant in this context. The author describes three major roles for the ICT coordinator. The first role is the provision of 'support by walking around' and thus being available to respond to the immediate needs of teachers. The second role includes the 'nuts and bolts' activities referring to technical skills, for example, installation of hardware and software. The third role is that of 'policy maker' comprising issues of planning and funding. Vanderlinde et al., (2009) suggest that ICT coordinators should act more as curriculum managers and change agents.

School leaders are also an important part of the innovation process in an organisation. The leadership behaviours of senior management plays an important role in determining the success or failure of an ICT implementation (Neufeld et al., 2007). In any organisation, there is therefore a need for strong leadership in ICT implementations. This is no less so for schools. School leaders must address the challenge of implementing new technologies, such as student management systems (SMS), as school administration becomes increasingly computerised. School leaders also have roles to play in championing ICT use to teachers for the benefits of increasing educational outcomes (Baek et al., 2008). School leaders are defined as individuals with leadership roles within schools such as principals, deputy principals, head of department and head teachers. Thus, in order to understand how school leaders come to take up the championing role, it is important to understand what encourages them to act as champions of the new technology. To perform these technology

roles well, school leaders need to have a level of ICT competence so they can be effective implementers of new ICT. ICT competence can also help school leaders to be effective leaders, this is an important leadership responsibility for school principals. However, although school leaders may have been formally mandated in terms of technology leadership responsibilities this can be problematic since they often do not have the training or background to feel confident in dealing with technology (Flanagan & Jacobsen, 2003).

ICT competence is a key factor that influence technology leadership behaviours such as willingness to champion new ICT. Champions are also important in the implementation of new technology. An experienced champion is essential to the success of large ICT projects implementation, therefore plays key roles in advancing or supporting the introduction of new technology into organisations (Neufeld et al., 2007). Champions can be distinguished from non-champions because they can communicate a clear vision of innovation, display enthusiasm for the innovation, demonstrate commitment and involve others in supporting it. However, champions are more often not formally responsible for promoting innovations but become technology champions because they believe in that technology (Howell, 2005). Champions therefore need to be proactive in promoting and supporting new technology in their organisation while enlisting others to aid them in this effort. Hence, the presence of an energetic and respected person is required to effectively champion new technology (Neufeld et al., 2007).

Howell and Boies (2004) suggest that champions need to understand the technology and how it fits within the broader organisational context to be effective promoters of the innovation. Champions therefore have broader general knowledge and capabilities and are able to recognise the potential benefits of new technologies for the organisation (Howell, 2005).

Learners and teachers are also likely to be more equal, according to the teachers, learners will be able to help teachers with the technology and thus create a mutually beneficial relationship. Jedsok's (2005) consideration that subjects adopting ICT suffer a loss of authority is correct in the sense that the relations between learners and teachers may become less hierarchal. It is also true in the sense that the teachers will expect to put their prestige on the shelf, that is, they cannot count on having the best knowledge in all contexts. Rather, learners too can be allowed to use their knowledge to help other learners. It does not seem to involve any loss of authority for the individual teacher. The teachers

emphasise rather that it is a matter of different relationship, a relationship based a different kind of respect than the one they have been used to. The consensus of the teachers is that it is leading to something positive and different (Jedeskog, 2005).

2.7 ICT – IT/IS policies

One of the central activities in the field of Information and Communication Technology (ICT) is the quest for conditions that support the integration of ICT into classrooms. The researchers have described supporting conditions situated at both the teacher and school level. One of the conditions situated 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) because of how it might influence teachers’ classroom integration.

ICT policy can be used synonymously with technology planning at different levels. Nations, states, districts and schools can all write an ICT policy plan, and although their specifics will vary in accordance with the policy level, all ICT policy plans will serve as blueprints for what education with ICT should look like (Fishman & Zhang, 2003). ICT policy plans are strategic and based upon collective processes. As such, school-based ICT policy plans are ideally linked with classroom activities and how ICT can benefit student learning. This reflects a relationship between leaders’ ideas for ICT-represented in their school policies and desired changes in the classroom (Jones, 2003). Thus, ICT policy plans and leaders’ involvement in their making and implementation provide insight into the nature of ICT leadership at a school and the degree to which leadership practices connect with and might influence classroom practices.

ICT policy planning and the establishment of a school-based ICT policy plan have recently gained attention because they can act as a lever for successful ICT integration (Vanderlinde et al., 2009). Bayler and Ritchie (2002) indicate that the schools which are successful in integrating ICT are often guided by an ICT plan. Teachers in schools with an explicit ICT policy plan that emphasises shared goals tend to use ICT more regularly in their classrooms.

According to Vanderlinde et al., (2010), in order to be successful:

- An ICT policy plan should be grounded in a shared vision of teaching and learning on the one hand and ICT on the other hand.
- An ICT policy plan must be related to particular curriculum content and the enhancement of student learning.
- An ICT policy plan needs to be frequently updated (Fishman & Pinkard, 2001) following the evaluation and monitoring of the implementation of the plan. An ICT plan is a dynamic or interactive document subject to continuous improvement and revision.
- An ICT policy plan should be jointly constructed. ICT policy planning requires collaboration (Fishman & Pinkart, 2001). When teachers participate in the process of policy planning and decision making, they become aware of the content of the ICT policy plan. Goals need to be shared and teachers must be involved in determining the means to attain these goals (Picciano, 2006; Tondeur et al., 2008)

Several authors argue that schools need leaders that guide and support them in the process of implementing ICT in education. For the context of ICT policy planning both the school leaders and the ICT coordinators can fulfil this specific role (Lai & Pratt, 2004).

Teachers in schools with an explicit ICT policy that stresses shared goals are using ICT more regularly in their classrooms. An ICT policy plan seems to be an important incentive to foster the integration of ICT use in classroom, but only when teachers are aware of its content. In other words, successful ICT integration becomes much more likely when teachers share the values expressed within the school policy and understand their implications (Kennewell et al., 2000).

In 1994, South Africa became a comprehensive and democratic political system. Three overlapping principles regulate access to education: access with no discrimination, physical accessibility in terms of distance and safety while travelling to school and affordability for all (Blignaut & Howie, 2009). South Africa has a host of legislation that governs and mandates delivery of education. Since 2004, the White Paper on e-Education (Department of Education, 2004) acts as the official governing policy on e-Education in South Africa.

This policy supports systematic, pedagogical, curricular and assessment reforms that will facilitate improved education and improved use of educational resources such as ICT tools

(Department of Education, 2004:14). The strategic goal of the policy is that “every South African manager, teacher and learner in the General and Further Education and Training (GET and FET) bands will be ICT capable, that is, use ICT tools confidently and creatively to help develop the skills and knowledge they need as lifelong learners to achieve personal goals and to be full participants in the global community by the year 2013” (Department of Education, 2004: 17).

Teachers are encouraged not only to make use of ICT tools for effective teaching and learning, but also to access ICT resources to support curriculum delivery, build capacity through collaboration and co-operation, and to make management and administration more cost and time effective. South African schools with access to computers increased from 20% in 1998 to 38% in 2006 (Law et al., 2008). 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).

The implementation of the strategic policy goals of the South African White Paper on e-Education follows a multi-year implementation strategy executed in three phases (Department of Education, 2004):

- Phase 1: Enhance system-wide and institutional readiness to use ICT tools for learning, teaching and administration.
- Phase 2: System-wide integration of ICT tools into teaching and learning.
- Phase 3: Integration of ICT resources at all levels of education system, including management, teaching and learning and administration.

2.8 Teacher involvement

Educational change is dependent on “what teachers do and think, it is as simple and complex as that” (Fullan, 2007:129). This is not to dismiss other educational stakeholders but to highlight that changes in the student learning experience ultimately reside with teachers. When looking at factors that affect technology use, the teacher is naturally the first person one can look to (Zhao et al., 2002). In the teacher domain, there are three factors associated with the teacher that impacted technology integration in classrooms, they are: technological proficiency, pedagogical compatibility and social awareness. The first factor refers to not just knowledge of technology but also its enabling conditions, The

second factor refers to the compatibility of the teacher's pedagogical beliefs and the technology being used. The third factor highlights the significance in the ability of a teacher to negotiate the social facet of the school culture (Zhao et al., 2002).

ICT skills refer to the ability to comprehend and utilise digital processes and tools. As the amount of equipment in schools increases, expectations of teachers continue to rise. Teachers are expected to make a substantial contribution to students' ICT ability. Teachers are supposed to help students develop lifelong learning skills as well appreciate the rights, responsibilities and ethics of the emerging digital world (ISTE, 2008). Teachers are also expected to use ICT to make learning environment more flexible, engaging and challenging (Culp et al., 2003; Orrill, 2001). To start with, a better understanding of teacher ICT usage is needed. Teacher ICT usage includes course preparation or instructional support, such as creating quizzes, searching the internet to find lesson plans and resources, creating presentations and building or hosting websites.

Webb (2005) explains ICTs from the point of view of the affordances they provide to support learning and the need for teachers and curriculum developers to see how these affordances could be used to support other innovations such as cognitive development, formative assessment and new curricula.

It can be simply stated that teacher pedagogical beliefs affect their teaching behaviours in the classroom (Bandura, 1996; Clark & Peterson, 1986). With the advent of ICT in education teachers have begun to form their own beliefs about the role of ICT as a teaching tool, the value of ICT for student learning outcomes and their own personal confidence and competency. These beliefs intersects with teachers' established pedagogical beliefs. This intersection can be a 'collision' or 'collusion' both having implications on how ICT is used in the classroom, as an add-on to established curriculum practices or as a tool that effects change in their practice (Prestige, 2007).

As beliefs are implicit, unobservable and complex in relation to what one knows and what one actually believes, both the labels and the definitions of teacher beliefs used in the literature are diverse and difficult to define. Beliefs are generally referred to as "suppositions, commitments and ideologies" whereas knowledge is referred to as "factual propositions and understandings" (Calderhead, 1996: 715).

Teacher beliefs about learning and teaching are critical factors in how ICT is actualised in the classroom (Becker, 2000; Orlando, 2009). The relationship between teachers' beliefs and the integration of ICT has been explored in the literature. Loveless (2003:323) in her research of primary teachers' perceptions of ICT and their pedagogy, found that teachers' perceptions of ICT are fashioned by their identity and participation in wider cultural and social spheres which influence the professional arenas and settings in which they practice'. She grouped teachers' perceptions of ICT into three categories: ICTs in society: teachers talked about the Information Society and its impact on children's future working lives; ICTs capability: teachers talked about the ICT skills or information literacies' children require as a subject and as a cross curricular tool; and ICT in schools: teachers talked about 'new' technology in schools and how the lack of resources influenced its integration. Loveless (2003) suggests that these perceptions reflect on-going negotiations of the meaning of ICT in teachers' work and that seeing them as sources of tension rather than as sources of anxiety is more constructive for continued meaning-making.

In order to capitalise on the institutional capacity of national education systems to use ICT, dedicated and sustainable teacher training and professional development is needed. This requires a re-orientation of the instructional culture to enable teachers to use available resources for innovation. ICT does not replace the teachers' roles in instruction, but creates new opportunities for teachers to engage students in critical thinking activities (Aydede & Robbins, 2009).

2.9 Advantages of ICT integration

A new era needs new forms of education which have no compatibility with the traditional one. Despite the many difficulties in implementing ICT in schools, research shows that students and teachers welcome ICT policies in schools and believe that technology could be useful in raising standards in teaching and learning (BECTA, 2001; Kington, 2003). Using ICT enables students to produce creative solutions to support learning and develop new understanding in areas of learning (Curriculum Corporation, 2006). Integrating curriculum elements with ICT characteristics, one should consider establishing smart schools. In contrast to traditional schools teachers are not mere educators, group work is encouraged, students learn according to their own pace and capacity, students can gain access to learning materials through the internet.

Integration of curriculum with ICT resources has brought us a lot of advantages such as the increase of the importance and reliability of curriculum contents, making the curriculum content more flexible, promoting learner's interest and enhancing curriculum usefulness with the possibility of exploiting a combinational curriculum to teach the learners (Curriculum Corporation, 2006).

ICT resources have reshaped the educational landscape by transforming the content and modes of delivery acquisition of learning as well as how the educational institutes operate (Tella, 2009). The use of new technology has brought about high potentiality in technology-based education which can be effective in the process of teaching and learning and also offer exciting new possibilities to promote the changes in education methodologies.

Moreover, Papert (1997) identified the following positive effects on students of ICTs in education:

- enhanced motivation and creativity when confronted by the new learning environments,
- a greater disposition to research and problem-solving focused on real social situations,
- more comprehensive assimilation of knowledge in the interdisciplinary ICT environment,
- systematic encouragement of collaborative work between individuals and groups,
- ability to generate knowledge,
- capacity to cope with rapidly changing, complex and uncertain environments, and
- new skills and abilities fostered through technological literacy.

Furthermore, Kozma and Anderson (2002) claim that ICT resources are transforming schools and classrooms by bringing in new curricula based on real world problems, providing scaffolds and tools to enhance learning, giving students and teachers more opportunities for feedback and reflection and building local and global communities that include students, teachers, parents, practicing scientists, and other interested parties.

2.10 IT/IS - ICT in schools

Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computer' was replaced by IT (Information Technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the term 'ICT' around 1992, when e-mail started to become available to the general public. The issue of 'computers in education' started to become popular in educational policy making in the early 1980s, when relatively cheap microcomputers became available for the consumer market. Also with regard to the early introduction of microcomputers in education in 1980s, there were high expectations that it would make education more effective and motivating.

ICT tools include multimedia resources, databases, Websites, digital cameras and word processing programs. These tools are used to help students to collect, organise and sort data they gather and write, edit and present reports on their findings and also to connect students to other schools, at home and abroad and to bring the global community into the local classroom (Lim, 2002).

Hepp et al. (2004) state that the roles ICT tools play in the educational system can be pedagogical, cultural, social, professional and administrative.

- Pedagogical Tool Role: ICT tools provide a new framework that can foster a revision and an improvement of teaching and learning practices such as collaborative, project based and self-paced learning.
- Cultural, Social and Professional Roles: The cultural, social and professional roles of ICTs are exercised primarily through an effective use of the vast amount of information sources and services available today via Internet and CD-based content for the entire educational community: students, teachers, administrators and parents.
- Administrative roles: ICT tools have important roles to play in making school administration less burdensome and more effectively integrated into the official information flow about students, curricula, teachers, budgets and activities through the educational system information pipelines.

As ICT enters the sociocultural setting of the school, it may trigger changes in the activities, curriculum and interpersonal relationships in the learning environment and is reciprocally affected by the very change it causes. That is, ICT in schools cannot be isolated from the learning environment in which it is situated. Although schools are known to be resistant to change, the proliferation of ICT is beginning to affect how teachers teach. One of the current issues about the use of ICT in schools is how ICT is integrated into the curriculum. Since curriculum documents encourage the use of ICT in schools, practicing teachers expect that new graduates will have a reasonable knowledge of how to use these technologies (Pelgrum & Law, 2003).

Due to the influence of traditional educational technology and settings, teachers do not have the capacity to take advantage of ICT in their teaching practice. It then becomes necessary to familiarise pre-service teachers with the availability of ICT tools and potential for their use in their schools and to make them aware of the school realities they are likely to encounter. Teachers also need to evaluate any new technology they think of bringing to school by considering existing human and technological infrastructures as well as current social support networks (Zhao et al., 2002).

The socio-economic costs of the IT infrastructure in schools also need to be taken into consideration during the planning stage. The socio-economic costs of the IT infrastructure in schools are made up of two basic aspects: on the one hand, the availability of hardware and software, and on the other, Internet connectivity. What are the costs of both and what are the resulting levels of inclusion and exclusion? Given the fact that most schools have to get involved in one way or another with computers, the crucial question of socio-economic evaluation is not to establish a false choice between having ICT or not. In tune with the arguments, it is apparent that the IT infrastructure of a given school is not just a matter of pure economic considerations but involves careful planning (Tearle, 2003).

It is suggested that school culture is an important consideration in terms of ICT integration (Lim, 2002; Tearle, 2003). School culture can be defined as “the basic assumptions, norms and values, and cultural artefacts that are shared by school members” (Maslowski, 2001). These meanings and perceptions indirectly affect attitudes and behaviour in the organisation of schools.

The successful ICT integration is clearly related to actions taken at the school level, such as the development of an ICT plan, ICT support and ICT training. The principals have to develop a more collaborative approach when defining the policy. It is also important to have a shared and school-wide vision about ICT integration that reflects the opinions and beliefs of the principal, the ICT coordinator and the teachers.

2.11 Research Questions

It has been established from the literature studied that various studies have been done on the integration of ICT into the curriculum from different perspectives by different schools of thought. Nevertheless, the inquiry still remains unanswered as to the integration of ICT into the teaching and learning activities in classrooms (curriculum). Especially with the case study of Mafikeng Area Office high schools. As a result the following research questions still remain:

- To what extent are the ICT tools used in the teaching and learning activities in Mafikeng schools?
- What are the issues and barriers in ICT use among Mafikeng school teachers?
- What are teachers' perceptions about the uses of ICT in teaching and learning activities?
- To what extent are teachers empowered with ICT application and skills?

2.12 Conclusion

It is accepted that Information and Communication Technology is changing the face of education. ICT plays a strong role in advancing the Education for Sustainable Development which vision is to have a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation, as is stipulated in the documents of United Nations General Assembly that proclaimed the United Nations Decade of Education for Sustainable Development, 2005-2014.

This chapter is concluded by highlighting that, what is important when it comes to education is not the technology but rather the identity and the quality of the teaching and learning process and the degree to which pedagogical activities are coherent with school's

pedagogical programme. The school's educational system should encourage the innovative roles of both teachers and students, allowing the successful ICT integration and for ongoing and negotiated assessment.

Thus, current research indicates that there are several perceived benefits to integrating ICT into educational practice for both teachers and learners. The value of ICT as a motivational tool stressed as well the affordances it allows for access to a wider range of more current resources. Like the study by Lai and Pratt (2004), this study seeks to ascertain the contribution of ICT use to teaching and learning as perceived by the teachers.

This chapter formed the theoretical base of this study. Formulating the conceptual framework was done by consulting relevant literature. The next chapter will give a comprehensive outline of the methods that were used to collect and analyse data.

Chapter 3

Research Methodology

3.1 Introduction

This chapter describes the research methodology applied in this study, it explains the rationale behind the methodology including the data collection method, data collection instruments, the research population and the method of sampling used. The research methodology outlines and explains the relationship between the research analysis of the research. According to Cohen et al., (2000), the aim of methodology is to help the researchers to understand the processes and products of scientific enquiry. This can be done through different data collecting techniques or strategies that are available and making meaning out of collected data. The geographical area where the study is conducted, the study design and the population are described.

The first phase involved gathering of information in a hard copy using a questionnaire. The questionnaire was drawn up and distributed to school teachers in a chosen district in North West Department of Education. The researcher used different research design methods such as qualitative and quantitative types of design. The population was sampled accordingly so that time must not be wasted.

The researcher placed emphasis on accurate and complete information so that subjects could fully comprehend the investigation and consequently be able to make a voluntary, thoroughly reasoned decision about their possible participation. Informed consent becomes a necessary condition rather than a luxury or an impediment (Hoinville et al., 1978).

3.2 Research approach and design

The study adopts the quantitative approach. According to Leedy and Ormrod (2005), all research can be categorised as qualitative, quantitative or what the author refers to as triangulation. The nature of data and the problem for research dictate the research methodology. If the data are verbal, the method to be used is qualitative and if the data are numerical, the methodology is quantitative.

3.2.1 Qualitative and quantitative research

Qualitative researchers aim to produce an understanding of the environmental issues with focus on interpretation rather than quantification. Qualitative research deals with designs techniques and measures that do not produce discrete numerical data. It involves extensive narrative data in order to gain insight into phenomena.

Burns and Grove (2011) define quantitative research as a formal, objective, systematic process to describe and test techniques and examine cause and effect interactions among variables. Quantitative research includes designs, techniques and measures that produce discrete numerical or quantifiable data. Data are analysed mainly statistically, the researcher analysing the data including coding of data and production of verbal synthesis. This is based on a generally held belief that there are different versions of understanding and the aim is to give an accurate voice to these (Cresswell, 2009). Begg (2008) goes on to define quantitative analysis by saying that it focuses on “quality”, a term referring to the essence or ambience of something. A quantitative method examines the “extent to which differences in one characteristic or variable are related to differences in one or more other characteristics or variables” (Leedy & Ormrod, 2005). Quantitative data collection methods often employ measuring instruments and it is underpinned by the principles that are fundamental to measurement with specific measuring instruments, namely questionnaires, checklists, indexes and scales.

3.3 Research setting

As the South African Department of Education (DoE 2003) is seeking to bridge the gaps that existed prior to 1994, this study will report on twenty one out of twenty-five Public Secondary (High) schools in Mafikeng Area Office according to the categories determined by the government. A survey was conducted in the sampled Mafikeng schools. Cohen et al., (2000) suggest that a survey in a research aims to gather information at a particular point in time intending to describe the nature of the conditions for determining the relationship that exists between specific events.

3.4 Target population and sample size

This section presents the population of the study and the size of the sample taken in the research. According to Burns and Grove (2011), a population is defined as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study.

3.4.1 Population

Seaburg (1998: 240) defines a population as the total set from which the individuals or units of the study are chosen. A population is the totality of persons, events, organisation units, case records or other sampling units with which the research problem is concerned hence a study of the whole (Hoinvill et al., 1978). Population can now be defined as a set of entities for which all the measurements of interest to the practitioner or researcher are represented.

The study was conducted in North West Province, in Mahikeng Area Office. The total number of high schools in Mahikeng Area Office is twenty-five (25), four (4) independent and twenty-one (21) ordinary public schools. Teachers in the twenty one public ordinary schools are targeted for the purpose of this study. A sample of 120 teachers were targeted for this study.

3.4.2 Sampling procedure and size

Sampling is a process by which a researcher selects a group of participants from a larger population. According to Burns & Grove (2011) a sample comprises the elements of the population considered for actual inclusion in the study. The population of interest for this study included all the teachers in the selected schools, out of a population of 447 teachers 120 questionnaires were distributed.

The participants needed to meet the following criteria to be included in the sample. They needed to:

- Be qualified teachers
- Be mentally sound in order to consent to participation
- Be willing to participate
- Be of either sex or any race

Sampling strategy, that is, design and size depend on the research paradigm. The quantitative method requires random and representative sampling characterised by larger samples (Leedy & Ormrod, 2005). For the selection of respondents a random sample was drawn since it is that sample of population where each member has an equal chance of being selected. Kerlinger (1996:110) succinctly states that random sampling is that method of drawing a portion or sample of population so that each member of the population has an equal chance of being selected.

Respondents out of twenty one selected schools consisted of principals, deputy principals, heads of departments and teachers per school. This is due to the fact that they were the relevant people who deal with curriculum and policy implementation on daily basis.

3.5 Data collection

3.5.1 Data collection instrument

The study made use of a questionnaire as a main tool for collecting data. A questionnaire is a printed self-report form designed to extract information that can be obtained through the written responses of the subjects. The information obtained through a questionnaire is similar to that obtained by an interview, but the questions tend to have less depth (Burns & Grove, 2011).

Data were collected with the aid of questionnaire to evaluate the teachers', HODs' and Principals' knowledge and views on the integration of Information and Communication Technology into the day to day teaching and learning activities in schools. Questionnaires were decided upon because of the following:

- They ensure a high response rate, as they are distributed to respondents to complete and collect personally by the researcher.
- They require less time and energy to administer.

Questionnaires should be as brief as possible and solicit only that information essential to the research project (Leedy & Ormrod, 2005). The number of questions was limited to not more than twenty five questions. The questionnaire consisted of two sections (Refer to Appendix B). The first section aimed at gathering biographical data on the respondents including age, gender, qualifications, subject taught, number of years of teaching

experience and frequency as well as the level of decisions that were normally made by respondents, while the second section focused on specific questions with regards to the extent ICT tools are being integrated into teaching and learning activities. To ensure that respondents shared a common notion of ICT integration, a definition was given in the questionnaire.

The questionnaire was written in English, as English is a national official communication language used in South Africa. It consisted of two sections, Section A and B. Section A aimed at gaining demographic data such as age, level of education, gender. This information could assist when interpreting the results. Section B aimed at the knowledge and views of teachers on ICT tools and the integration of ICT into the school curriculum. Instruction guidelines were attached to the questionnaire to guide the subjects as to whether to circle or tick the chosen response.

3.5.2 Data collection procedure

Questionnaires were personally distributed by the researcher to schools. In each school, the questionnaires were left with the school principal to distribute them to the entire staff. Data were collected during the month of July 2013. Two application letters were written requesting permission to collect data at schools in Mafikeng Area Office in Ngaka Modiri Molema District. One letter was addressed to Mafikeng Area Office manager and the other was addressed to principals of the chosen schools.

3.6 Validity

The validity of a measurement is the extent to which the instrument measures what it is supposed to measure (Leedy & Ormrod, 2005). Schwandt (1997:168) defines validity as a property of a statement, argument or producer. To call something 'valid' is to indicate that it is sound, convincing, well grounded, justifiable or logically correct. Because researchers work within different paradigms, the criteria used to establish validity within studies differs. In quantitative studies researchers normally use tried and tested measures, experiential arrangements and statistical techniques to ensure that accurate conclusions can be drawn from the research results (Terre Blanche & Durrheim, 1999). Contrary to this, validity in qualitative research has to do with description and explanation and whether or not the explanation fits the description. In addition, qualitative researchers do not claim

that there is only one way of interpreting event. There is no correct interpretation (Denzin & Lincoln, 2003).

There are four types of validity that can be discussed in relation to research and statistics. Researchers must be aware that this represents a cursory discussion of the concept of validity. Each type of validity has many threats which can pose a problem in a research study. For a comprehensive discussion of the four types of validity, the threats associated with each type of validity and additional validity issues are discussed (Cook & Campbell, 1979).

3.6.1 Statistical conclusion validity

According to Cook and Campbell (1979), statistical conclusions validity refers to inferences about whether it is reasonable to presume covariation given a specified alpha level and the obtained variances. Essentially, the question that is being asked is – “Are variables under study related?” or “Is variable A correlated with variable B?” If a study has good statistical conclusion validity, it should be relatively certain that the answer to this question is “yes”.

Example of issues or problems that would threaten statistical conclusion validity would be random heterogeneity of the research subject (the subjects represent a diverse group – this increases statistical errors) and small sample size (more difficult to find meaningful relationships with a small number of subjects).

3.6.2 Internal validity

Once it has been determined that the two variables (A & B) are related, the next issue to be determined is one of causality. Does A cause B. If a study is lacking internal validity, one can not make cause and effect statements based on the research; the study would be descriptive but not causal. There are many potential threats to internal validity. If a study has pre-test, an experimental treatment, and a follow-up post-test, history is a threat to internal validity. If a difference is found between pre-test and post-test, it might be due to the experimental treatment but it might also be due to any other event that subjects experienced between the two times of testing (for example, a historical event, a change in weather, and other more).



3.6.3 Construct validity

One is examining the issue of construct validity when the researcher want to know if a particular drug (Variable A) will be effective for the treatment of depression (Variable B), the reasearcher will need at least one measure of depression. If that does not truly reflect depression levels but rather anxiety levels (Confounding Variable X), then the study will be lacking construct validity. Thus, good construct validity means that the researcher will be relatively sure that Construct A is related to Construct B and that this is possibly a causal relationship. Other threats to construct validity include subjects' apprehension about being evaluated, hypothesis guessing on the part of subjects, and bias introduced in a study by expectancies on the part of experimenter (Cook & Campbell, 1979).

3.6.4 External validity

External validity addresses the issue of the researcher being able to generalise the results of the study to other times, places and persons. If researchers conduct a study looking at heart diseases in men, can these results be generalised to women? Therefore the external validity of this study is threatened.

In qualitative research trustworthiness is used as a criterion parallel to conventional (positivist) research. Trustworthiness criteria are for judging adequacy (goodness, quality) within analysed data that the researcher has collected in the investigation. The techniques within trustworthiness criteria are credibility, transferability, confirmability and dependability.

To ensure the credibility of the study, permission was sought from the school management teams and initial contact made with the possible participants to apprise them of the nature of the study. The qualitative data analysis method was used in this study where the researcher relied more on the simple statistical analysis. The questionnaire instruments were analysed using the qualitative approach. Assistance to analyse data was received from an experienced statistician. A statistical tool (SPSS) was used to determine the results of the study.

3.7 Conclusion

The questionnaire was used as a main tool for collection of data for this study. The data were analysed quantitatively and interpreted after this chapter in order to check on results of what the researcher was investigating as true reflection of the research problem. This helped the researcher to come up with findings and recommendations on the integration of ICT in the day to day teaching and learning activities.

The next chapter focuses on the study findings, statistical analysis and interpretation of data that would be used in rejecting or accepting the raised challenges in the implementation of ICT in schools.

Chapter 4

Data Discussion

4.1 Introduction

The use of computers in all the Mafikeng Area Office high schools is not different from any other schools in developing countries. The earlier studies of computer usage in developing countries have shown that these countries have more challenges in their ICT tools integration than their developed counterparts, which are sometimes taken for granted. These challenges will ultimately impact on ICT integration in schools development in many countries. In this chapter the findings of teachers' perceptions of the use of ICT tools in the teaching and learning activities from high schools in the Mafikeng area are presented. The data collected were explored under the following topics: ICT teacher competency; teachers' challenges in the use of ICT tools; teachers understanding about ICT integration; teachers' ICT skills and tools availability as guided by research questions. Survey was conducted in the form of a questionnaire.

4.2 Background

The study was conducted in North West Province, in the Mafikeng Area Office. The total number of high schools in Mafikeng Area is twenty-five (25), four (4) independent and twenty-one (21) ordinary public schools. Teachers and School Management Team members in all the twenty one (21) schools were targeted for the purpose of this study.

4.3 Response rate

Of a population of 447 teachers, 120 questionnaires were given out, and the researcher had a response rate of 108 (a favourable response rate). The response rate from this study made it meaningful to the variable used. Responses given were very useful to the study to be able to make meaningful conclusions in chapter five. The data were summarised on a spread sheet and the statistics were calculated using a modern software package called Statistical Package for Social Sciences (SPSS). Data were analysed by using descriptive statistics. The following statistical sample shows that the sample met the strict rules and it was randomly selected. All names were allocated a number and numbers were drawn. If

someone did not complete a questionnaire, the next number was drawn and the person used. In this way the sample could be regarded as being representative. It is also acknowledged that, should somebody else want to use the results, they must first test the results in their organisation so that it can be used to confirm the results.

4.4 Demographics

In the study on ICT tools integration into every day teaching and learning activities, some kinds of characteristics such as gender, age, race and educational levels show differences compared to their responses. The totality of respondents involved 108 in number from Mafikeng Area Office high schools and they were split evenly between males and females, the males outnumber females especially those who teach Grade 12. The educational level is also an important predictor on the level of ICT tools usage in the teaching and learning activities.

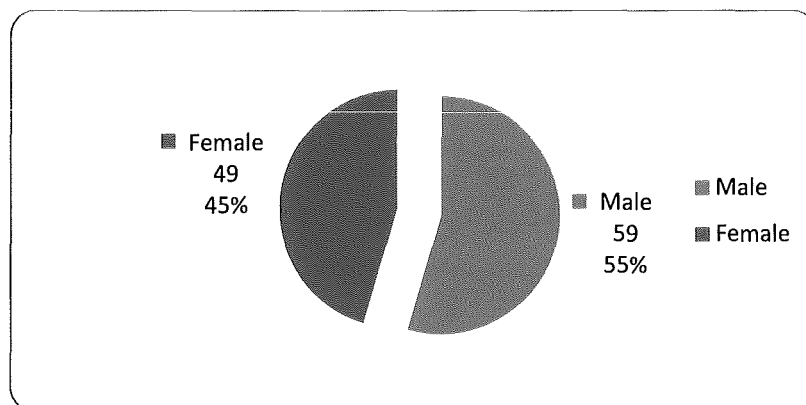


Figure 4.1: Gender of respondents

One hundred and eight (108) teachers completed and returned the completed questionnaires. Of these 59 (55%) were male and 49 (45%) female teachers. The difference in the frequency of male and female respondents was found not to be significant. It is evident from the figures above that the difference between male and female is not huge. Although education has historically been a predominant female field, the number of male teachers in public schools has increased strongly. Furthermore, the sex distribution of respondents in the sample studied may be seen to represent the sexual distribution of the teacher population in high schools. It is also evident that both male and female teacher employees are equally represented in the study.

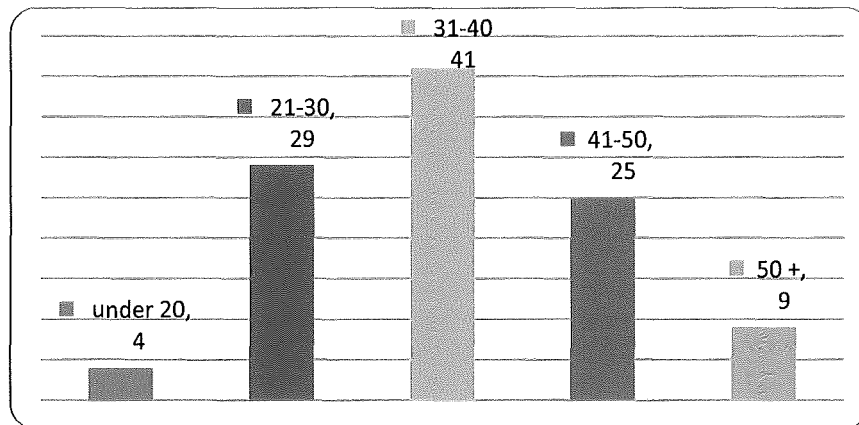


Figure 4.2: Ages of respondents

Figure 4.2 indicates that four (4%) respondents were aged below 20 years; 29 (27%) were aged between 21 and 30 years; 41 (38%) were aged between 31 and 40 years; 25 (23%) were aged between 41 and 50 years and 9 (8%) were aged above 50 years. People that responded mostly were those between 31 and 40 years old. It is important that this group responded, as they are the ones to inform older and younger teachers about ICT integration into the curriculum.

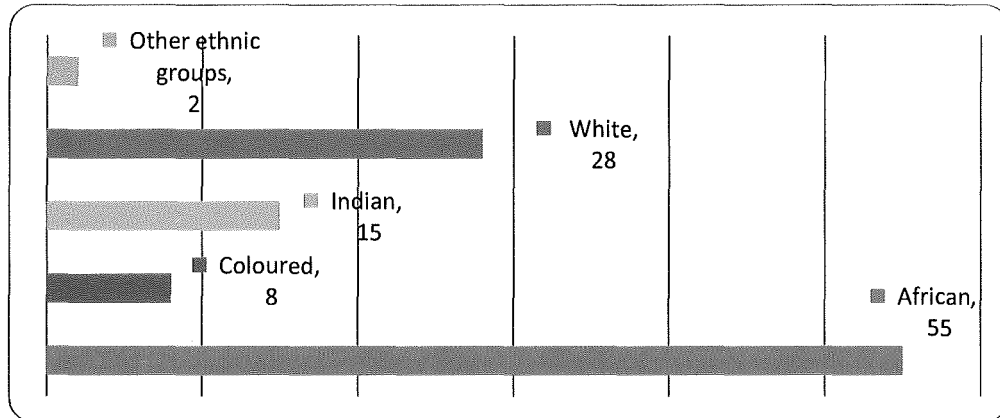


Figure 4.3: Ethnic group of respondents

Figure 4.3 shows that there is some ethnic mix across the sample, 55 (51%) were Africans, 8 (7%) were Coloureds, 15 (14%) were Indians, 28 (26%) were whites and the 2 (2%) were from other ethnic groups. As in the case of gender, it was necessary to determine whether teachers from different ethnic groups have different opinions on ICT integration into the teaching and learning activities. According to the research results 51% of the

respondents were Africans. It is thus clear that teachers from all ethnic groups responded to the study and the ethnicity groups are well represented.

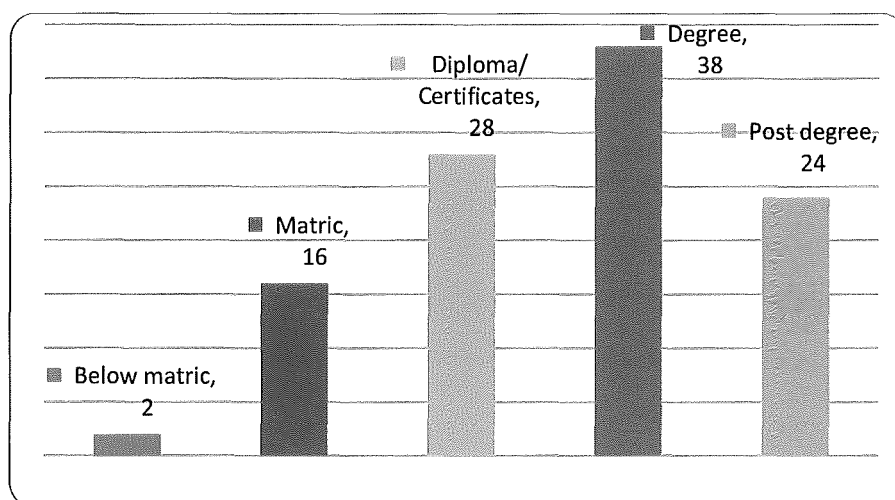


Figure 4.4: Academic qualifications

Respondents without matric were represented by 2 (2%) of the total respondents; 16 (15%) were those with matric only. The majority of 38 (35%) of the respondents possess university degrees and 24 (22%) possess post graduate degrees. The remaining at 28 (26%) are those who possess college teaching diplomas or certificates. The distribution of respondents according to their qualifications shows that the views of both qualified and unqualified teachers are presented.

4.5 Results of the investigation

The discussion is in a form of question elaborations and graphs. The questions are elaborated with the support of Chapter 2. The graphs are used as illustrations of the data collected. The researcher will then prove negative and positive results of the hypotheses formulated before the study. Through these results North West Department of Education will be able to close the gaps on ICT integration into the school curriculum. Part 3 of the questionnaire focused on ICT teacher competency. The first question requested teachers to indicate how often they deliver ICT empowered lessons.

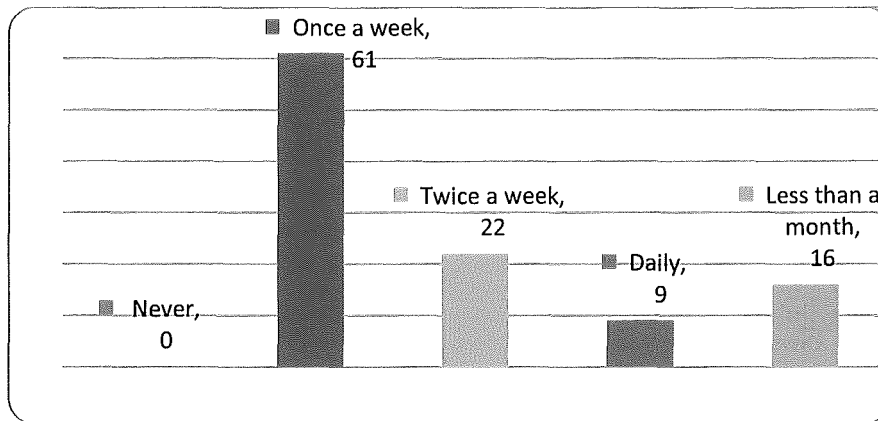


Figure 4.5: How often are teachers delivering ICT empowered lessons?

Figure 4.5 shows that sixty one respondents (57%) agree that they delivered ICT empowered lessons at least once a week, 22 (20%) teachers indicated that they only did it twice a week, 16 (15%) they do deliver ICT empowered lessons in less than a month and 9 (8%) of the teachers indicated that they do that in less than one month. The findings reveal that teachers from all high schools in Mafikeng Area Office do use ICT tools in their daily teaching and learning activities. Teachers are expected to use ICT to make learning environment more flexible, engaging and challenging (Culp et al., 2003; Orrill, 2001).

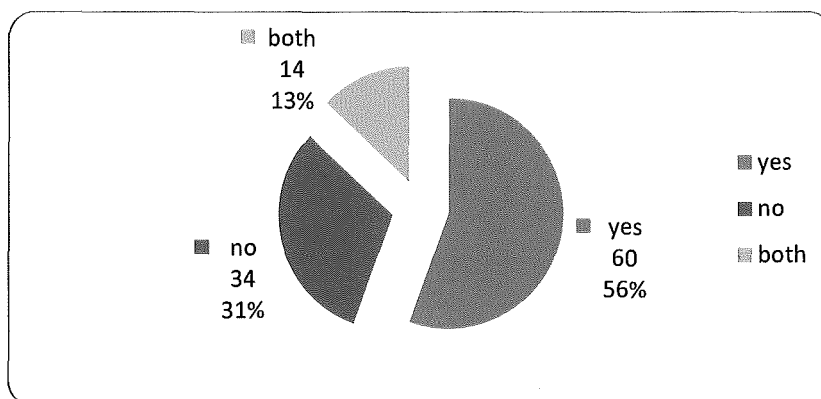


Figure 4.6: Are subject objectives integrated with ICT components?

Figure 4.6 indicates that 50% of the respondents indicated that subject objectives are integrated with ICT components in their teaching and learning activities. This will motivate teachers to make use of more ICT tools to be able to achieve subject specific objectives by using a variety of such tools. One must always keep in mind that ICT is just one component of the teaching process, but it is particularly important because of the

special features brought to learning and application of other subjects in the school curriculum, such as: speed, capacity and range of access to information, automatic processing of data, ease of amendment of work carried out, immediate feedback to the learner (Kennewell et al., 2000).



Figure 4.7: How are teachers skills rated with ICT components?

This question sought to find out the readiness of teachers in using ICT tools in their classrooms. The above figure shows that eighty six (80%) teachers rated themselves highly on the skills they have with ICT components, fourteen (14) rated themselves satisfactory. This suggests that most of the teachers use the tools unknowingly that they are integrating. Because of the diversity of ICT as well as their applications in educational situations, a thorough working knowledge of all these technologies is expected of teachers in their teaching and learning processes (Katz & Macklin, 2007).

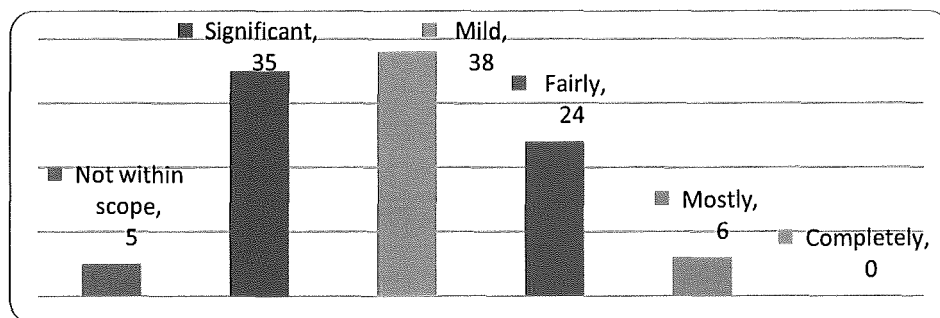


Figure 4.8: Challenges in integrating ICT in teaching and learning activities.

Despite the good promises that ICT resources are making, some schools have enormous challenges in the integration of ICTs into their teaching and learning. In this case 38/108 teachers indicated that challenges experienced in integrating ICT in teaching and learning activities are mild while 35 out of 108 responded by saying that the challenges are significant.

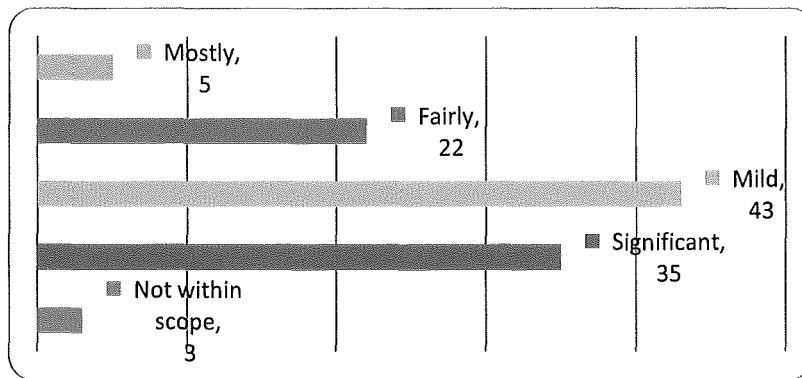


Figure 4.9: Teachers' views on how ICT has been used in schools today?

The question attempted to elicit information about the teachers' perceptions on how ICT has been used in schools today. To get reliable information, teachers were to respond to; not within scope, significant, mild, fairly, mostly and completely. Of the mentioned categories 43 (40%) teachers responded to mild, 35 (32%) teachers to significant, saying that it was noteworthy, 22 (20%) responded to fairly which means that ICT in schools is used fairly. It is only 5 (5%) teachers who perceive that ICT had been used mostly in schools. It can be deduced from Figure 4.9 that teachers in Mafikeng Area Office High Schools have a significant to mild perception about how ICT has been used in schools today.

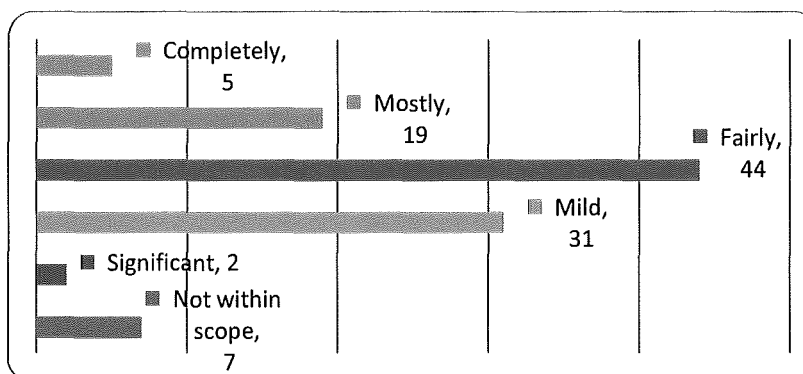


Figure 4.10: How do teachers use ICT tools in their classes?

Teachers are the gatekeepers of the curriculum, and they perform the role of lesson designer and classroom manager. In this study, 44 out of 108 teachers reported that they fairly used ICT tools in their classes, 19 out of 108 used ICT tools mostly and 5 out of 108 completely used ICT tools in their classes. Table 4.10 shows that most teachers used ICT tools on a regular basis.

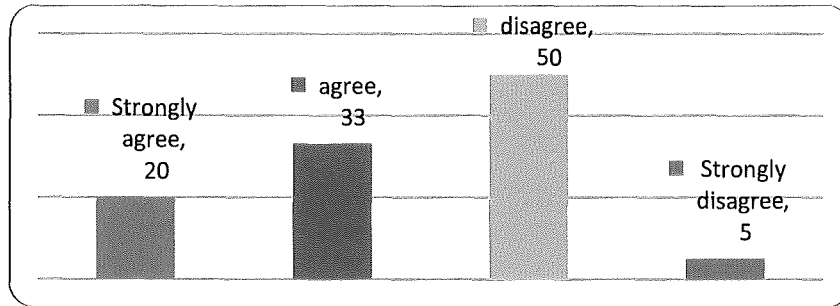


Figure 4.11: Does integration reduce teachers' administration burden?

The topic under discussion was responded to by teachers in the survey as shown in Figure 4.11. Most of the respondents, 50 (46%) disagreed and 5 (5%) strongly disagreed that ICT integration reduced teachers' administration burden. Teacher ICT usage includes course preparation or instructional support, such as creating quizzes and the internet to find lesson plans and resources, creating presentations and building or hosting websites. All that teachers' need is more time to allow them for planning and preparation for both teachers and learning environments conducive for ICT application. Teachers are encouraged not only to make use of ICT tools for effective teaching and learning, but also to access ICT resources to support curriculum delivery, build capacity through collaboration and co-operation, and to make management and administration more cost and time effective, (Culp et al., 2003; Orrill, 2001).

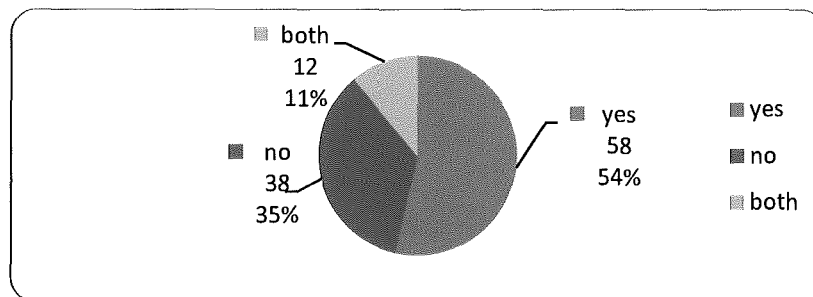


Figure 4.12: Has internet proved to be useful source of ideas and information for teachers?

Looking at the use of Internet, more teachers indicated that they used Internet to source ideas and information. From the questionnaire 58 (54%) of teachers agreed that the Internet proved to be a useful source of information, 38 (35%) indicated that the Internet had not proven to be a useful source of information, and the last group 12 (11%), are those who are not sure whether to say yes or no. What was not initially clear was how they gained access to Internet since some of the schools are not connected to the Internet.

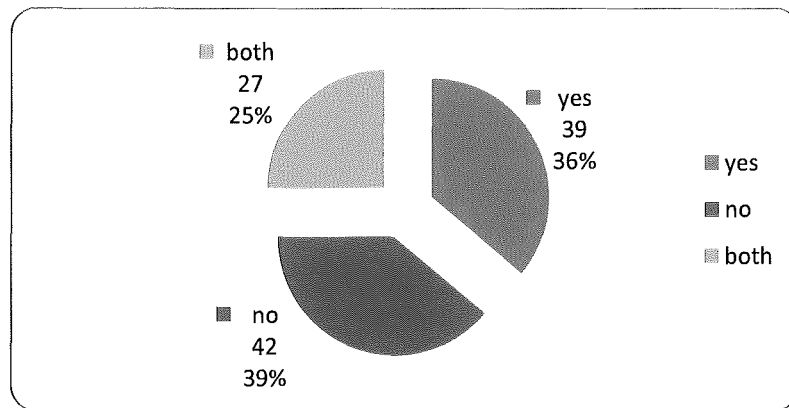


Figure 4.13: Are teachers trained with ICT skills at pre-service or in-service?

ICT integration may take a long time for teachers to become proficient for using ICT tools for themselves, and even longer for them to use the tools for students. Teachers' proficiency of using ICT for teaching has to do with previous training and experience (Van Braak et al., 2004). Only 39 out of 108 teachers felt confident about training in ICT skills at pre-service or in-service. A solution to that would be running workshops on ICT integration so that majority of the teaching force can see the benefits that come with the use of ICT tools.

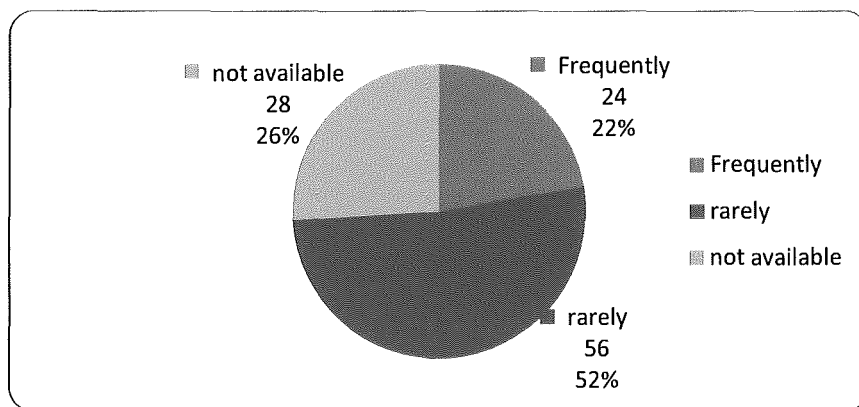


Figure 4.14: How often do teachers get support for the distance training?

Many teachers had difficulty in answering the above-mentioned question. Figure 4.14 shows that 56 (52%) teachers of respondents indicated that it was rare for them to get support for distance training and 28 (26%) teachers indicated that no distance training support had been offered for them. This remains a problematic aspect of teacher education. To address this concern, teachers could be trained in ICT skills and educational applications in the form of coaching and mentoring, team teaching, mutual observation and feedback within the school settings rather than externally developed training seminars.

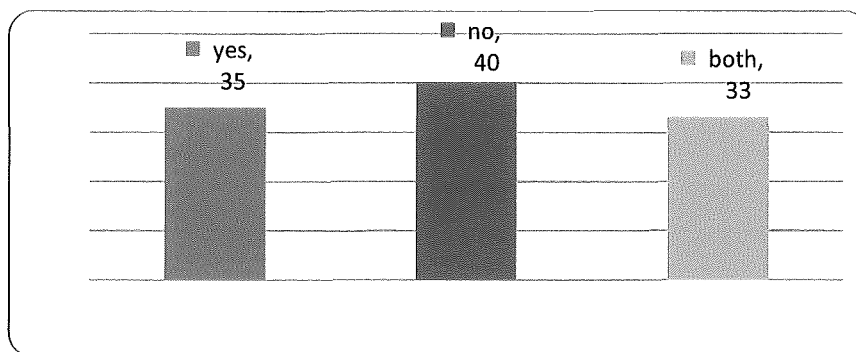


Figure 4.15: Were teachers trained in technical support for their schools?

There is a possibility that teachers were trained in technical support for their schools as 32% were sure that they were trained in technical support. These respondents who were sure, made it obvious that they formed part of employees who care for ICT integration. This will minimise the impact of ICT integration into the curriculum and strive for continuous improvement. 37% of respondents indicated that no training had been conducted while 31% respondents were not sure whether training had been conducted or not.

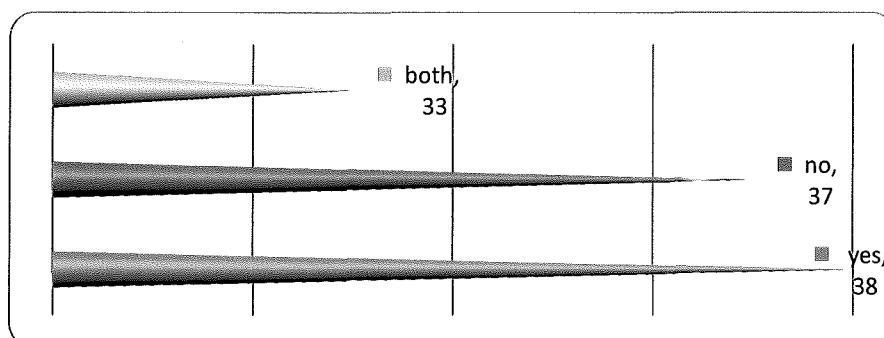


Figure 4.16: Does the North West Department of Education support the ICT implementation in schools?

Figure 4.16 shows that only 35% of respondents agreed that there was support offered by NWDoE in ICT implementation in schools. On the other hand 34% of respondents reported that integration of ICT in the curriculum was taking place without the involvement of DoE. This means that teachers are aware that the DoE may not have enough budget to support schools with ICT related resources; however, at least part of ICT should be supported, for example; maintenance and security. This lack of support from DoE officials may be due to insufficient ICT knowledge possessed by district officials (Department of Education, 2004).

4.6 Measures of association

Correlation is a measure of the relation between two or more variables. The measurement scales used should be at least interval scales, but other correlation coefficients are available to handle other types of data. The simplest question we could ask about two continuous variables is whether they varied in a related way, and whether there was a correlation between the two of them.

Pearson's Correlation Coefficient was used for data interpretation. Correlation Coefficients can range from -1.00 to +1.00 representing a perfect negative correlation while a value of +1.00 represents a perfect positive correlation. A value of 0.00 represents a lack of correlation.

4.7 Correlation

The correlation between age and qualification during performance shows -0.315. This means that if a person grows older there is a weak chance (correlation) of 0.315 that people will have a higher education. In other words, this impacts on the use of ICT. Educated people will be able to use ICT easier but the correlation should be improved. The correlation between teacher skills rated in the selected ICT application tools and age shows -0.539. This means teachers are generally not happy with the ICT tool performance on skills development according to this and this should be paid attention to. The correlation between the views on ICT future direction in High Schools and age shows - 0.547- a high negative. This means that older teachers are generally not happy with the future development of ICT usage in high schools. The correlation between on how the teachers use ICT tools in their classes and age shows -0.305- a negative. This means that olderteachers are not experienced or able to use ICT tools in their classrooms. It seems that older people are unwilling to apply ICT tools in their daily teachings to their pupils or lack experience. The correlation between age and whetherICT integration reduces teachers' administration burdens shows +0.417 - a high negative. Older people seem less likely to reduce their administration burdens due to their lack of experience in administering ICT integration in their daily planning for their classroom. The correlation between age and whether the Internet has proved to be a useful source of ideas and information for teachers and age shows + 0.354 - a positive. Older people seem to use the Internet often for new ideas and for gathering better information for their classrooms. The correlation between

rating teacher skills in selected ICT application tools and the views on ICT future direction in High Schools shows +0.326— a positive correlation. This means that teachers are benefiting when using the ICT tools in their classroom and will further aid other teachers in the future. The correlation between on how the teachers use ICT tools in their classes and what teachers' views are on how ICT has been used in schools today shows +0.358 - a positive correlation. Teachers are pleased with using ICT tools in their daily work in their classroom. The correlation between age and were teachers trained in technical support for their schools shows - 0.408 - a negative association. This shows that not all teachers have been on a course or been trained to use the ICT tools in their classrooms and this should be brought to the schools attention. The correlation between what are the challenges in integrating ICT in teaching and learning activities and are subject objectives integrated with ICT components shows - 0.312 - a negative association. There seem to be challenges involved in integrating ICT in their teaching and learning to use it in their subjects. The correlation between age and whether teachers were trained in technical support for their schools shows - 0.336 - a negative association. Older people have not been trained in technical support for their schools and this need to be addressed. The correlation between teachers trained with ICT skills at pre-service or in-service and the views on ICT future direction in High Schools shows +0.323 - a positive association. The correlation between the views on ICT future direction in High Schools and whether ICT integration reduces the teachers' administration burden is +0.385 - a positive association. The correlation between age and whether teachers had been trained in technical support for their schools shows +0.394 - a positive association.

4.8 Conclusion

Chapter four provided analysis and interpretation of data gathered using a questionnaire as a method of collecting data, a number of statistical techniques were applied to guide the analysis. Correlation was used specifically to establish meaning of the analysis of data collected. In some instances charts and tables were used to assist in the presentation of the analysis.

The data presented suggest that the use and some degree of integration of ICT in the teaching and learning activities appears to be taking place at the classroom level, with 57% of respondents indicating that they deliver ICT empowered lessons once a week, 20%

twice a week and 9% deliver ICT empowered lessons daily. Teachers' responses on subject objectives integration with ICT components (Figure 4.6) and teachers' use of ICT tools in their classes (Figure 4.10) provide more evidence that ICT tools are integrated in the teaching and learning activities in class.

The analysis of primary data collected revealed that all respondents (100%) understand what ICT integration is about. This is an encouraging result because it is consistent with the hypothesis that individuals are conscious of the integration of ICT tools in teaching and learning activities. In the next and final chapter the researcher will provide conclusions and recommendations about the findings of the study and address items as limitations of the research study.

Chapter 5

Conclusions and Recommendations

5.1 Introduction

This chapter presents the conclusions and major recommendations flowing from the analysis of the extent of ICT tools integration into Mafikeng Schools. The final conclusions are drawn from the literature study conducted in chapter three versus the analysis and the interpretation of data gathered from the survey analysis in Chapter Five. The research problem is revisited, and the research question re-stated. In order for the research question to be adequately answered, the researcher revisits the analytical questions.

The aim of this study was to investigate the use of ICTs in teaching and learning activities in Mafikeng High schools. Even though there is some willingness about ICT usage to improve teaching and learning in schools, there are a lot of things that need to be looked into. In order to achieve this, answers to these questions were needed; to what extent are the ICT tools used in the teaching and learning activities, what are the issues and barriers in ICTs use among school teachers, what are the teachers' perceptions on the use of ICT in teaching and learning activities and to what extent are teachers empowered with ICTs application and skills.

5.2 Research design and methodology

In Chapter Three the research design choices were explained, the tool used being a questionnaire as a main tool for collecting data in Mafikeng High Schools. Questionnaires were decided upon because they ensure a high response rate, as they are distributed to respondents to complete and collect personally by the researcher and they require less time and energy to administer. Some of the questionnaires were filled with irrelevant information even though an explanation of the whole questionnaire had been done. The reason might be the fact that the questionnaire was not filled in immediately after the explanation.

5.3 Summary of findings

Teachers indicated that they used ICT tools in their teaching and learning activities in the classroom. They use ICT tools for teaching and learning, administration, course preparations, and also the internet to find lesson plans and resources. From the uses identified, one found teaching and learning, course preparations and to find teaching resources as relevant to the integration of ICT into the curriculum.

What transpired from the findings is that most of the teachers who responded positively about using ICT tools for teaching and learning are those who are below the age of forty-five years. This is because older teachers are not experienced or able to use ICT tools in their classrooms. They are unwilling to apply ICT tools in their daily teachings to learners or lack experience thereof.

The internet was also used to search for relevant resources and lesson plans. Teachers mostly search for information for their learners and download it to be used in class. The findings reveal that teachers agree that the internet had proved to be a useful source of information. Some of the schools are not connected to the internet; therefore it was not clear on how the teachers from those schools gain access to the internet.

Reflecting on how teachers claim to integrate ICT tools into the curriculum, it is evident that the high school teachers in Mafikeng Area Office face a number of obstacles and challenges. Some of the challenges are:

- Teachers' training in ICT skills;
- Lack of support for distance training; and
- Training in technical support for their schools.

What might have been key to the challenges faced by the teachers is the fact that most of the teachers' previous training and experience in ICT skills at pre-service or in-service training. In addition teachers are not confident about training in ICT skills. This might be the reason why there were teachers who still possessed insufficient knowledge about the national policies on ICT in education as well as specific computer related knowledge and skills. The findings of the study revealed that some of the teachers indicated that it is rare that they get support for distance training and no distance training support has been offered

for them. This then reflects on the lack of support from DoE which was reported as a challenge by some of the teachers.

Also, the lack of a policy or guidelines on ICT usage implementation supports one of the reasons that make teachers resist the use of ICT tools in their teaching and learning scenarios. Without a policy, it is difficult for schools to come up with logical and effective plans on how to use ICT in the classroom.

5.4 Teachers' areas of strength

Even though the teachers still possess insufficient appropriate knowledge for ICT integration they have displayed areas of strength which include:

- Teachers' effort to obtain ICT integration knowledge, obtaining training through their own studies;
- Teachers' belief in the role played by ICT tools in transforming the curriculum, even those who did not receive formal training; and
- Teachers' efforts and creativity to ensure that they integrated ICT into the curriculum, downloading information from other institutions in cases where the school has no access to internet.

In short, teachers showed enthusiasm and commitment about integrating ICT despite the challenges they faced. Individual motivation might be a key to effective integration of ICT; however, it would be unfair to defer the responsibility of effective integration to teachers alone.

5.5 Strengths of ICT integration

The findings of the study revealed that teachers did perceive several positive benefits to the integration of ICT in the teaching and learning activities. Many teachers had difficulty answering the question about how ICT has been used in schools today. Most indicated that it had not fundamentally changed the ways in which they teach or the ways they design learning experiences within the classrooms. Teachers are incorporating the computers available into their existing practices.

Teachers see the way of teaching now as being much more child-centred rather than teacher-directed. Technology within this context appeared to impact on children's independence as well as the teacher's truthfulness in assessing and planning learning experiences for the learners. There is also some evidence in the literature to suggest that the integration of ICT is associated with a shift from instructive to constructive philosophies of teaching and learning.

Schools are using various forms of leverage to 'encourage' teachers to adopt ICT, such as reporting on ICT outcomes, but it was clear that pressure needed to be accompanied by support in the form of professional development.

ICT use exposes both the teacher and the learners to a wider range of resources and made possible real world experiences that aroused learners' empathy and made learning more meaningful. However, its use still needs to be carefully monitored as it could easily become a source of distraction and a deterrent learning.

Generally, teachers viewed ICT as a 'fantastic tool' for engaging learners and capturing their interest. ICT use exposed learners to richer, less intimidating learning environment and encourage them to take ownership of their learning. In addition ICT was also seen as an important motivational tool for teachers, engaging and exciting them about their ability and encouraging them to be more creative in their approach to their work.

5.6 Weaknesses of ICT integration

Without discussing more strengths of ICT (which appear to be countless) on the delivery of a range of benefits, again there are some risks of using ICT in education which should be alleviated through appropriate mechanisms (OECD, 2009). Weaknesses of ICT integration:

- ICT can create a partition, a digital gap within the classroom, where some learners are more familiar with ICT and will have more benefits and will learn faster than others unfamiliar to technology;
- ICT can remove the attention from the main goal of the learning process to develop ICT skills, which may be a secondary goal in this process;

- ICT may affect the connection process between the teacher and the learners, as ICT can become a mere communication tool instead of face to face communication, so the distance of learning transactions will increase;
- Also since not all teachers are ICT experts they may be negligent in updating the content of courses, which can slow down the process of learning;
- There is also a need for training related to ICT by all stakeholders;
- The cost of hardware and software can be high.
- Online time can be a waste of time, as many learners spend computer time doing personal projects that have nothing to do with their learning tasks (playing online games when they are meant to be researching a topic).

5.7 Limitations

This study has been limited to Mafikeng high schools teachers in the North West Department of Education. Firstly the intention was to involve all 25 high schools in the Mafikeng Area Office, i.e. Public Secondary and combined Schools and the Independent Combined Schools, but because of the number of questions that were asked, Independent Combined Schools were to be left out. However, there is a need to find out how the Independent Combined teachers integrate ICT into the curriculum in order to be able to compare and contrast the experience of Government schools with that of Independent schools.

5.8 Recommendations

South Africa as a developing country needs to move from using ICT in administration to using, creating and managing ICT in teaching and learning processes. The literature reviewed revealed that teachers in developing countries mostly use ICT as a tool for management in schools, such as an administration tool to increase productivity like preparing for lessons, recording of learners' assessment scores and for reporting, but not in the teaching and learning activities.

In order to encourage teachers and gifted learners, the North West Department of Education need to encourage schools to get more teachers to use ICT daily in their classrooms to enhance their instruction and the curriculum implementation. Successful strategies to get teachers to use ICT tools include conducting staff development and

making professional development workplace-based. Professional development should be conducted in the very environment in which the teacher will be expected to use ICT tools in (his/her classroom). This will build confidence that teachers can use particular pieces of software given their own constraints (Burns & Grove, 2011).

One of aspects to be considered by the NWDoE in integrating ICT in schools' curricula is that computers require maintenance. This cannot be done by every teacher, even if teachers are familiar with ICT, additional technical support is needed to make ICT a tool for curricular change in the teaching and learning process. The appointment of full time technicians is recommended, to monitor and fix serious technical problems.

ICT tools and its components demand financial support. According to Howell et al. (2000) the cost of ICT tools in schools includes teacher training, additional advisory and technical staff, hardware, software, telecommunications infrastructure (for example, telephone lines) and content development. Mooij and Smeets (2001) argue that in order to achieve ICT goals the National authorities should make financial means available to schools.

The effectiveness of ICT integration needs guidelines on how the process will be followed from National Department of Basic Education down to school level. The reluctance of schools in designing their own policies is the most frequently mentioned inhibiting factors around the ICT policies. Teachers argue that it is impossible to integrate ICT when the school time-table does not integrate ICT access. Hennessy et al., (2007) argue that the fact that teachers have little say in the designing and implementing development plan for using ICT within their school is hindering the use of ICT in teachers' practices.

Zhao (2003) add by indicating that teachers' attitudes and expertise toward ICT tools contribute to widespread usage. They identified compatibility to the teaching and learning environment, and systematic and professional development as factors that contribute to widespread use. While ICT tools can be used for different purposes in teaching and learning, their usage should be guided by the goals of the curriculum in order to bring positive change.

For successful and effective ICT tools usage, teachers' training is of utmost importance. Training should start with basic ICT tools skills and then when teachers have developed confidence move on to the pedagogical use of ICT tools. However training alone is not

sufficient. There should be ongoing support that will help teachers to deal with the challenges they are faced with in their endeavour in ICT tools usage.

Bayler and Ritchie (2002) indicate that schools which are successful in integrating ICT are often guided by an ICT plan. Similarly, Tondeur et al., (2008) found that teachers in schools with an explicit ICT policy plan that emphasizes shared goals tend to use ICT more regularly in their classrooms.

In South Africa the goal of the White Paper 7 on e-education is to ensure that every South African learner in 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 economy (DoE, 2004). The success of this goal depends on the adoption of the policy strategies by nine provinces of South Africa as a country.

5.9 Suggestions for further research

This study focussed on the integration of ICT tools in the high schools that are fully funded by the DoE. The suggestion is that the next study be conducted on the Independent schools that are also in the Mafikeng AO. This study should also investigate how teachers of Independent schools are integrating ICT tools in their curriculum. The purpose should be to extract ideas of how the Public secondary schools can improve their integration of ICT into the curriculum.

In addition to this, further studies can be carried focussing on one subject, e.g. a study that will look at how teachers integrate ICT in “English”, “Geography”, or “Mathematics” lessons. These studies will assist the ICT education specialists in the Area Office and districts in their attempt to understand what is lacking in the integration of ICT in each subject.

5.10 Conclusion

This chapter concludes the investigation on how ICT tools are used in high schools in Mafikeng Area in the North West Province. The study investigated the use of ICT tools in the teaching and learning activities in schools. Few will disagree that ICT offers a range of

powerful tools which proficient users can employ to achieve an array of outcomes in the classroom (Dean et al., 2006). It is critical, therefore, that teachers acquire the skills and competences necessary to fully exploit the potential that ICT has to offer for teaching and learning as they prepare their charges to meet challenges of the 21st century.

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Appendix A: Table of Construction

Research Question	Survey Questions	Variable(s) And/or Relationships measured	Statistical Tests
To what extent are ICT tools used across teaching and learning activities into the Mafikeng AO schools	1. Assessing ICT teacher competency	Ordinal/Nominal variables	Descriptive Stats – frequency tables, bar charts
	1.1 How often are teachers delivering ICT empowered lessons?	1.1 Never, daily, once a week, twice a month, less than a month	Numerical description – location, spread, distribution, cross tabulation
	1.2 Are subject objectives integrated with ICT components?	1.2 Yes/No	Convert nominal to ratio
	1.3 How are teacher skills rated in the selected ICT application tools	1.3 Excellent, Very good, Good, Satisfactory, Fair, Poor	Normal and distribution
What are the issues and barriers in ICT use among school teachers?	2. Do teachers see any Barriers/challenges in their use of ICT tools in the teaching and learning activities?	Ordinal/Nominal variables:	Descriptive Stats – frequency tables, bar charts
	2.1 What are the challenges in integrating ICT in teaching and learning activities?	Not within, Significant, Mild, Fairly, Mostly, Completely.	Numerical description – location, spread, distribution, cross tabulation

	2.2 What are teachers' views on how ICT has been used in schools today? (What challenges affect them most?) 2.3 What are the views on ICTs future direction in schools? What is its place in Mafikeng High Schools)	Not within, Significant, Mild, Fairly, Mostly, Completely. Not within, Significant, Mild, Fairly, Mostly, Completely	Numerical description – location, spread, distribution, cross tabulation Convert nominal to rational 0,1,2,3,4, and do correlation co-efficient with personal information
What are teachers' perceptions on the use of ICT in teaching and learning activities	3. Teachers understanding and pre-conceived ideas about ICT integration. 3.1 How do teachers use ICT tools in their classes? 3.2 Does ICT integration reduce the teachers' administration burden? 3.3 Has the internet proved to be a useful source of ideas and information for teachers?	Ordinal/Nominal Variables: Not within scope, Poorly, fairly, mostly, completely Strongly agree, Agree, Disagree, Strongly agree Yes/No	Descriptive Stats – frequency tables, bar charts Numerical description – location, spread, distribution, cross tabulation. Measures of association – Phi, Grammers V Measures of association – Phi, Crammers V
To what extent are teachers	4. Teacher ICT skills and tools availability	Ordinal/Nominal Variables:	Descriptive Stats – frequency

empowered with ICT application and skills	4.1 Are teachers trained with ICT skills at pre-service or in-service?	4.1 Yes/No	tables, bar charts Numerical description – location, spread, distribution, cross tabulation
	4.2 How often do teachers get support for the distance training?	Frequently, Rarely, Not available	Convert nominal to rational 0,1,2,3,4, and do correlation co-efficient with personal information.
	4.3 Were teachers trained in technical support for their schools?	Yes/No/ Not sure	Measures of association – Phi, Cramm's V
	4.4 Does the NW Department of Education support the ICT implementation in schools	Yes/No If yes, what kind of support is given?	Normal and distribution

Appendix B: Questionnaire

FOR OFFICE USE ONLY: Respondent Code: _____

VOLUNTARY QUESTIONNAIRE

“INTEGRATION OF ICT IN THE CURRICULUM: CASE OF MAFIKENG SCHOOLS”

Graduate School NWU

University of South Africa

Researcher: Evelyn MashuduMmolawa

Supervisor: Prof S. Lubbe

Note to the Respondent

- We need your help to understand the extent of ICT integration into the South African Curriculum – Mafikeng schools
- Although we would like you to help us, you do not have to take part in this survey.
- If you do not want to take part, just hand in the blank questionnaire at the end of the survey session
- What you say in this questionnaire will remain private and confidential. No one will be able to trace your opinions back to you as a person.

The Questionnaire as four parts:

Part 1 asks permission to use your responses for academic research.

Part 2 asks general personal particulars like your age, gender and home language.

Part 3 asks about ICT issues within the curriculum in South Africa schools

How to complete the questionnaire

1. Please answer the questions as truthfully as you can. Also, please be sure to read and follow the directions for each part. If you do not follow the directions, it will make it harder for us to do our project.
2. We are only asking you about things that you and your fellow researchers should feel comfortable telling us about. If you don't feel comfortable answering a question, you can indicate that you do not want to answer it. The responses to the questions that you do answer will be kept confidential.
3. You can mark each response by making a tick or a cross or encircling each appropriate response, with a PEN (not a pencil), or by filling in the required words or numbers.

Part 1: Permission to use my responses for academic research

I hereby give permission that my responses may be used for research purposes provided that my identity is not revealed in the published records of the research.

Initials and surname _____ Postal address: _____

_____ Postal code: _____

Contact numbers: Home: _____ Cell: _____

No.	PART 2: GENERAL PERSONAL PARTICULARS <i>Please tell us a little about yourself</i> Please mark only ONE option per question below.	3.2	Are subject objectives integrated with ICT components? ☐ Yes ☐ No ☐ Both
2.1	I am a: ☐ Male ☐ Female	3.3	How are teacher skills rated in the selected ICT application tools? ☐ Excellent ☐ Very Good ☐ Good ☐ Satisfactory ☐ Fair ☐ Poor
2.2	I am a: ☐ below 20 years ☐ 21- 30 years ☐ 31 - 40 years ☐ 41- 50 years ☐ above 50 years		PART 4: Do teachers see any barriers/challenges in their use of ICT tools in the teaching and learning activities? Please mark only ONE option per question below
2.3	I am a: ☐ African ☐ Coloured ☐ Indian ☐ White ☐ A member of another ethnic group	4.1	What are the challenges in integrating ICT in teaching and learning activities? ☐ Not within scope ☐ Significant ☐ Mild ☐ Fairly ☐ Mostly ☐ Completely
2.4	Indicate your education/ qualification status ☐ Below matric ☐ Matric ☐ Diploma ☐ Degree ☐ Post degree	4.2	What are teachers' views on how ICT has been used in schools today? (What challenges affect them the most). ☐ Not within scope ☐ Significant ☐ Mild ☐ Fairly ☐ Mostly ☐ Completely

	PART 3: Assessing ICT teacher competency Please mark only ONE option per question below.	4.3	What are the views on ICTs future direction in schools? What is its place in Mafikeng High Schools? ☐ Not within scope ☐ Significant ☐ Mild ☐ Fairly ☐ Mostly ☐ Completely
3.1	How often are teachers delivering ICT empowered lessons? ☐ Never ☐ Once a week ☐ Twice a week ☐ Daily ☐ Less than a month		PART 5: Teachers understanding and pre-conceived ideas about ICT integration. Please mark only ONE option per question below
5.1	How do teachers use ICT tools in their classes? ☐ Not within scope ☐ Poorly ☐ Fairly ☐ Mostly ☐ Completely	6.1	Are teachers trained with ICT skills at pre-service or in-service ☐ Yes ☐ No ☐ Not Sure
5.2	Does ICT integration reduce the teachers' administration burden? ☐ Strongly Agree ☐ Agree ☐ Disagree ☐ Strongly Disagree	6.2	How often do teachers get support for the distance training? ☐ Frequently ☐ Rarely ☐ Not available
5.3	Has the internet proved to be a useful source of ideas and information for teachers? ☐ Yes ☐ No ☐ Not Sure	6.3	Were teachers trained in technical support for their schools? ☐ Not within scope ☐ Yes ☐ No ☐ Not Sure

	PART 6: Teacher ICT skills and Tools availability Please mark only ONE option per question below.	6.4 Does the NW Department of Education support the ICT implementation in schools? ☐ Yes ☐ No ☐ Not Sure
--	---	---

Appendix C: Correlation

			Gender	Age	Ethnics	Qualificati on	Qu1	Qu2	Qu3
Spearman's rho	Gender	Correlation Coefficient	1.000	-.089	-.042	.039	-.097	.180	.100
		Sig. (2-tailed)	.	.360	.668	.686	.319	.063	.304
		N	108	108	108	108	108	108	108
	Age	Correlation Coefficient	-.089	1.000	.162	.315**	.011	-.254**	-.539**
		Sig. (2-tailed)	.360	.	.093	.001	.911	.008	.000
		N	108	108	108	108	108	108	108
	Ethnics	Correlation Coefficient	-.042	.162	1.000	-.084	-.090	-.072	-.120
		Sig. (2-tailed)	.668	.093	.	.386	.356	.458	.215
		N	108	108	108	108	108	108	108
	Qualificati on	Correlation Coefficient	.039	.315**	-.084	1.000	-.046	-.036	-.149
		Sig. (2-tailed)	.686	.001	.386	.	.636	.711	.124
		N	108	108	108	108	108	108	108
	Qu1	Correlation Coefficient	-.097	.011	-.090	-.046	1.000	.182	-.009
		Sig. (2-tailed)	.319	.911	.356	.636	.	.059	.929
		N	108	108	108	108	108	108	108
	Qu2	Correlation Coefficient	.180	-.254**	-.072	-.036	.182	1.000	.138
		Sig. (2-tailed)	.063	.008	.458	.711	.059	.	.155
		N	108	108	108	108	108	108	108
	Qu3	Correlation Coefficient	.100	-.539**	-.120	-.149	-.009	.138	1.000
		Sig. (2-tailed)	.304	.000	.215	.124	.929	.155	.
		N	108	108	108	108	108	108	108
	Qu4	Correlation Coefficient	-.096	-.053	.093	.083	.086	.312**	.168
		Sig. (2-tailed)	.322	.588	.339	.396	.375	.001	.082
		N	108	108	108	108	108	108	108
	Qu5	Correlation Coefficient	-.148	-.053	-.045	.140	.153	.199*	-.010

		Qu4	Qu5	Qu6	Qu7	Qu8	Qu9	Qu10	Qu11
	Sig. (2-tailed)	.125	.585	.644	.149	.114	.039	.920	
	N	108	108	108	108	108	108	108	
	Correlation	-.083	-.547**	-.113	-.210*	.043	.002	.326**	
	Coefficient								
	Sig. (2-tailed)	.394	.000	.244	.029	.658	.987	.001	
	N	108	108	108	108	108	108	108	
	Correlation	.079	-.305**	-.175	-.034	-.096	-.033	.209*	
	Coefficient								
	Sig. (2-tailed)	.418	.001	.071	.729	.322	.736	.030	
	N	108	108	108	108	108	108	108	
	Correlation	-.013	-.417**	-.138	-.084	-.082	.005	.358**	
	Coefficient								
	Sig. (2-tailed)	.890	.000	.156	.386	.401	.962	.000	
	N	108	108	108	108	108	108	108	
	Correlation	-.325**	-.354**	-.005	-.231*	.030	.192*	.123	
	Coefficient								
	Sig. (2-tailed)	.001	.000	.963	.016	.754	.046	.205	
	N	108	108	108	108	108	108	108	
	Correlation	-.132	-.038	-.073	.036	.086	-.123	-.075	
	Coefficient								
	Sig. (2-tailed)	.174	.698	.453	.714	.378	.204	.439	
	N	108	108	108	108	108	108	108	
	Correlation	.087	-.469**	-.116	-.164	.063	.151	.218*	
	Coefficient								
	Sig. (2-tailed)	.369	.000	.233	.091	.516	.119	.023	
	N	108	108	108	108	108	108	108	
	Correlation	-.049	.394**	.094	-.120	-.066	-.079	-.168	
	Coefficient								
	Sig. (2-tailed)	.615	.000	.334	.214	.495	.417	.082	
	N	108	108	108	108	108	108	108	
	Correlation	.151	-.408**	-.041	-.131	-.017	.200*	.358**	
	Coefficient								
	Sig. (2-tailed)	.119	.000	.673	.177	.860	.038	.000	
	N	108	108	108	108	108	108	108	

Spearman's rho	Gender	Correlation Coefficient	-.096	-.148	-.083	.079	-.013	-.325	-.132	.087
		Sig. (2-tailed)	.322	.125	.394	.418	.890	.001	.174	.369
		N	108	108	108	108	108	108	108	108
	Age	Correlation Coefficient	-.053	-.053	-.547	-.305**	-.417	-.354**	-.038**	-.469
		Sig. (2-tailed)	.588	.585	.000	.001	.000	.000	.698	.000
		N	108	108	108	108	108	108	108	108
	Ethnics	Correlation Coefficient	.093	-.045	-.113	-.175	-.138	-.005	-.073	-.116
		Sig. (2-tailed)	.339	.644	.244	.071	.156	.963	.453	.233
		N	108	108	108	108	108	108	108	108
	Qualification	Correlation Coefficient	.083	.140**	-.210	-.034	-.084	-.231	.036	-.164
		Sig. (2-tailed)	.396	.149	.029	.729	.386	.016	.714	.091
		N	108	108	108	108	108	108	108	108
	Qu1	Correlation Coefficient	.086	.153	.043	-.096	-.082	.030	.086	.063
		Sig. (2-tailed)	.375	.114	.658	.322	.401	.754	.378	.516
		N	108	108	108	108	108	108	108	108
	Qu2	Correlation Coefficient	.312	.199**	.002	-.033	.005	.192	-.123	.151**
		Sig. (2-tailed)	.001	.039	.987	.736	.962	.046	.204	.119
		N	108	108	108	108	108	108	108	108
	Qu3	Correlation Coefficient	.168	-.010**	.326	.209	.358	.123	-.075	.218
		Sig. (2-tailed)	.082	.920	.001	.030	.000	.205	.439	.023
		N	108	108	108	108	108	108	108	108
	Qu4	Correlation Coefficient	1.000	.134	-.127	-.160	-.085	.064**	.036	.109
		Sig. (2-tailed)	.	.168	.192	.098	.379	.513	.709	.262
		N	108	108	108	108	108	108	108	108
	Qu5	Correlation Coefficient	.134	1.000	-.018	-.336	-.174	.247*	.060	.063
		Sig. (2-tailed)	.168	.	.853	.000	.072	.010	.538	.520
		N	108	108	108	108	108	108	108	108
	Qu6	Correlation Coefficient	-.127	-.018**	1.000	.244*	.385	.118	-.065**	.323
		Sig. (2-tailed)	.192	.853	.	.011	.000	.225	.504	.001
		N	108	108	108	108	108	108	108	108

Qu7	Correlation	-.160	-.336**	.244	1.000	.268	.085	.143*	.006
	Coefficient								
	Sig. (2-tailed)	.098	.000	.011	.	.005	.381	.141	.949

Qu8	N	108	108	108	108	108	108	108	108
	Correlation	-.085	-.174**	.385	.268	1.000	.075	-.244**	.203
	Coefficient								
Qu9	Sig. (2-tailed)	.379	.072	.000	.005	.	.442	.011	.035
	N	108	108	108	108	108	108	108	108
	Correlation	.064**	.247**	.118	.085*	.075	1.000*	.047	.004
Qu10	Coefficient								
	Sig. (2-tailed)	.513	.010	.225	.381	.442	.	.631	.967
	N	108	108	108	108	108	108	108	108
Qu11	Correlation	.036	.060	-.065	.143	-.244	.047	1.000	-.047
	Coefficient								
	Sig. (2-tailed)	.709	.538	.504	.141	.011	.631	.	.628
Qu12	N	108	108	108	108	108	108	108	108
	Correlation	.109	.063**	.323	.006	.203	.004	-.047*	1.000
	Coefficient								
Qu13	Sig. (2-tailed)	.262	.520	.001	.949	.035	.967	.628	.
	N	108	108	108	108	108	108	108	108
	Correlation	-.017	-.083**	-.130	-.252	-.137	-.183	-.184	-.018
Qu14	Coefficient								
	Sig. (2-tailed)	.864	.394	.179	.009	.158	.058	.057	.857
	N	108	108	108	108	108	108	108	108
Qu15	Correlation	.083	.179**	.105	.123	.008	.323*	-.114**	.254
	Coefficient								
	Sig. (2-tailed)	.394	.064	.280	.207	.933	.001	.238	.008
Qu16	N	108	108	108	108	108	108	108	108
	Correlation								
	Coefficient								

			Qu12	Qu13
Spearman's rho	Gender	Correlation Coefficient	-.049	.151
		Sig. (2-tailed)	.615	.119
		N	108	108
	Age	Correlation Coefficient	.394	-.408
		Sig. (2-tailed)	.000	.000
		N	108	108
	Ethnics	Correlation Coefficient	.094	-.041
		Sig. (2-tailed)	.334	.673
		N	108	108
	Qualification	Correlation Coefficient	-.120	-.131**
		Sig. (2-tailed)	.214	.177
		N	108	108
	Qu1	Correlation Coefficient	-.066	-.017
		Sig. (2-tailed)	.495	.860
		N	108	108
	Qu2	Correlation Coefficient	-.079	.200**
		Sig. (2-tailed)	.417	.038
		N	108	108
	Qu3	Correlation Coefficient	-.168	.358**
		Sig. (2-tailed)	.082	.000
		N	108	108
	Qu4	Correlation Coefficient	-.017	.083
		Sig. (2-tailed)	.864	.394
		N	108	108
	Qu5	Correlation Coefficient	-.083	.179
		Sig. (2-tailed)	.394	.064
		N	108	108
	Qu6	Correlation Coefficient	-.130	.105**
		Sig. (2-tailed)	.179	.280
		N	108	108
	Qu7	Correlation Coefficient	-.252	.123**
		Sig. (2-tailed)	.009	.207
		N	108	108
	Qu8	Correlation Coefficient	-.137	.008**
		Sig. (2-tailed)	.158	.933
		N	108	108
	Qu9	Correlation Coefficient	-.183**	.323**

	Sig. (2-tailed)	.058	.001
	N	108	108
Qu10	Correlation Coefficient	-.184	-.114
	Sig. (2-tailed)	.057	.238
	N	108	108
Qu11	Correlation Coefficient	-.018	.254**
	Sig. (2-tailed)	.857	.008
	N	108	108
Qu12	Correlation Coefficient	1.000	-.070**
	Sig. (2-tailed)	.	.470
	N	108	108
Qu13	Correlation Coefficient	-.070	1.000**
	Sig. (2-tailed)	.470	.
	N	108	108

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Appendix D: Request permission letter to the Area Office Manager

Enq: Mmolawa E.M.

Cell: 082 802 3497

P.O. Box 4352

MMABATHO

2735

26 February 2013

The Area Office Manager

Mafikeng Area Office

Department of Education

Private Bag X 2044

Mmabatho

2735

Sir

Request for permission to do data collection in your schools: All High Schools

- With reference to the above matter, kindly consider my request to collect data at the above-mentioned schools.
- The data are part of my research work towards my studies; I am at present studying with North-West University– Mafikeng Campus.
- The expected participants are all supposed to be all High school teachers and School Management Teams.

Your co-operation in this regards will be highly appreciated.

Yours faithfully

Mmolawa E.M. (Ms)

Appendix E: Request permission letter to the school

Enq: Mmolawa E.M.

Cell: 082 802 3497

P.O. Box 4352

MMABATHO

2735

26 February 2013

The Principal

Mafikeng Area Office

Sir/Madam

Request for permission to do data collection in your school

- With reference to the above matter, kindly consider my request to collect data at your school.
- The data are part of my research; I am presently studying with North-West University– Mafikeng Campus.
- The expected participants are all supposed to be High school teachers and School Management Teams.
- Attached is a request for permission letter that was written to the Area Office Manager, Mr KoKong.

Your co-operation in this regards will be highly appreciated.

Yours faithfully

Mmolawa E.M. (Ms)

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
1. Situating ICT in the teacher education programme : Overcoming challenges, fulfilling expectations		1	1	1			1		1
2. An activity-theoretical approach to research of ICT integration in Singapore	1		1	1	1				1
3. Identify multiple roles of ICT coordinators	1		1		1				1
4. ICT policy planning in a context of curriculum reform: Disentanglement of ICT policy domains and artefacts	1				1	1	1		1
5. Obstacles to the integration of ICT in education: results from a worldwide educational assessment	1	1	1			1			1
6. Connecting schools, community and family with ICT	1	1					1		1
7. Investigating ICT using problem-based learning in face-to-face and online learning environment	1	1	1	1			1		1
8. ICT and learning: Lessons from Australian classroom	1		1	1			1		1
9. Technology planning: A roadmap to successful technology integration in schools			1	1			1		1
10. Common needs and different agendas			1	1			1		1
11. The socio-economic dimensions of ICT-driven educational change								1	1
12. Which factors obstruct or stimulate teacher educators to use ICT innovatively	1		1				1		1
13. ICT integration in the classroom: Challenging the potential of a school policy	1	1	1			1	1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
14. Examining the digital divide in K-12 public schools: Four-year trends for supporting ICT literacy in Florida	1		1	1			1		1
15. The use of ICT in primary schools within emerging communities of implementation	1	1	1	1		1	1		1
16. School leaders, ICT competence and championing innovations	1	1			1				1
17. Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviours with educational technology		1	1			1	1		
18. Revisiting and reframing use: implications for the integration of ICT		1	1	1	1		1	1	1
19. Socio-Economic differences in elementary students' ICT beliefs and out of school experiences		1	1	1					1
20. School subject paradigms and teaching practice in lower secondary Swedish schools influenced by ICT and media		1	1	1	1		1		1
21. The e-capacity of primary schools	1	1	1	1	1	1	1		1
22. ICT in education policy and practice in developing countries: South Africa and Chile compared through SITES 2006		1	1	1		1	1		1
23. Who assigns the most ICT activities		1	1	1			1		
24. An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada	1	1	1	1	1		1		1
25. ICT in teacher education in an emerging developing country	1	1			1		1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
26. Teaching and learning activities in Chilean classrooms: Is ICT making a difference	1		1	1	1	1	1	1	1
27. A framework for teachers' integration of ICT into their classroom practice		1	1		1		1		1
28. The beliefs behind the teacher that influence their ICT practices			1	1	1		1		
29. Measuring integration of information and communication technology in education	1		1				1		
30. ICT-integrated education and national innovation systems in the Gulf Cooperation Council (GCC) countries	1	1	1	1	1	1	1		1
31. Using ICT for school purposes: Is there a student-school disconnect		1	1				1		1
32. Little experience with ICT: Are they really the Net Generation student-teachers?		1	1			1	1		1
33. The impact of information and communication technology (ICT) on the management practice of Malaysian Smart Schools		1	1		1		1	1	1
34. Design of educational and ICT conditions to integrate differences in learning		1	1		1		1		
35. Slovak high school students' attitudes to ICT using in biology lesson	1	1	1	1			1		1
36. Developing conceptual frameworks for creativity, ICT and teacher education		1		1		1			1
37. Teachers' effect on ICT use in education: the Turkey sample	1	1	1	1			1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
38. ICT policies in schools and their effect on pedagogical innovation in the Spain: the Amara Berri Basque School case study		1	1	1		1	1	1	1
39. Integrating ICT in Traditional Training – Reactions of Teachers and Pupils’ involved in FISTE Project Activities		1	1	1			1		1
40. Opinions of Primary School Teachers on their students and Information Technologies Course	1		1				1	1	1
41. A model for application of ICT in the process of teaching and learning	1	1	1	1	1	1	1	1	1
42. Promoting the effective use of ICT in Romanian primary and secondary education – steps made in the frame of edutic project		1	1		1	1	1		1
43. ICT skills, practices and barriers of its use among secondary school students	1		1	1		1			1
44. Effect of applying informant on and communication technology (ICT) on learning level and information literacy of students			1		1		1	1	1
45. ICT infrastructure, technical and administrative support as correlates of teachers’ laptop use	1		1			1	1		1
46. ICT integration into Chemistry – In middle schools - Approach		1	1	1		1	1		1
47. Computer anxiety and ICT integration in English classes among Iranian EFL teachers	1		1			1	1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
48. Development strategy for requirement of ICT in learning of Comprehensive Regional Higher Education Institute: Comparing Undergraduates			1		1	1	1	1	1
49. TECHNOLOGY AND LEARNING – TEACHER LEARNING		1	1			1	1		1
50. The study and comparison of curriculum in smart and traditional schools	1		1			1	1	1	1

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	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
1. Situating ICT in the teacher education programme : Overcoming challenges, fulfilling expectations		1	1	1			1		1
2. An activity-theoretical approach to research of ICT integration in Singapore	1		1	1	1				1
3. Identify multiple roles of ICT coordinators	1		1		1				1
4. ICT policy planning in a context of curriculum reform: Disentanglement of ICT policy domains and artefacts	1				1	1	1		1
5. Obstacles to the integration of ICT in education: results from a worldwide educational assessment	1	1	1			1			1
6. Connecting schools, community and family with ICT	1	1					1		1
7. Investigating ICT using problem-based learning in face-to-face and online learning environment	1	1	1	1			1		1
8. ICT and learning: Lessons from Australian classroom	1		1	1			1		1
9. Technology planning: A roadmap to successful technology integration in schools			1	1			1		1
10. Common needs and different agendas			1	1			1		1
11. The socio-economic dimensions of ICT-driven educational change								1	1
12. Which factors obstruct or stimulate teacher educators to use ICT innovatively	1		1				1		1
13. ICT integration in the classroom: Challenging the potential of a school policy	1	1	1			1	1		1

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	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
14. Examining the digital divide in K-12 public schools: Four-year trends for supporting ICT literacy in Florida	1		1	1			1		1
15. The use of ICT in primary schools within emerging communities of implementation	1	1	1	1		1	1		1
16. School leaders, ICT competence and championing innovations	1	1			1				1
17. Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviours with educational technology		1	1			1	1		
18. Revisiting and reframing use: implications for the integration of ICT		1	1	1	1		1	1	1
19. Socio-Economic differences in elementary students' ICT beliefs and out of school experiences		1	1	1					1
20. School subject paradigms and teaching practice in lower secondary Swedish schools influenced by ICT and media		1	1	1	1		1		1
21. The e-capacity of primary schools	1	1	1	1	1	1	1		1
22. ICT in education policy and practice in developing countries: South Africa and Chile compared through SITES 2006		1	1	1		1	1		1
23. Who assigns the most ICT activities		1	1	1			1		
24. An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada	1	1	1	1	1		1		1
25. ICT in teacher education in an emerging developing country	1	1			1		1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
26. Teaching and learning activities in Chilean classrooms: Is ICT making a difference	1		1	1	1	1	1	1	1
27. A framework for teachers' integration of ICT into their classroom practice		1	1		1		1		1
28. The beliefs behind the teacher that influence their ICT practices			1	1	1		1		
29. Measuring integration of information and communication technology in education	1		1				1		
30. ICT-integrated education and national innovation systems in the Gulf Cooperation Council (GCC) countries	1	1	1	1	1	1	1		1
31. Using ICT for school purposes: Is there a student-school disconnect		1	1				1		1
32. Little experience with ICT: Are they really the Net Generation student-teachers?		1	1			1	1		1
33. The impact of information and communication technology (ICT) on the management practice of Malaysian Smart Schools		1	1		1		1	1	1
34. Design of educational and ICT conditions to integrate differences in learning		1	1		1		1		
35. Slovak high school students' attitudes to ICT using in biology lesson	1	1	1	1			1		1
36. Developing conceptual frameworks for creativity, ICT and teacher education		1		1		1			1
37. Teachers' effect on ICT use in education: the Turkey sample	1	1	1	1			1		1

Appendix F

	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
38. ICT policies in schools and their effect on pedagogical innovation in the Spain: the Amara Berri Basque School case study		1	1	1		1	1	1	1
39. Integrating ICT in Traditional Training – Reactions of Teachers and Pupils’ involved in FISTE Project Activities		1	1	1			1		1
40. Opinions of Primary School Teachers on their students and Information Technologies Course	1		1				1	1	1
41. A model for application of ICT in the process of teaching and learning	1	1	1	1	1	1	1	1	1
42. Promoting the effective use of ICT in Romanian primary and secondary education – steps made in the frame of edutic project		1	1		1	1	1		1
43. ICT skills, practices and barriers of its use among secondary school students	1		1	1		1			1
44. Effect of applying informant on and communication technology (ICT) on learning level and information literacy of students			1		1		1	1	1
45. ICT infrastructure, technical and administrative support as correlates of teachers’ laptop use	1		1			1	1		1
46. ICT integration into Chemistry – In middle schools - Approach		1	1	1		1	1		1
47. Computer anxiety and ICT integration in English classes among Iranian EFL teachers	1		1			1	1		1

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	Definition of IS/IT and ICT	Challenges and obstacles	Lessons IT	ICT Based	ICT Co-ordinators	ICT, IT/IS Policies	Teacher involvement	Advantages	IT/IS, ICT in Schools
48. Development strategy for requirement of ICT in learning of Comprehensive Regional Higher Education Institute: Comparing Undergraduates			1		1	1	1	1	1
49. TECHNOLOGY AND LEARNING – TEACHER LEARNING		1	1			1	1		1
50. The study and comparison of curriculum in smart and traditional schools	1		1			1	1	1	1

