

**THE INTEGRATION OF INFORMATION AND COMMUNICATION
TECHNOLOGIES (ICTs) IN THE PREPARATION OF TEACHERS AT
COLLEGES OF EDUCATION IN NAMIBIA**

**A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (CURRICULUM,
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BY

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ABSTRACT

After independence, the Namibian government wished to exploit the new opportunities created by the use of Information and Communication Technologies (ICTs). Therefore, the government embarked upon developing national policies and strategies for integrating ICTs into the education curriculum. The need for ICT integration and application in the entire educational system has become a national policy in Namibia. In order to contribute to Namibia becoming a Knowledge-based Economy, the Colleges of Education are expected to integrate ICTs across the curriculum, aimed at achieving Level 4 in terms of use, knowledge and expected teaching competency.

The research study investigated the teacher educators and students' perceptions on the use and integration of ICT in teaching and learning opportunities at all four Colleges of Education in Namibia. To achieve this goal, six research questions were formulated in order to facilitate a better understanding of perceptions of teacher educators and student teachers.

This study used both qualitative and quantitative methods of collective data and these were interviews, observations, document analysis and questionnaires. A total of 81 teacher educators and 199 student teachers from all four Colleges of Education participated in this study. The study used purposive sampling to choose teacher educators who were teaching Integrated Media and Technology (IMTE) at the Colleges of Education while cluster sampling was used in selecting a group of teacher educators who

were not teaching IMTE. The students were also selected through cluster sampling which was based on class groups.

The main findings of the study were that the majority of teacher educators expressed interest and willingness to integrate ICT in their teaching and learning situations. Participants also perceived ICT to be useful in their teaching and learning despite the difficult circumstances with the lack of ICT equipment, hardware and educational software. Findings have, however, revealed that much of the ICT integration was taking place in IMTE and to a lesser extent in ETP, Mathematics and Natural Sciences while in other subjects little or nothing was taking place. Most of the ICT integration activities encouraged drill and practice kind of skills and mostly used common software such as Word Processing, PowerPoint, Excel and Spreadsheet.

Successful implementation of the use and integration of ICT, however, will also depend on the management of Colleges of Education accepting and recognising factors and issues as identified in this study as barriers to the integration of ICT. Further, participants agreed that professional development opportunities in ICT integration would result in more teacher educators becoming comfortable in its use and integration; hence speeding up the rate of adoption. Finally, the current available ICT infrastructure at the Colleges of Education and lack of knowledge among the teacher educators in e-learning approaches makes it extremely difficult to create e-learning opportunities. Based on the findings of the study, the study made recommendations directed at the student teachers and teacher

educators, the management at the Colleges of Education and recommendations for further research in order to improve the current ICT integration practices at the Colleges of Education.

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Thank you all and may the Almighty God Bless you!

DEDICATION

To my inspiring parents: Petrus Katowe and Loide Nekamba

To my lovely wife: Johanna Ndamonongheda

To my sons: Tangeni Omwene Etupa Tshakutaamba “Councillor” and Tangi Uugwanga
Tshapwa “Young Man”

With all your encouragement and positive attitudes, there has always been light at the end
of the tunnel. This is for you.

Kulupeni nomeho, mayego ndi mu taasinine!

DECLARATIONS

I, Sakaria Mwashindandye Ipinge, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any institution of higher education.

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----- [signature]
Sakaria Mwashindandye Ipinge

Date -----

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LIST OF ABBREVIATIONS/ACRONYMS

ACTET	Advisory Council on Teachers Education and Training
AECT	Association for Educational Communications and Technology
AUP	Appropriate User Policy
BETD	Basic Education Teacher Diploma
BES3	Basic Education Support 3
CCE	Caprivi College of Education
CECS	Community Education Computer Society
CD-ROM	Compact Disk Read-Only-Memory
DfES	Department for Education and Skills
DEP	Diploma in Education Programme
DSTV	Digital Satellite Television
DVD	Digital Versatile Disc
ECP	Education Certificate Primary
E-KICKS	Essential Knowledge Information Collegial Skills
ERIC	Educational Resource Information Centre
ETP	Education Theory and Practice
ETSIP	Education and Training Sector Improvement Programme
GeSCI	Global e-Schools and Communities Initiative
HPTC	Higher Primary Teacher Certificate
HDE	Higher Diploma in Education HDE

ICDL	International Computer Drivers License
ICT	Information and Communication Technology
ICET	International Council on Education for Teaching
ICTED	ICT Integration for Educators Standards
IFESH	International Foundation for Education and Self-Help
IFIP	International Federation for Information Processing
IMTE	Integrated Media and Technology Education
IP	Internet Protocol
KE	Knowledge Economy
LCD	Liquid Crystal Display
LCE	Learner-Centered Education
LP	Lower Primary
LPTC	Lower Primary Teacher Certificate
MBESC	Ministry of Basic Education, Sport and Culture
MHEVTST	Ministry of Higher Education, Vocational Training, Science and Technology
MoE	Ministry of Education
NAMCOL	Namibia College of Open Learning
NQA	National Qualifications Authority
NCHE	National Council for Higher Education
NEC	National Education Certificate
NHEC	National Higher Education Certificate
NDF	Namibian Defence Force

NDP2	National Development Plan 2
NETSS	National Educational Technology Service and Support Centre
NETA	Namibian Educational Technology Alliance
NIED	National Institute for Education Development
NPC	National Primary Certificate
NPTS	National Professional Teaching Standards
OHP	Overhead Projector
OCE	Ongwediva College of Education
OKOU	The Open University of the United Kingdom
PIL	Python Imaging Library
PTC	Primary Teacher Certificate
REALS	Rich Environments for Active Learning
RCE	Rundu College of Education
SITE	Society for Information Technology and Teacher Education
TETF	Teachers Education Training Fund
UNAM	University of Namibia
UNESCO	United Nations Educational, Scientific and Cultural Organization
U.S	United States
VTC	Vocational Training Centre
WebCT	Web Course Tools
WCE	Windhoek College of Education
WWW	World Wide Web

CHAPTER 1: INTRODUCTION

1.1 Background to the study

In the new learner-centred driven environment, the explosion of the information age and the prevailing high-technology environment, Namibian teachers and teachers in other developing countries need to be technologically literate or face being marginalized in the 'information age' era (Rathedi, 2000). Moving into a future dominated by the explosion of technology, one of the main challenges facing teachers may be what was captured by the United Nations Education Scientific and Cultural Organization (UNESCO) in a statement which warned that “teacher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change” (UNESCO, 2002, p. 1). Similar ideas were expressed by Jung and Alley (1995, p. 292) when they wrote that “the future is determined by the choices made today. Teachers have the choice to sit back and let the trends become pervasive and then respond to them or take an active role in shaping the future”.

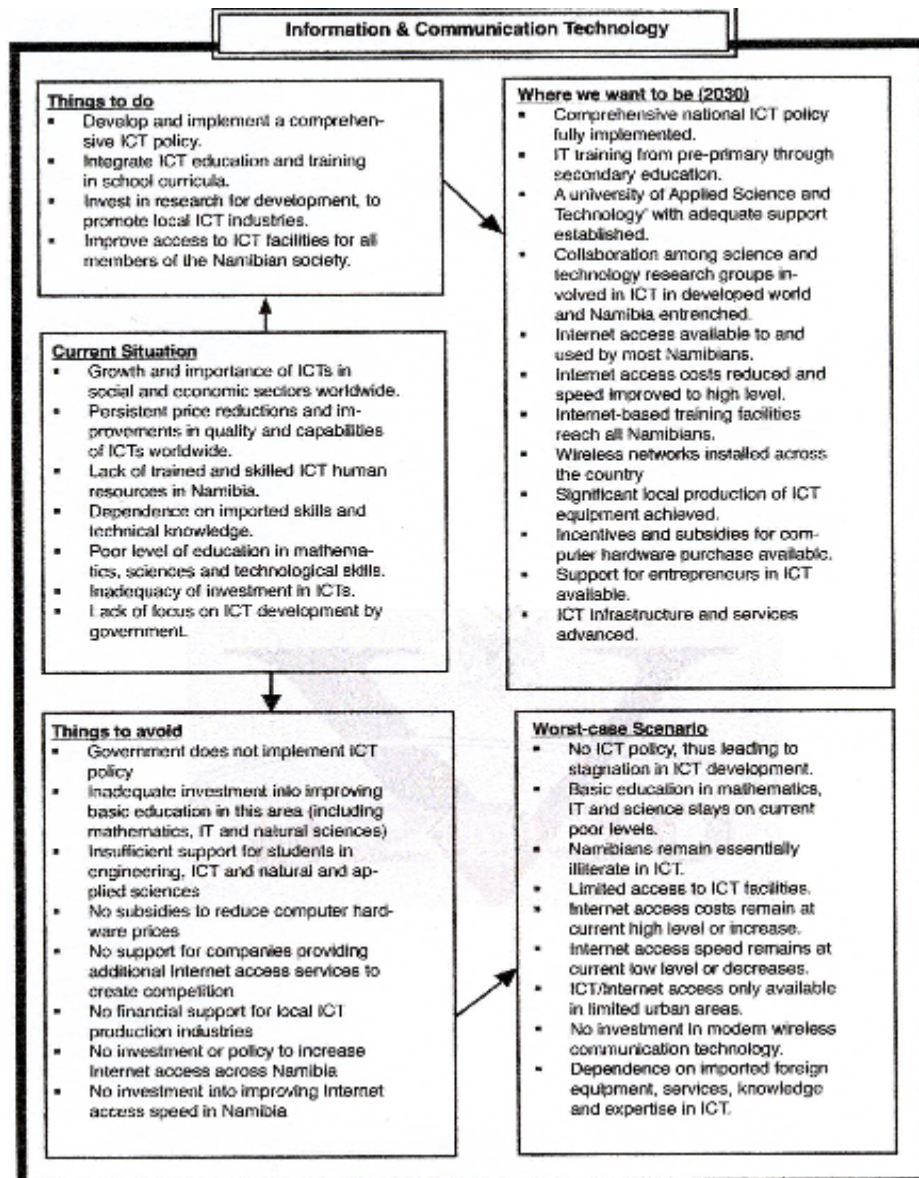
Reflecting on these views and the desire to exploit the new opportunities created by the use of Information Communications Technologies (ICTs), the Namibian government embarked upon developing national policies and strategies integrating ICTs into the education curriculum. Policies that embrace the need to integrate ICTs within the Education Sector in Namibia include: the Strategic Plan for the Ministry of Basic Education (2001-2006), the National ICT Policy, the ICT Policy for Education, the ICT

Strategy for the Ministry of Higher Education and the Education and Training Sector Improvement Programme (ETSIP) 2005-2011.

Overall, these policies outline strategies that could be used to attain the development objectives as set out by the government of the Republic of Namibia in the National Development Plans 2 and 3 (NDP 2 and 3) and Vision 2030. Figure 1 presents the summary of where Namibia wants to be by 2030 in terms of ICT development.

Figure 1: Where Namibia wants to be by 2030 in terms of ICT development.

(Source: Government of the Republic of Namibia, Vision 2030 – Executive Summary, 2004, p. 32)



According to the ICT Policy for Education which was jointly written by the Ministry of Basic Education, Sport and Culture (MBESC) and the then Ministry of Higher Education,

Vocational Training, Science and Technology (MHEVTST) in 2004 and launched by the Ministry of Education in 2005, Colleges of Education are expected to be at “development” Level 4 of educational institutions. For each of the five levels of ICT development, a set of criteria has been established which education institutions have to meet in order to obtain a certain level. The criteria for level four expects Colleges of Education, among others, to be well equipped with ICT hardware and software, as well as to create ICT learning environments through the use and integration of ICTs into teaching and learning.

1.2 What are ICTs and ICT integration?

Information and communication technology is commonly defined as “different technological equipment and resources used to communicate and to produce, distribute, store and manage information” (Blurton, 2002, p. 1). These technologies include, among others, radio, television, cellular phones, Internet, computer and network hardware and software, satellite systems, audio - conferencing technologies and online technologies.

The concept of ICT integration is not new. It goes back to the time when "older" ICTs such as television, telephone, newspapers and films played a more crucial role in ICT integration in teaching and learning. The concept of ICT integration, according to Earle (2002), is associated with the idea of completeness or wholeness; when all components of the system are joined together to make a whole. For example, content and pedagogy as essential components of teaching and learning must be combined when applying ICT integration. For example, an educator who simply provides students with a set of websites

or CD-ROM programmes is not applying ICT integration, because he/she does not address the pedagogical component. Given the above background, ICT integration is defined as the process of using any ICT tool (Internet, e-learning technologies, multimedia, CD-ROMS) to support teaching and learning (Williams, 2003).

With the explosion of new technologies such as the Internet, CD-ROMS, e-mail, digital video-camera and video-conferencing, ICT integration became part of teaching and learning in various teacher development programmes (Moon, 2004). For example, teachers in the Canadian province of Alberta in 2000 embarked upon a three-year implementation process for an ICT programme of studies from pre-school to Grade 12 (Alberta Learning, 2000-2003). This programme required the effective integration of technology in teaching and learning processes. In order to provide an electronic learning environment for their students using new forms of ICT, the University of Twente and the University of Amsterdam in the Netherlands began using course management software such as TeleTOP and Blackboard in 1999. With this course management software the courses were delivered through a website. The website incorporated all the content and tools required to teach the course (Collis and Boer, 1999). Owing to the vast size of Australia, a number of universities there (University of Southern Queensland, Deakin University, Charles Stuart University) are now offering courses through e-learning technologies (Stuparich, 2001). The United Kingdom Open University (UKOU), established in 1969, recently put most of its courses online (www.open.ac.uk). On the African continent, the University of Stellenbosch in South Africa implemented WebCT

(Web Course Tools) in 1999 as part of its e-learning initiatives in various programmes such as teaching and learning, administration and training and support (Van der Merwe, 2001). When it comes to the African Virtual University, all courses are delivered on-line. All interactions between students and lecturers, content, learning activities and assessment are done on-line (www.avu.org). The Stellenbosch Declaration of July 2005 recognized the important role teachers can play and their potential contribution to a knowledge-based society. It recommended that teachers be "empowered with ICT integration skills" and called on educational initiatives and policies to "consider teachers as key agents of education, of the evolution of education, and of the preparation of players and citizens of the knowledge society" (Cornu, 2005, p. 4). This is in part what the declaration stated:

The information and knowledge society provokes a continuous change in the role and the mission of teachers. Being a teacher in the Knowledge Society requires new specific competencies: a teacher has to deal with new knowledge and new ways of accessing knowledge; a teacher has to deal with a networked world and with new types of co-operation and collaboration; a teacher has to deal with a society in which knowledge plays a crucial role; a teacher has to deal with lifelong learning. The networked Knowledge Society results in teachers working in a more collaborative way, not only locally in their school, but regionally, nationally and also globally. The teaching profession therefore needs to evolve strongly and quickly. Clearly it appears that teachers are the key agents in the education system and are instrumental in the evolution of education. Hence we must take into account their major central role when creating educational policies, and it is our common responsibility to help all countries, though particularly developing countries, to train and recruit teachers, and to involve all teachers in international networks. ICT changes teaching and learning, but technology is not the main issue. We should always remember: technology matters, but good teachers and good teaching, matter more. (Cornu, 2005, p. 4)

On the whole, the declaration outlines the critical role the teacher needs to play in order to educate the learners that can function well in the knowledge society. It further raises

issues of networking and collaboration at both regional and local levels, lifelong learning and educational policies. In case of Namibia, these are the same issues that are addressed in the ICT Policy for Education.

1.3 Integration of ICTs at Colleges of Education in Namibia

Integration of ICTs at Colleges of Education in Namibia happens in two different areas: teaching and learning and administration. While ICT integration into teaching and learning takes into consideration the content and learning pedagogy of the whole course, ICT integration into administration undertakes the role of managing the institution using ICT. Examples include record keeping, student class lists, student tracking and assessment. The focus of this study is mainly on ICT integration into teaching and learning and not on ICT integration into administration.

1.4 The rationale of ICT integration

Many different stakeholders, in addition to the Ministry of Education, encourage ICT integration through the rapid emergence of e-learning as a mode of instruction and learning delivery. E-learning is defined in many ways, and as such it is important to have a clear understanding by providing a definition (Gallagher, 2001). It can be defined as learning which is facilitated and supported through the use of ICT. It should be pointed out that the emphasis is on learning.

E-learning can cover a spectrum of activities from web-supplemented, to web-dependent to learning fully online. Learning that is *web-supplemented* means that participating online is optional for students. Information that may include course descriptions, study guides, examinations, readings and other online learning resources are used to complement traditional forms of delivery. E-learning that is *web-dependent* requires interaction with course content as well as communicating with staff and/or other students. Some traditional on-campus elements are maintained. In some literature, web-dependent is called blended learning. E-learning that is *fully online* means that there is no direct contact on-campus. All communication between staff and students, education content, learning activities, assessment and support services are incorporated and conveyed online (Gallagher, 2001).

As mentioned earlier, e-learning which uses ICT to support learning and teaching is becoming important to institutions of higher education around the world including in Namibia (Gay & Blades, 2005). For example, at the beginning of 2005, Microsoft sponsored a competition requiring teacher educators and student teachers to integrate ICT into their lesson planning (Namibian Educational Technology Alliances (NETA), 2005). In addition, workshops on the integration of ICT into the instructional programme for both students and teacher educators are held regularly with the purpose of providing teacher educators with computing experience and skills necessary for modern-day classrooms in 2005 and 2006 (Windhoek College of Education, 2005; Basic Education Support (BES) 3, 2006; United Nations Education Scientific and Cultural Organization (UNESCO), 2006).

Another factor that encouraged ICT integration in Namibia was the fact that the syllabus for Integrated Media and Technology Education (IMTE) in the Basic Education Teacher Diploma (BETD) programme was revised in March 2006 to accommodate the ICT standards for educators and the National Professional Teaching Standards (NPTS) for teachers in Namibia (Ministry of Education, 2006a). The revised syllabus requires blended teaching and learning approaches in ICT integration. It is also believed that the use and integration of ICT provides for a learner-centred environment in terms of teaching and learning and the provision of more access to education, which is promulgated in the Namibian educational philosophy (Namibian Educational Technology Alliances (NETA), 2005).

Given all the recent national initiatives in the use of technologies in teacher education discussed above, and therefore the expected high degree of use of such technologies at Colleges of Education, it seemed fitting to explore perceptions of teacher educators and student teachers on the use and integration of ICT in support of teaching and learning activities. It could logically be expected that, after taking part in all these activities, teacher educators would integrate various ICT tools and applications and subsequently pass on these critical skills to students to apply them in their classrooms.

1.5 Statement of the problem

The Annual Report of the Ministry of Higher Education, Vocational Training, Science and Technology commented on the challenges of “new technological developments facing Namibia” (MHEVTST, 1999, p. 71). One of these challenges was the need “to provide the nation with the necessary human capacity, technical competence and technological ability to launch itself into the first century of the millennium” (MHEVTST, 1999, p. 71). However, as Lopes (2003) observed, the expected broad integration of ICTs in college lessons remains limited – an issue which is the main concern of this study. Further, some individual teacher educators, especially the experienced ones have minimal computer-related pedagogical experience and as a result do not have the required skills to integrate ICTs into their subject with confidence (British Educational Communications Agency (BECTA), 2004). In addition, some teacher educators use e-learning as an addition to their face-to-face instruction (BECTA, 2004). This may result in students using it on a voluntary basis and may lead to ICT policy goals, objectives and vision not being achieved. This study seeks to address this gap in the Ministry of Education's efforts to promote ICT use and integration. The study further seeks to shed some light on the perceptions of teacher educators and students regarding the possible levels of e-learning integration as envisioned by the ICT policy at Colleges of Education.

1.6 Research questions

The following research questions were formulated to solicit perceptions on the integration of ICT and e-learning in teaching and learning at the Colleges of Education.

1. How do the teacher educators and student teachers perceive the use and integration of ICT in teaching and learning at the Colleges of Education?
2. To what extent do teacher educators currently integrate and use ICT in their teaching and professional development?
3. How do the teacher educators and student teachers perceive the constraints that hinder the use and integration of ICT in delivering effective teaching and learning?
4. What is the impact of ICT on the implementation of the curriculum at teacher training institutions?
5. To what extent are specific e-learning methodologies part of ICT implementation and supported by the available infrastructure in the preparation of teachers?
6. What ICT strategies and practices might be employed that could enhance the use and integration of ICT and e-learning in delivering educational programmes at the Colleges of Education?

1.7 Significance of the study

At international, national and regional levels there is widespread support for the integration of ICT in education (Jung, 2005; Department for Education and Skills (DfES),

2004; Sutherland, 2002). For example, the Sutherland Report (2002) in Hong Kong recommended that “teaching and learning be informed by continued attention to the educational opportunities created by the technological revolution which is reshaping both the means of delivering education, and the opportunities for learning” (p. 29). In Africa, UNESCO (2002) has created Internet resources and websites to assist teachers to use ICTs to improve their teaching, trained teachers to deliver courses through distance education using ICTs and to foster cooperation across institutions of higher learning in the use of ICT.

According to the National Planning Commission (2004) of Namibia, the need for ICT integration and application in the entire educational system has become a national policy in which Colleges of Education are expected to integrate ICT across the curriculum aimed at achieving Level four in terms of use, knowledge and expected teaching competency in order to contribute to Namibia becoming a Knowledge-based Economy (KE).

By investigating the perceptions of teacher educators and students on the use and integration of ICT in teaching and learning opportunities at Colleges of Education, it was anticipated that this study would be an invaluable source of new knowledge and information which would be disseminated to other educators, so that they might re-examine their traditional teaching methods with the view toward integration of ICT. The expectations of the researcher were that:

1. Teacher educators may not have had sufficient opportunity and training to integrate ICT into their teaching;

2. Their background (as a result of their own training prior to the widespread use of ICT) was a hindrance to the integration of ICT into their teaching;
3. The infrastructure of the Colleges of Education was inadequate to cater for maximum use of technology; and
4. Despite the obstacles mentioned above, the researcher expected that the teacher educators would demonstrate a willingness to learn the skills required for integration of ICT into their teaching.

The important contribution of this study is that it examined the participants' perceptions within the implementation context of the ICT policy and on the curriculum reforms of the Basic Education Teacher Diploma (BETD). This study not only used the constructivist learning theory approach as the theoretical framework, it also demonstrated the usefulness and appropriateness of integration of ICT in the implementation and evaluation of the teacher training curriculum. With regards to the best ICT strategies and practices supported by the constructivism learning theory, adult learning theory, critical theory and Rogers' (2003) theory on diffusion of innovation, the study proposed appropriate ICT strategies for instructional delivery and integration in the preparation of teachers. The study also contributes to the knowledge of the state of modern electronic technologies as part of ICT tools in instructional delivery and expansion of learning opportunities for teachers in Namibia that could be more beneficial to them.

1.8 Scope of the study

The research was conducted at the four Colleges of Education namely, Caprivi College of Education (CCE), Rundu College of Education (RCE), Ongwediva College of Education (OCE) and Windhoek College of Education (WCE). A total of 81 teacher educators and 199 student teachers participated.

1.8.1 Windhoek College of Education (WCE)

Windhoek College of Education, which is the most urbanized of the colleges, is in the central part of Namibia. Windhoek College of Education used to be for “whites” only and in 1990 was merged with Khomasdal College of Education, which was for “coloured” people. Before independence, the Windhoek College of Education offered teacher training courses which were developed, evaluated and administered from South Africa (Frykholm, 1992). Although the courses offered by WCE at the time were of a high standard, they were not designed for and did not adapt well to the Namibian context (Frykholm, 1992). These courses included a three-year Diploma in Education Programme (DEP) and a four-year Higher Diploma in Education (HDE). Other programmes offered were: National Primary Certificate (NPC), National Education Certificate (NEC) and National Higher Education Certificate (NHEC). In 1992, the College started to offer the Basic Education Teacher Diploma.

Windhoek College of Education has both hostel and lecturing facilities and is blessed with modern facilities, which include a modern arts centre, computer centre, a library,

science laboratories, micro-teaching demonstration rooms, workshops for woodwork and metal work and an IT Academy. Currently WCE has 624 students and 55 teacher educators, which makes it the second largest of the four Colleges of Education in Namibia.

1.8.2 Ongwediva College of Education (OCE)

Ongwediva College of Education is situated in the northern town of Ongwediva. It is located on the Ondangwa-Oshakati main road, about 700 kilometres from Windhoek. It was formerly known as Ongwediva Teacher Training College and was built in 1975. OCE has a population of 928 students and 67 teacher educators. The college is equipped with a computer room, a new library, a storeroom, a science laboratory, an impressive assembly hall, a dining hall, six hostels, four blocks of classroom buildings and several fields for various sports activities.

Ongwediva College of Education was the first teacher training institution in Northern Namibia. In the past, the institution offered several teacher-training courses including: Primary Teacher Certificate (PTC), Lower Primary Teacher Certificate (LPTC), Higher Primary Teacher Certificate (HPTC), Education Certificate Primary (ECP), National Education Certificate (NEC) and National Higher Education Certificate (NHEC). OCE was only allowed to award certificates unlike WCE, which trained teachers for diplomas for a period of three to four years. Soon after independence, some of these programmes

were found to be of “little or no relevance to the situation in [Namibian] schools” (Swarts, 2000, p. 20). This resulted in the introduction of the BETD Programme in 1992.

1.8.3 Rundu College of Education (RCE)

Rundu College of Education was established in 1970 and has a modern campus, with most of the buildings constructed soon after independence. This teacher training institution was popularly known as 'Die Onderwyserkollege' in Afrikaans (meaning Teachers' College) and was physically located where Dr. Romanus Kampungu school (formerly Rundu Junior Secondary School) was situated. It offered similar programmes of study as OCE, that is, ECP, LPTC, HPTC, NEC and NHEC (Katewa, 1999). The student population now stands at about 380 student teachers and 36 teacher educators. The college has a computer room, a new library, an assembly hall, a science laboratory and several teachers' houses. The college was renamed Rundu College of Education when it started offering the Basic Education Teacher Diploma in 1992.

1.8.4 Caprivi College of Education (CCE)

Caprivi College of Education (CCE) is situated in the north eastern part of Namibia in the town of Katima Mulilo. The college history goes back to the early seventies. The College has changed its premises three times since its inception and the new campus was officially opened in April 1996. The student population stands at around 386 while the staff complement is about 30. The College has eight departments: Professional Studies; Skills; Mathematics and Integrated Natural Science; Languages and Social Sciences;

Lower Primary; Hostels and Student Affairs; Library and Administration. The College in the past offered similar qualifications to that of the Rundu and Ongwediva Colleges. It now (since 1992) offers the BETD qualifications.

1.9 Limitations of the study

First, this study was carried out at all four Colleges of Education. Findings and the likelihood of being able to generalize these findings to other similar training institutions for example, University of Namibia (UNAM), would be limited. Second, the study was carried out at a time when most of the ICT plans, outlined by ETSIP, were still at an early stage of implementation, thus making it difficult to fully evaluate their impact. Third, as with all studies based on self-report data, responses were dependent on the participants' ability and willingness to reflect honestly on their perceptions of ICT integration and the use of it at the four Colleges of Education.

Fourth, the researcher's bias and the effect of the researcher might have been present during the interview process. However, since the study used more than one instrument to collect information, the validity and reliability of data was not a problem, as it was analyzed through triangulation.

1.10 Organization of the dissertation

The dissertation is organized into six chapters. The first chapter introduces the study by presenting the following topics: a brief overview of the field of educational technology, a

general statement of the problem, a summary of the methodology, the aim and purpose of the study, the significance of the study, scope of the study, research questions, limitations of the study, definition of terms, and organization of the dissertation. The second chapter provides a general review of related literature relevant to the topic that was investigated. The third chapter describes the methodology used to collect the data including research sites, participant selection, participants, data collection procedures, pilot study, research instruments, data analysis procedures and ethical issues. Data presentation and analysis of data gathered make up the fourth chapter. The fifth chapter discusses the findings. The sixth chapter of the study offers a summary, conclusion as well as recommendations.

1.11 Definition of concepts and terms

For the purpose of this study, the following operational concepts and terms were defined as follows:

Antivirus: Software that can be used to protect the computer from being infected with viruses for example, Norton, AVG.

Bandwidth: This refers to the capacity in which data can travel through a network or Channel in a certain period of time as a rate, without taking into consideration the worth of the signal itself. Bandwidth is measured in bits per second or in some larger denomination of bits such as kilobytes, megabytes and gigabytes. The bigger the network's bandwidth, the more information can travel through or be sent.

Basic Education: This concept refers to education that is provided from Grades 1-12 in Namibian schools (Ministry of Education and Culture, 1993).

Blended learning: This refers to teaching and learning that combine traditional classroom approaches with e-learning as an ICT education tool.

Analyst Programmer: A person responsible for examining and developing computer information systems to meet the demands of the people. This person also advises the college with regard to the expenditure and sustainability of ICT equipment.

Computer animations: These are moving images that can be created by either using a specific computer software or being downloaded from another programme for instructional or educational purposes.

Computer crash: Unexpected malfunction of a computer system or a programme. For example, a person opens a word processing programme and the programme responds that a certain file is not opening due to the fact that some files are missing. The data that is not saved is often lost in the process.

Computer lab: A central area or room where computing activities are carried out for teaching and learning purposes. It may also be accessible to students after lessons.

Computer technician: A person responsible for repairing, installing and maintenance of ICT equipment.

- Computer virus:** A computer infection caused by a computer programme that can replicate itself and can either lead to the deletion of information in the programme or system or eventually to the corruption of the computer system.
- Constructivism:** An education philosophy based on the assumption that learners construct their own knowledge from ideas, objects, and events which they experience and encounter in relevant environments (Perkins, 1992; von Glasersfed, 1992).
- Downloading:** A process of either extracting or receiving information from another programme, Internet or computer system.
- e-learning:** Also known as electronic learning it is broadly defined as instructional and learning environments that are delivered via electronic technology such as the Internet, audio and videotape, satellite broadcast, interactive TV and CD- ROM. Web-based learning, computer-based learning and virtual classrooms are some of the processes and applications used to distribute e-learning.
- Educational Technology:** “A complex, integrated process involving people, procedures, ideas, devices and organizations, for analyzing problems and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning” (AECT, 1977, p. 1). In this study, educational technology is viewed as a

broader term which includes ICT for teaching and learning, which is the focus of this study.

Hard copy: A replica of information printed on permanent paper, for example, computer printout and facsimile printout.

Hardware: A common term that refers to the physical elements of a technology, for example, computer keyboard.

Information Communication Technology: This is an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems as well as the various services and applications associated with them, such as video-conferencing.

Innovation: An idea, practice or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003).

Internet: The networks of computers using common protocols such as Internet computer protocols (ICP), Internet protocols (IP).

KEWL NextGen: An e-learning platform or learning management system developed by the University of Western Cape with the purpose of providing free access to learning content materials.

(www.kingforge.uwc.za/index.php?module=stories&action=viewstory&id=kng_6)

Multimedia Applications: The process of making use of computers to incorporate text, audio, video and moving images.

- Offline:** When computers are not connected to a network or the Internet and users are not able to receive and send information.
- Online:** When computers are connected to a network and users are able to receive and send information.
- Paradigm:** An approach to research that is based on values, beliefs and methods that direct a researcher in formulating a conceptual framework of the research problem (Kuhn, 1970).
- Soft copy:** Unprinted digital information stored in a computer programme or in other saving devices which can be accessed through a specific programme, for example, word processing programme.
- Software:** A common term that is used to mean computer programmes, for example Word Processing Programme.
- Stellenbosch Declaration:** A statement issued by the International Federation for Information Processing (IFIP) on the improvement of ICT in education as a result of a conference that took place at Stellenbosch in South Africa from 4-7 July 2005. The recommendations contained in this statement targeted six areas within ICT in education namely, digital solidarity; learners and lifelong learning; decision making strategies; networking; research and teachers (IFIP, 2005).

- Student teacher:** A person being trained at a College of Education to become a teacher. A student teacher is also called a student. In this study, these terms are used interchangeably.
- Teacher educator:** A person responsible for teaching and training student teachers at a College of Education. Another common term for a teacher educator is lecturer. In this study, these terms are used interchangeably.
- Technology:** Computer related tools that teachers can use to support teaching and learning. In this study, the term technology is used synonymously with ICT.
- Track Changes:** A tool that makes it possible for making changes to and suggestions regarding a document. Word Processing packages offer this tool.
- Upload:** The transmission of information from one network to another computer network.

1.12 Summary

This study investigated the perceptions of teacher educators and student teachers on the use and integration of ICT in teaching and learning situations at four Colleges of Education in Namibia. This chapter gave an introduction to the background of the study and a short general overview of ICT integration in teacher education at both local and global levels. The next chapter provides a review of literature and a theoretical framework for this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The aim of the literature review was to “provide a set of explanatory concepts. These concepts offer ways of looking at the world which are essential in defining the research problem. ... without a theory, there is nothing to research” (Silverman, 1993, p. 1). The literature review was done in the broad context of the topic under investigation. It also reviewed the current achievements and activities related to teacher education since the launch of Namibia’s ICT Policy for Education in June 2005. Also included are literature reviews on the relationship between learning theories, adult learning theory, critical theory and diffusion of innovations theory and the use of technologies in teaching and learning. Literature on the impact of ICT on the implementation of the curriculum and barriers faced when integrating technology in the classroom were also reviewed.

2.2 Overview of ICT achievements and activities related to teacher education in Namibia

Many initiatives and achievements related to ICT development in the Namibian education system have been documented (Ministry of Education, 2006b). It is imperative to outline the initiatives and achievements related to ICTs in education, and specifically in teacher education. Various ICT developments have taken place since the launch of the ICT Policy for Education and the publication of the education strategic plan known as the Education and Training Sector Improvement Programme (ETSIP) in 2005.

Soon after the launch of the ICT Policy for Education in June 2005, the Steering Committee and the Ministry of Education's Project Management Office for ICTs in Education developed a comprehensive guide for the ICTs in the Education Implementation Plan. The Ministry of Education (2006b) clearly specified that this plan is "guided by education objectives rather than technology-related targets" (p. 2). The educational objectives of the implementation plan focused on the following seven main issues: leadership and management; infrastructure readiness and platform deployment; curriculum availability; content development; training and usage support; maintenance and technical support; monitoring and evaluation.

In 2005, the Ministry of Education embarked upon a 15 year strategic plan called ETSIP, with the purpose of improving the quality of education by mobilizing resources from private, public and non-governmental organizations (Ministry of Education, 2005). The priority components of ETSIP relating to ICT issues include: Review and develop curriculum content; review, develop and implement training; develop and deploy ICT services and support and strengthen education management through the use of ICT. The Ministry of Education, through ETSIP, has committed N\$243.9 million to ICT issues in education for Phase 1 (2006-2011).

The Embassy of Finland has donated N\$1 000 000 (One million) to the Community Education Computer Society (CECS) to provide the International Computer Drivers

Licence (ICDL) course to 15 teacher educators at each College of Education and 10 lecturers from the Faculty of Education at the University of Namibia (UNAM). This training started in September 2006 (Minutes of Steering Committee, 2007a). CECS also provided training for Interactive Whiteboards which were donated to all four Colleges of Education by Cambridge Hitachi through the assistance of the Global e-Schools and the Communities Initiative (GeSCI) (Ministry of Education, 2006b).

A National Educational Technology Service and Support Centre (NETTS) was launched in September 2006 (Ministry of Education, 2006b). The overall function of this centre is to assist educational institutions in the deployment and maintenance of computers.

The e-learning Centre located in Windhoek, which coordinates all e-learning activities in Namibia, has already completed the training of 60 individuals in the area of content development. These individuals came from UNAM, Namibia College of Open Learning (NAMCOL), Polytechnic of Namibia, the Ministry of Education, NIED, WCE and CECS Namibia (Ministry of Education, 2006b).

A new initiative called Edunet to improve Internet connectivity at educational institutions was created and started operating in December 2006. The purpose of Edunet is to improve the quality of education by mobilizing resources from private, public and non-governmental organizations (Ministry of Education, 2005). It is envisaged that Edunet

will double the amount of Internet bandwidth to all educational institutions on a dedicated basis (Ministry of Education, 2006b).

The Unit Standards for ICT Integration for Educators were completed and submitted to the Namibia Qualifications Authority (NQA) for approval before December 2006. It was envisaged that all teacher educators would successfully complete the module on ICT Integration for Educators by December 2007. It was also expected that all teacher educators would develop at least three assignments per semester per course requiring ICT integration by student teachers beginning January 2008 (Ministry of Education, 2006b).

The National Standards for Teachers that were developed by the NQA included several ICT domains and competencies for teachers. These ICT domains contain elements of competencies specifying learning outcomes, which teachers need to perform (Ministry of Education, 2006b). The following are ICT domains:

- (1) Operate ICT applications in an education context,
- (2) Design and deliver lessons using ICT tools,
- (3) Use ICTs for learners with special needs,
- (4) Assess and evaluate learning using ICT applications, and
- (5) Apply ICTs to engage in continuous professional development.

At the beginning of 2009, Computer Studies was offered as either a major or minor specialization in grades 8-10 by the Colleges of Education. This means that students who

graduate from the Colleges of Education are expected to teach Computer Studies in schools. Discussions with NIED and the Curriculum Coordinating Committee regarding the syllabi for Computer Studies started in 2005 (Ministry of Education, 2006).

The curriculum for ICT as a subject in schools has been revised to include Integrated Media and Technology Education (IMTE) for Colleges of Education. From the analysis of the IMTE syllabus by Shakwa (2008), the following approaches can be acknowledged as shaping the core for teaching and evaluating the knowledge and skills of IMTE:

- (1) ICT pedagogy content knowledge approach,
- (2) ICT subject matter knowledge approach, and
- (3) ICT literacy skills approach.

This implies that the integration aspect of ICT training in the IMTE syllabus is now shifting its original focus of equipping students with technical skills to that of providing pedagogical expertise in using technology to support teaching and learning activities. Such actions are in line with what has been reported in the literature. ICT training should include a component of pedagogy in order for the students to see how they might use it in their teaching practice as well as to learn how ICT can didactically support specific subjects such as Biology (Willis & Mehlinger, 1996).

2.3 Theoretical framework

The theoretical framework for this study was informed by the following theories: adult learning theory (Knowles, 1980), theory on diffusion of innovations (Rogers, 2003), critical theory (Peca, 2000) and constructivism learning theory (Duffy & Jonassen, 1992).

2.3.1 Adult Learning Theory

Taking into consideration that the study investigated adults, it was important to draw from the literature on adult learning theories. Although there are many theories on adult learning, this study was guided by Knowles' (1980) Theory of Andragogy because it is relevant to online learning. With regard to the learning environment, the relevance and applicability of Knowles' theory is evident through the learners' wish for control, flexibility and feedback.

Knowles, Holton and Swanson (1998) defined andragogy as "the art and science of helping adults learn" (p. 61). Knowles' theory is based on the following six assumptions regarding the education of adults: (1) adults must first establish the need to learn before embarking upon it; (2) adults must accept responsibility for their own learning; (3) adults come to education with experience and will bring other different experiences than younger individuals; (4) adults are willing to learn things that they need to learn and apply them to real life situations; (5) adults are goal oriented in their learning; and (6) adults are mostly motivated by internal pressures (quality of life, self-esteem and the desire to perform better at work) rather than external pressures (better jobs, higher

salaries, promotions). This implies that ICT integration should be organized in the best interests of the students while also considering other factors that may affect them positively or negatively when involved in technology activities.

2.3.1.1 Linking Knowles' theory to e-learning and ICT integration to the research study

How a person learns influences the way in which ICT may be integrated. Learners, especially adult learners, vary in their learning and preferences for training. Teacher educators need to be aware of these needs and be flexible and prepared to include various adult learning styles and methods. The adult learning theory presented an opportunity for the study to relate the educational context (integration of ICT in teaching and learning in adult learning environments) and experiences of students to the assumptions of Knowles' theory of adult learning.

2.3.2 Theory on Diffusion of Innovations

The study also used Rogers' (2003) theory on diffusion of innovations as a theoretical framework to examine the use and integration of ICT into teaching and learning. A study by Collis, Knezek, Lai, Miyashita, Pelgrum, Plomp and Sakamoto (1996), argued that "teachers are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore one of the key factors for affecting an integration of information technology in the school curriculum is adequate training of teachers in handling and managing these new tools in their daily practices" (p. 31). Rogers' theory also

emphasizes the responsibility of individuals, their social authority and institutional change in the diffusion theory. This theory incorporates the innovation-decision process, innovation characteristics, adopter characteristics and opinion leadership. As shown by this theory, implementation of an innovation, in this case ICT, is a continuous process that should be communicated through certain channels over time to all individuals within a social organization. Innovation, therefore, takes place in five phases: knowledge, persuasion, decision, implementation and confirmation. Acceptance of an innovation such as ICT in any school organization needs to guarantee that the pace of acceptance is facilitated with all the social groups described by Rogers, from early innovators and adopters to the early and late majorities and laggards (Rogers, 1995).

2.3.2.1 Linking theory on Diffusion of Innovations to e-learning and ICT integration to the research study

Rogers' (2003) theory was chosen because it offers a broad explanation with regards to acceptance, use and implementation of technology in teaching and learning. The theory proposed that people do not accept new innovations at the same speed or in similar ways. Some people are more hesitant than others to take on new innovations or technologies in their work. Overall, three factors identified by Rogers as influencing technology adoption and use, namely technology ownership, adopter characteristics, and innovation attributes, were important to consider in this study. They relate to how ICT is adopted and implemented by teacher educators and students at colleges of education in their teaching and learning. A consideration of the issues that influence the acceptance of innovation is

also vital when planning and designing the materials for continuous staff development programmes with regard to integrating ICTs into teaching and learning.

2.3.4 Critical Theory

Critical theory was developed by members of the Frankfurt School in the 1930s. Some members of the Frankfurt School include Max Horkheimer, Jürgen Habermas, Theodor Adorno, Herbert Marcuse and Walter Benjamin (Peca, 2000). The theoretical suppositions of Critical theory hold that knowledge allows people to self-reflect, which as a result would lead to “emancipation”; people look for knowledge because “an increased reality” requires them to do so; “people consistently evolve toward a higher level of knowledge” and “knowledge would result in action which furthers the evolutionary process” (Peca, 2000, p. 11).

Critical theory was used in this study in order to provide a theoretical background to investigate the social reality of ICT use and integration at Colleges of Education. This also provided a broad view of how ICT is shaping the education system and how it is shaped by evolving social processes (Peca, 2001). Proponents of Critical theory assume that reality is created by people. Advocates of Critical theory also recognize the existence of objective reality and that it is thus ontologically in line with the positivistic model. According to Popkewitz (1984), the purpose of Critical theory is to "change the world and not to describe it" (p. 45). Emancipation and empowerment are the two concepts that are clearly understood to be sought after by this theory (Peca, 2000; Popkewitz, 1984). This,

according to the theory, happens when people are involved in the dialectical process which will increase awareness of reality, thus ensuring that change occurs (Peca, 2000). Such change is understood to lead to the emancipation and empowerment of people, since the dialectical process makes it possible for them to differentiate between the real and the ideal and progress towards the ideal (Popkewitz, 1984). Relating the Critical theory to the national policy for ICT in education, the use and integration of ICT exhibits a number of empowering arguments intended for different groups and individuals (Ministry of Basic Education, Sport and Culture and Ministry of Higher Education, Training and Employment Creation, 2004).

2.3.1.1 Linking critical theory to e-learning and ICT integration to the research study

Critical theory provides a broad view of how ICT is shaping the education system and how it is being shaped by evolving social processes. A central question is whether the integration of ICT is capable of promoting concepts of emancipation and empowerment to individuals involved in its implementation, for example, teacher educators and student teachers (Peca, 2000; Popkewitz, 1984). ICT integration, especially e-learning, was found to be capable of empowering individuals to direct their own training and professional development opportunities (Brockbank, 2001).

2.3.5 Constructivism Learning Theory

When looking broadly at the impetus for learner-centredness and the contribution of ICT to that learning environment, the relevance of constructivism theory is primary. It has been suggested that learning with ICT is closely linked to a constructivist theory of learning (Duffy & Jonassen, 1992; Mclellan, 1996; Clouse & Nelson, 2000). Constructivism is a philosophy of learning founded on the premise that, by reflecting on individual experiences, an individual constructs his/her own understanding of the world in which he/she lives (Duffy & Jonassen, 1992). Each of us as individuals generates our own rules and mental models, which we then use to make sense of our experiences (Merrill, 1991). This school of thought developed out of the cognitive theory of learning, especially the work of Piaget (1970) and Vygotsky (1978).

The Australian Education Council (1991) recognized the contribution of constructivism theory to the learning process when it released the statement that “learners construct their own meanings from, and for, the ideas, objects and events which they experience” (p. 16). Leder (1993) put it even more clearly, “students actively and uniquely construct knowledge within the framework of their own experience” (p. 12). Nafziger (1998) offered a definition of constructivism theory in the context of what it does to the learner. He noted that "what it says is that knowledge is best acquired through learning experiences that are connected to things the child already knows, that engage the child socially and emotionally, and that harness the child's natural curiosity to the task at hand" (p. 62). Simonson and Thompson (1997) argued that “whereas more traditional models

of learning emphasized teachers delivering information to students, constructivist models emphasize students constructing their own knowledge” (p. 5). Simonson and Volker (1995) argued that constructivism is “characterized by shifting the locus of control for learning to students, putting them more in charge of what they learn and how they construct their own personal understanding of ideas and concepts” (p. 7). Constructivism envisions that both the learner and the teacher are “engaged in a personal search for understanding... that the content can only have a meaning (when) it fits into each individual’s personal construction of the world” (Brown & Freeman, 1998, p. 208). These characteristics were echoed by Harada (2003), who noted that “in this constructivist approach, there is a fundamental shift from instruction to construction and delivery. Learning is not simply assimilating knowledge transmitted by textbooks and instructors but personally building and communicating knowledge” (p. 42). In constructivism’s view of delivering knowledge, it is evident that students are creating their own knowledge based on their experiences relative to their culture and living environments. Based on principles of Rich Environments for Active Learning (REALS) as outlined by Dunlap and Grabinger (1996), such concepts as collaboration, generativity, reflectivity, active engagement and anchored instruction are constructivist ways of delivering knowledge.

2.3.5.1 Linking Constructivism Theory to e-learning and ICT integration to the research study

The research study was relevant in establishing whether teacher educators who integrated ICT into their teaching and learning were aligned with constructivist principles such as student-centred classrooms, collaboration, active involvement and building knowledge based on experiences. This research study also pointed out the impact of ICT integration on the curricula in terms of didactic approaches and delivery of educational courses, for example, online courses.

2.4 The impact of ICT on teaching and learning when implementing curriculum

It is documented in the literature that there is a positive impact of ICT on the learning environment, students and teachers (Committee on Development in the Science of Learning, 2000). The impact of ICT on the learning environment can be summarized under the following categories: (1) investigating reality and building knowledge (Riel, 1998); (2) active learning and authentic assessment (Riel, 1998); (3) engaging students through motivation and challenge (Cradler & Bridgforth, 2002); (4) providing scaffolding to support higher level thinking (Schacter, 1999); (5) increasing student independence (Cradler & Bridgforth, 2002); (6) collaborative and cooperative learning (Riel, 1998); and (7) widening access to educational opportunity, and provision of learning flexibility (Riel, 1998).

Some other general areas of the impact of ICT on teachers are identified as: (1) providing greater access to information, leading to increased interest in teaching and experimentation (Cradler & Bridgforth, 2002); (2) providing flexible time to engage with students, leading to greater productivity and collaboration (Cradler & Bridgforth, 2002); and (3) increasing collaboration and communication with all stakeholders e.g. parents (Cradler & Bridgforth, 2002). From the information above, it is clear that the impact of ICT influences the curriculum in terms of didactic approaches and delivery of educational courses, for example, online learning and virtual classroom.

2.5 Constraints and problems in the use and integration of ICT

As institutions of education prepare teachers to be ready for the technology explosion, they should be aware that there undoubtedly will be teachers who will be uncertain and frustrated by incorporating information communication technology in the classroom. Hope (1998) identified five barriers to teachers' use of computers and related technologies in teaching: (1) school leaders neglect to identify the problem(s) to be addressed by introducing technology in schools; (2) school management fails to create a vision of how technology transforms teaching; (3) teachers' vested interest in other pedagogies to accomplish teaching and learning objectives; (4) teachers' lack of access to the technology they are expected to integrate into practice; and (5) change agents fail to articulate the advantages technology has over what teachers presently do to accomplish their work (p. 137-138). In addition, Hope (1998) listed three things that often occur when a person tries to integrate computer technology into school practice. First, there is

the “difficulty associated with obtaining hardware.” The second is “that of maintaining hardware that has been purchased.” The third “resides in the human realm and influences teachers’ decisions about integrating computer technology into practice.” The third point, according to Hope, “manifests itself in teachers’ fear of technology, lack of interest in technology, reluctance to change because of familiar pedagogy and unwillingness to replace established classroom procedures and routines” (p. 138).

Ronan (1994) provided further evidence by stating that the main problem in introducing Information Technology in institutions to support teaching and learning was “authority having no knowledge of Information Technology coupled with a fear of computers” (p. 22).

Guha’s (2003) studies found teaching load and time management to be two constraints that prevented the successful ICT integration. In another study conducted by Vannatta (2000), lack of time to learn new technologies was found to be the main factor that prevented participants from integrating technology into their lessons. Osin (1998) found that teacher training colleges in developing countries such as Namibia “lack state of the art educational technology, which could be a stepping stone for positive changes in future teachers’ behaviour” (p. 3). Another factor identified in the literature is technophobia, which is a fear of technology. Iiping (2004) found that student teachers had a fear of using computer technology. Student teachers were quoted as saying: (1) “In my mind, I thought if I started operating a computer without being instructed, I would break it”. (2)

“I had the fear that if I used the computer I would break it because I didn’t have the skill”.

(3) “I was afraid to touch the computer. I was afraid I would break the machine” (p. 10).

With e-learning, access might also be a problem to students living in remote areas. The telecommunications infrastructure is insufficient and the information technology bandwidth makes the retrieval of information slow and difficult (Palmieri & Cashion, 2002).

From the foregoing information, one can see clearly that when there is a paradigm shift when new things are introduced. It might result in confusion and cause anxiety because new things require people to adjust and change their routines and procedures.

2.6 Strategies and best practices for ICT integration in delivering educational programmes in the Colleges of Education

Several authors pointed out that having a support system at an institution is one of the key strategies to successful ICT integration (Bitner & Bitner, 2002; Guha, 2003). Support systems that were identified included factors such as an institution having a technician, and having well informed administrators and helpful colleagues who could assist when the need arose. As Brody (1995) suggests, “helping technology users while they are actively engaged with technology at their work location is probably the most meaningful, essential and appreciative support that can be provided” (p. 137). Zhao, Pugh, Sheldon and Byers (2002) identified professional development activities that are conducted at the institution combined with a sufficient support system available at the training venue as

one of the best strategies that ensures the use and successful delivery of ICT integration. A research study by Collis, Knezek, Lai, Miyashita, Pelgrum, Plomp and Sakamoto (1996) went even further to say that sufficient training of teachers is a prerequisite for effective information technology integration in any school curriculum. The study pointed out that "teachers are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore one of the key factors for affecting an integration of information technology in the school curriculum is adequate training of teachers in handling and managing these new tools in their daily practices" (p. 31). The same study noted further that the "degree of classroom computers was closely tied to extent of training in integration techniques" (p. 32). Ritchie and Wiburg (1994) seem to emphasize the point that training needs to be ongoing and continual, with just-in-time support rather than a one-time just-in-need workshop.

Various scholars have also debated whether teacher preparation programmes should have a separate course on educational technology or whether such technology should be integrated across subjects (Stetson & Bagwell, 1999). Critics of this proposition, argue that a separate course will only expose teachers to technology on a short-term basis (Gillingham & Topper, 1999) and will focus on technical aspects of technology (Drazdowski, 1994) rather than emphasizing integration and how it relates to curriculum content.

A number of writers have also found that the most effective way of training prospective teachers for technology integration is when it is infused into methods courses (Dugdale, 1994; Campbell & Warburton, 1999; Halpin, 1999) rather than having a stand-alone technology course. This, according to these authors, should be followed by practical fieldwork. This experience will enable teachers to attach learning theories to their teaching practices (Niederhauser, Salem & Fields, 1999). In this researcher's view, this can only happen when teacher educators who teach these methods courses are fully conversant with technology integration in their subject areas. Jung (2005) summarized ICT integration efforts found in teacher training programmes in many different countries into four categories. These categories are: (1) ICT used as main content focus of teacher training (2); ICT used as part of teaching methods (3); ICT used as the core technology for delivering teacher training; and (4) ICT used to facilitate professional development and networking (p. 95). Regardless of all these different approaches to ICT integration, what is important is that students should be provided with ICT learning opportunities that are more learner focused, which will help them link pedagogy, learning content and learning theories.

Based on the foregoing findings from research on ICT integration and delivery approaches, it is clear that there is no common agreement on how an institution can prepare teachers with regard to ICT. Some training institutions present specific courses on technology only (Willis & Mehlinger, 1996), while others infuse technology in a specific subject content, for example, Mathematics and Science (Niess, 2001). Some

institutions, as observed by Butler and Sellbom (2002), are at a standstill pondering questions of why and how they should integrate ICT into particular courses that are offered through a face-to-face mode. These questions, according to Butler and Sellbom, are at times not easy to answer.

What is clear, however, is that one has to choose the model that will successfully lead to achieving policy goals, mission and vision as well as addressing specific needs and levels of different individuals in a social system (Rogers, 2003). As further reported by DeCorte (1990), “a powerful computer learning environment is characterized by a good balance between discovery learning and personal exploration on one hand, and systematic instruction and guidance on the other, always taking into account the individual differences in abilities, needs, and motivation between students” (p. 74). One is, however, also cautioned to take into account the cost effectiveness of each specific training model as well as the careful selection of ICT tools for the particular institution (Jung, 2005).

2.7 Summary

The literature review exposed a gap in the literature on the integration and use of ICT and its impact on teaching and learning and teacher education. The best strategy for the integration of ICT is open to debate, as there are not much comprehensive and convincing data to support it. Generally, researchers have focused on examining the integration of ICT into either teaching methods courses or specific stand alone technology courses

rather than looking at all subject areas that form part of the teacher training programme. This is one gap that this study tried to fill by specifically investigating the integration of ICT and e-learning across all the subject areas offered in the BETD programme.

The literature review also revealed that most studies on the integration of ICT and e-learning in teacher education have been limited to schools in developed countries (Beukes-Amiss & Chiware, 2006). In Namibia, the few studies that are found have been carried out by outside experts funded by donor agencies or carried out as part of a consultancy with limited scope of investigation (Namibian Education Technology Alliance, 2005). Further, researchers have identified numerous constraints facing teacher educators when they try to integrate ICT and e-learning into their teaching and learning processes (BECTA, 2004). In the case of Namibia, the researcher did not find any empirical data that points out the constraints teacher educators and student teachers experience when they integrate ICT and e-learning in teaching and learning situations. The researcher sought to address this gap by specifically looking at the constraints and problems teacher educators and student teachers at the Colleges of Education in Namibia were facing with regards to the integration of ICT and e-learning into their teaching and learning.

This chapter provided a review of the literature, theoretical frameworks and key concepts related to the research questions of the study. It also provided a general overview of ICT achievement and activities related to teacher education in Namibia. Finally, the chapter

provided a review of literature with regard to the constraints and problems in the use and integration of ICT and the best strategies and practices in delivering educational programmes at the Colleges of Education. The next chapter deals with the research methods employed in this study to collect and analyse data.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methods and procedures employed by this study in collecting information with regard to the integration of ICTs at the Colleges of Education.

3.2 Research design

Research design is viewed by some researchers as “a master plan specifying the methods and procedures” (Zikmund, 1991, p. 42) or a “detailed plan which you will use to guide and focus your research” (Hussey, 1997, p. 114). Meriam (1988) defines a research design as a “plan for assembling, organising, and integrating information (data), and it results in a specific end product (research findings). The selection of a particular research design is determined by how the problem is shaped, by the questions it raises, and by the type of end product desired” (p. 6).

Methodologically, the study’s research questions were set within an interpretive paradigm rather than in a positivist one. The research questions were an attempt to understand and look at the feelings, experiences, perceptions and human actions of teacher educators and student teachers rather than testing any hypothesis. In a positivist paradigm, a researcher’s objectives would be to “measure, test hypotheses, discover, predict, explain, control, generalize and identify the cause-effect relationship” (Higgs, 1998, p. 146).

Wildemuth (1993, p. 451) compared the aims of the positivist and the interpretive paradigms by stating that:

It is true that the positivist approach, with its goal of discerning the statistical regularity of behaviour, is oriented towards counting the occurrences and measuring the extent of the behaviour being studied. By contrast, the interpretive approach, with its goal of understanding the social world from the view point of the actors within it, is oriented towards a detailed description of the actors' cognitive and symbolic actions, that is, the meaning associated with observable behaviours.

Given the fact that an interpretive paradigm can use a combination of quantitative and qualitative methods (Fetterman, 1988), this study sought to utilize both qualitative and quantitative research methods of collecting and analyzing information. As argued by Olson (1996, p. 1) "specific methods, particular data gathering methods are not necessarily linked with one set of assumptions as opposed to another. The question underlying differences of research stances (or paradigms) should be their ontological and epistemological assumptions". This was further supported by Guba and Lincoln (1998, p. 195) who noted that:

...both qualitative and quantitative methods may be used appropriately with any research paradigm. Questions of method are secondary to questions of paradigm, which we define as the basic belief system or worldview that guides the investigator not only in choices of method but in ontologically and epistemologically fundamental ways.

The qualitative approach was more appropriate to this study as its purpose was to gain a deeper understanding of the use of ICT for teaching and learning as perceived by the teacher educators and student teachers at the four Colleges of Education in Namibia. Johnson (1995) suggests that those who are involved in education technology should

"engage in research that probes for deeper understanding rather than examining surface features" (p. 4). Johnson is of the opinion that qualitative methods enrich the understanding of classroom teaching and learning. Qualitative methods have also, according to Johnson (1995) "gained increasing acceptance in recent years" (p. 4). Listening to what respondents say and observing what they do, is a major step in portraying the issues of actions and experiences investigated in this study. Regarding qualitative research methods, Van Maanem (1998) proposes that "to portray the culture requires the fieldworker to hear, to see, and most important for our purpose, to write of what was presumably witnessed and understood during a stay in the field. Culture itself is not visible, but is made visible only through its representation" (p. 3). This study attempted to do this by spending time at all Colleges of Education observing and talking to participants.

Bogdan and Biklen (1992) believe that it is important to spend time at the setting (in this case, place of study) in order to better understand and analyze people's feelings, social actions, beliefs, thoughts, and perceptions. The researcher was interested in describing teacher educators' and student teachers' experiences with technology, using the informants' own words coupled with the investigator's observations in the participants' natural setting. Qualitative methods in this study included interviews and observations.

In this study, the researcher did not have predefined dependent and independent variables nor did the researcher test a hypothesis; which are the most crucial aspects in quantitative

research (Neuman, 2003). The reason was that the researcher was interested in providing a holistic view of the phenomena under study (Patton, 1980) than explaining a set of data to find out the issues of causality (Cassell and Symon, 1994).

This study used the descriptive statistical method of the quantitative approach to describe basic features of the data as well as to summarize the results (Gay & Airasian, 2003). Descriptive statistical analysis was also used to describe the characteristics of responses on the questionnaire items (frequency counts and averages) for teacher educators and student teachers. The means and the standard deviations were calculated to find out the distribution of scores in terms of the spread (Refer to Table 11 and Table 30). In order to ensure this, the data collected were coded and prepared for analysis using the Excel programme (specifically standard deviations, averages and range of scores). For example, a demographic information sheet for each participating teacher educator was requested through a questionnaire in order to elicit information regarding years of teaching experience, qualifications, gender, subjects taught, age, department and college.

3.3 Population

There are four Colleges of Education that prepare teachers for primary and junior secondary education (grades one to ten) in Namibia. These four Colleges of Education are located in four different political regions of Namibia: Oshana, Khomas, Kavango and Caprivi (see Appendix A). The total population for this study comprised 2318 students

(386 at CCE, 380 at RCE, 624 at WCE, 928 at OCE) and 188 teaching staff (30 at CCE, 36 at RCE, 55 at WCE, 67 at OCE) (Ministry of Education, 2007b).

3.3.1 Sample and sampling procedures

There is no general prescription for selecting a sample size in the qualitative inquiry process, because the "sample size depends on what you want to know, the purpose of the inquiry, what's at stake, what will be useful, what will have credibility, and what can be done with available time and resources" (Patton, 1990, p. 184). Best and Khan (1998) have argued that thought invested in choosing a sample is more essential than increasing the size of the sample. However, it is commonly held that samples of 30 or more are to be considered as large samples (Best & Kahn, 1993).

The sample for this study was drawn from all four Colleges of Education following the criteria for choosing a sample as suggested by Cohen, Mannion and Morrison (2000) with regard to the sample size, the representativeness and parameters of the sample, access to the sample and the sampling strategy used. As further argued by Cohen, Mannion and Morrison (2000), "the choice of which strategy to adopt must be mindful of the purposes of the research, the time scales and the constraints on the research, the methods of data collection and the methodology of the research" (p. 104).

Purposively sampling was used in this study to choose teacher educators who taught Integrated Media and Technology (IMTE) at the Colleges of Education. This type of sampling allowed teacher educators from the four Colleges of Education to be chosen

because they were suitable for this study. The information they provided was rich and could be studied in greater depth (Patton, 1990). Further, the IMTE teacher educators were also chosen because this subject catered for all media and ICT integration in the teaching and learning process at the Colleges of Education. A total number of 11 IMTE teacher educators participated in this study (see Table 4).

In a case such as this study, where the population was “very large and spread out over a wide geographic area” (Gay & Airasian, 2003, p. 108), cluster sampling was found to be useful and appropriate in selecting a group of teacher educators who were not teaching IMTE. Other advantages of cluster sampling applied to this study were the same as those outlined in studies by Charles and Mertler (2002) and Gay and Airasian (2003), namely there is less time and expense involved, more convenience and the groups are selected randomly.

Teacher educators who were not teaching IMTE were randomly selected to participate in the study in order to find out how they integrated ICT across the subjects they taught. The criterion used was that they should represent different subject disciplines. The number of teacher educators belonging to this category who participated in this study was 86 (see Table 4).

An acceptable sample size which was representative in providing relevant and balanced results was drawn up, taking into consideration the cost involved in this study and the

student teacher population in all Colleges of Education (386 in Caprivi, 380 in Rundu, 624 in Windhoek and 928 in Ongwediva) (Ministry of Education, 2007). Thirty (30) student teachers taken from both Caprivi and Rundu Colleges of Education was found to be sufficient for the study while 60 student teachers from Windhoek College of Education and 100 student teachers from Ongwediva College of Education were considered to be an acceptable representative sample. Two hundred and twenty questionnaires to be completed by student teachers were then distributed to Colleges of Education as follows: 30 to Caprivi College of Education, 30 to Rundu College of Education, 60 to Windhoek College of Education and 100 to Ongwediva College of Education.

The student teachers were randomly selected and included both males and females. The study found it appropriate and easier to use all the student teachers in one class group when selecting the student teachers (for example, all 15 students in BETD 1F) rather than selecting a few student teachers from each class group existing at the Colleges of Education (for example, 10 in BETD 2C and 10 in BETD 3F).

It was initially planned that the sample of student teachers who would complete the questionnaire should have equal representation from all three year groups of study (years 1 to 3). This was to have a fully representative sample and balanced viewpoints. This, however, proved impossible because the third year students were involved in their teaching practicum in schools when the questionnaire was administered.

3.4 Pilot study

The issues of validity and reliability were a concern to this study mainly because the research instruments involved the use of questionnaires and interviews. As a first step to check the validity of the questionnaire and interview questions, a pilot study was carried out with 14 student teachers and 10 teacher educators at the Windhoek College of Education between 25-27 April 2007. According to Bless and Higson-Smith (2000, p.155), a pilot study is a “small study conducted prior to a larger piece of research to determine whether the method is appropriate.” The pilot study was carried out with participants with similar characteristics to the larger population of the main study. The reason for piloting the instruments at WCE was accessibility. The researcher had full access to participants from WCE on a daily basis. The sample for the pilot study was selected from a total of 55 teacher educators and 624 student teachers currently at WCE. The researcher wanted a pilot sample of 10 teacher educators and 14 student teachers who met the criteria as indicated in the research population. Every fifth (5th) name was drawn from the list of teacher educators until ten participants were identified. Among the 10 teacher educators selected, 2 were teaching IMTE. For student teachers, every forty fourth (44th) name was selected, until the required number was identified. The 10 teacher educators and 14 student teachers who participated in the pilot study were excluded from the main study.

The piloting of the research instruments was necessary because it gave the researcher an opportunity to identify ambiguities in the questions, evaluate the type of responses given

and revise and adjust questions in the implementation of the data collection phase of the proposed research study (Peat, Mellis, Williams & Xuan, 2002). This enabled the researcher to revise the research instruments and procedures for data collection before starting the fieldwork.

3.4.1 Modifications of interview questions after pilot study

Changes were made to the interview questions as a result of the analysis of results from the pilot study. The main content of the questions, however, remained unchanged. The analysis of the pilot interviews showed that teacher educators might not be in a position to describe accurately how others integrated ICT and e-learning in their teaching and learning. Furthermore, it was found that the participants were reluctant and uncomfortable to talk about how their colleagues integrated ICT and e-learning in their teaching and learning. Thus, the questions were changed to request information directly from the teacher educator about himself or herself. For example: "What are teacher educators' perceptions regarding the integration of ICT in their teaching and learning?" was changed to: "What are your perceptions as a teacher educator regarding ICT and e-learning in your teaching and learning?"

Questions containing two issues were separated. For example: "How does the integration of e-learning and ICT affect the empowerment and emancipation of students as professional educators?" was changed to: "How does the integration of e-learning and ICT affect the empowerment of students as professional educators?" The second concept

of “emancipation” was separated as well. This was done in order to remind a person that he/she should not talk about other concepts, which could create confusion and misunderstanding of concepts.

The word “learners” was changed to “students” since the word "learner" in Namibia is associated with the learners enrolled in the Basic Education System and not in the institutions of higher learning. This was done to avoid confusion.

3.4.2 Modifications of the questionnaire after the pilot study

Participants were requested to make comments and suggestions regarding instructions, recording procedures, the wording and the order of questions that may have been vague or unclear. It appeared that most participants in the pilot study had a narrow definition of e-learning. The following definition of e-learning was then included at the beginning of the questionnaire: *The mode of instruction and learning delivery which is supported through the use of ICT.* There were editorial comments and restructuring of some tables, which were suggested to clarify the questions.

3.5 Administration procedures for the teacher educators’ questionnaires in the main study

A total of 100 questionnaires were sent to colleges to be completed by teacher educators. The distribution of the questionnaires to the Colleges of Education was as follows: 15 to

Caprivi College of Education, 15 to Rundu College of Education, 35 to Windhoek College of Education, and 35 to Ongwediva College of Education.

With the exception of Windhoek College of Education, questionnaires were sent through the office of the Rectors during July 2007. This was done in order to ensure a high return rate of the questionnaires. A note of explanation with regard to the proper procedures for administering and collecting information was attached. This was followed up by a telephone conversation with each Rector to make sure that they understood the process of completing the questionnaire. Also attached was a letter from the Permanent Secretary indicating that the researcher had secured permission to conduct the said research at the Colleges of Education as requested (see Appendix B & C).

3.6 Validity and reliability

According to Patton (2001), validity and reliability are the two most important factors that should be taken into consideration when planning, designing, analyzing results and judging the value of the study. Considering issues related to validity and reliability, Lincoln and Cuba (1985, p. 290), posed this question, “How can an inquirer persuade his or her audiences that the research findings of an inquiry are worth paying attention to?” To ensure that this study produced desirable results, the questionnaire and interview questions were checked for validity and reliability by using the method of triangulation described in this chapter. Triangulation is seen by some researchers as one of the strategies for improving the validity and reliability of research or assessment of findings

(Mathison, 1988). In addition, research instruments were revised after the pilot study, which the researcher believed brought credibility to the data.

3.6.1 Validity

The term validity refers to “whether the research truly measures that which it was intended to measure or how truthful the research results are” (Joppe, 2000, p.1). In this study, issues related to content validity were taken into consideration. Content validity refers to “the degree to which a test [method] measures an intended content area” (Gay, 1992, p. 156). Content validity is also “concerned with how well the test samples the total content area” (Gay, 1992, p. 156). In this study, content validity was ensured by giving research instruments (questionnaire and question for interviews) to colleagues and study supervisors for comments. This was done to make sure that the instruments had covered the topic being investigated.

3.6.2 Reliability

Joppe (2000, p. 1) defined the term reliability as, ... “the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be produced under a similar methodology, then the research instrument is considered to be reliable.” Kirk and Miller (1986, p 41-42), listed three types of reliability, which related to (1) the degree to which a measurement, given repeatedly, remains the same; (2) the stability of measurement over time; and (3) the similarity of measurements within a given time period. In ensuring

reliability in this study, the procedures for administering the questionnaire and interviews were the same for all the participants. In terms of the consistency in administering the questionnaire and interviews, it is possible for other researchers to replicate similar results given that they follow the same procedures.

3.6.3 Precautions taken against likely sources of bias

The researcher was constantly aware of bias that might occur in this study. The awareness of the presence of bias had allowed the researcher to be more careful in scrutinizing the research design, findings and conclusions of the study. With regards to the research design, the researcher first ensured that the sample was randomly selected. Second, the researcher adopted an interpretive paradigm as an epistemological orientation of the study. This meant that the researcher used the core assumptions of interpretive paradigm as an integral part of the research design. The assumption of this paradigm is that the researcher should try to understand the phenomena through the meanings that participants give to them based on their historical and social backgrounds (Wildemuth, 1993).

The researcher was also constantly aware about different cultures, resources and historical background of the participants at the Colleges of Education and how this could influence the participants' thinking and responses. Therefore, the researcher was aware that the expectations outlined in Chapter 1 of this study might not necessarily apply to all participants in the Colleges of Education. Given this, the researcher approached the above issues with an open mind.

Finally, the researcher was constantly sensitive to the position he held at one of the colleges and about how his cultural connections, values and beliefs about ICT integration could influence how participants responded to questions. The researcher assured participants that issues mentioned during the research would be kept confidential and would only be used for the purpose of this study.

3.7 Research instruments and data collection procedures for the main study

Research instruments used in this study were interviews, questionnaires, observations, and document analysis. All these instruments are explained in detail in the following pages.

3.7.1 Interviews

The interviews were formal and gave participants the opportunity to describe their own experiences of using and/or integrating ICT as an educational tool in teaching and learning (see Appendix D & E). These interviews were mostly on an individual basis with the 45 participants (20 teacher educators and 25 student teachers) and were conducted in a convenient, suitable and comfortable location of their choice; college classrooms, offices or the library. Each interview lasted from 45 minutes to an hour, and with the permission of the participant, each interview was audio taped. As noted by Hopkins and Hammersman (1993), interviews provide ample opportunities for the researcher to verify what has been seen at the natural setting. They also provides the

researcher with other necessary information that could not be obtained through other techniques. Gay (1996) commented on the importance of conducting interviews, "there are certain things which simply cannot be observed including past events, events which occur outside of the researcher's observation, and mental processes" (p. 223). The interview comprised open-ended questions, which addressed teacher educators' and student teachers' perceptions regarding the use and integration of ICT and e-learning in teaching and learning, the teacher educators' and student teachers' perceptions regarding the constraints that hindered the use and integration of ICT and e-learning for educational purposes and what ICT strategies and practices might be employed that could enhance the use and integration of ICT for educational purposes at the four Colleges of Education.

3.7.2 Questionnaire for teacher educators

The questionnaire which was used in this research measured both qualitative and quantitative data. The questionnaire was adapted from the Teacher Technology Survey (American Institute for Research, 1998). With this questionnaire, it is clearly stated on the web site that, "permission has also been granted for the reader to use the questionnaires or parts of the questionnaires, for research purposes." This instrument contained two sections, biographical information and information on the use of ICT in teacher education. The biographical section elicited personal information such as years of teaching experience at a college, subject taught, age, gender, college name, department, employment status and professional training in the use of ICT. The section on the use of ICT and e-learning in teacher education was to obtain information regarding to the

average time spent using various ICTs, participants' rating of their experience and comfort level of using ICT, how student teachers used ICT in their classes and the role of teacher educators when using and integrating ICT.

The questionnaire elicited responses that answered the first three research questions of the study: teacher educators' perceptions regarding the use and integration of ICT in teaching and learning, the extent to which teacher educators integrated ICT in their teaching and teacher educators' perceptions regarding the constraints that hindered their use of ICT for educational purposes (see Appendix F).

3.7.3 Questionnaire for the student teachers

Students from all four Colleges were asked to complete a questionnaire that was developed to probe their perceptions of the use and integration of ICT in teaching and learning. This instrument was a shorter and modified version of the questionnaire that was completed by the teacher educators. The questionnaire consisted of 18 questions, of which 17 were closed-ended questions while one question was open-ended. The student teachers' questionnaire was similar to that of the teacher educators and sought to obtain answers to the first three research questions of the study. The general purpose of this questionnaire was to check whether what the teacher educators said was similar to or different from what the students said (see Appendix G).

3.7.4 Observation schedule

During classroom observation of teacher educators and student teachers, the researcher sat at the back of the classroom, taking notes and held short discussions with the teacher educators and student teachers after the lesson. The main reason for conducting classroom observation was to reaffirm what participants had said during the interviews and to see whether this corresponded with what they said and did in the classroom. The overall objective of the observation was to complement or triangulate the data obtained from the questionnaires and interviews. Furthermore, classroom observations were done in order to witness first-hand the extent to which teacher educators and/or student teachers integrated and used ICT in their teaching and learning. It also gave the researcher the opportunity to see things that participants were not comfortable with or did not want to discuss (Patton, 1990).

Specifically, the observation described how the student teachers worked with each other, described instances of technological barriers and how this was being handled, described the relationship of ICT to teacher educators' teaching style and described the curriculum connection of ICT and content/learning objectives of the lesson being observed (see Appendix H). Each College was visited for one week. More follow-up observations were undertaken when there was a need to do so, for example, observing whether there was a pattern in terms of classroom activities, classroom interactions and teaching strategies. As Spindler and Spindler (1987) quoted in Mubita (1996) noted that, "observation (should be) prolonged and repetitive, (and) chains of events (should be)

observed more than once to establish the reliability of the observation” (p. 19). The study incorporated this principle by observing some lessons more than once.

3.7.5 Document analysis procedures

The researcher also reviewed documents related to the study such as policy documents, minutes of the ICT Steering Committee on Education meetings, Guide to ICTs Implementation Plan, workshop and training seminar reports, ICT modules, curriculum materials related to lessons that integrated ICTs, lesson outlines (plans), worksheets, handouts, students’ homework and other official documents that were useful to the study. By analyzing various documents, the researcher gained insight into the contextual framework within which instructional activities were taking place. These documents were also useful in answering research questions specifically on teaching strategies and practices and the impact of ICT at the curriculum level of teacher training. The document analyses were also useful in informing the problem statement, especially in terms of considering at practical aspects of ICT policy implementation and syllabus implementation.

3.8 Data analysis procedures

The researcher followed the suggestions of Bogdan and Biklen (1982) concerning the analysis of qualitative data in terms of "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what you will tell others" (p. 145). The researcher examined each transcript and highlighted themes or

categories. The basis for categorization was to develop coding systems which according to Miles and Huberman (1984) have four important functions: (1) reducing large amounts of data into a smaller number of analytic units; (2) getting the researcher into the analysis during data collection; (3) helping the researcher build a cognitive map, an evolving schema for understanding what is happening locally; and (4) laying the groundwork for cross-site analysis by surfacing common themes and causal processes (p. 68). Following a common practice in writing qualitative reports, the researcher used the voices of participants in the text in the form of quotes. This was vital in describing a phenomenon from the point of view of the 'insider' or 'native' rather than the 'outsider', in this case, the researcher. The chart presenting the flow of data collection procedures discussed in this chapter as well as in previous ones is illustrated in Appendix I.

The Microsoft Excel programme was used to calculate frequency counts of teacher educators' and student teachers' responses. These data were reported using percentages or adding up the total values. This allowed the researcher to analyze and summarize data, present tables and charts, and determine if there were some differences between the responses of teacher educators and student teachers.

To minimize errors and bias in data collection, the researcher looked at the cumulative data drawn from multiple sources in order to triangulate the data. This was done to determine whether the findings corroborated with one another (consistency) and or if there were some contradictory findings. In cases where one instrument provided contradictory results, the researcher offered some explanations as to what could had

caused the contradictions. When the contradictions were major, the researcher went back to the participants to confirm and or clarify what they had said. The researcher believed that this process of cross-checking information from different sources brought greater validity and reliability to the data. According to Mathison (1988, p. 13), “triangulation has risen an important methodological issue in naturalistic and qualitative approaches to evaluation [in order to] control bias and establishing valid propositions because traditional scientific techniques are incompatible with this alternative epistemology.”

3.9 Ethical considerations

In line with the government requirements for conducting research in Namibia, the researcher wrote a letter to the Ministry of Education to request permission to conduct research at the Colleges of Education (see Appendix B). After approval to conduct research was obtained from the Ministry of Education, the researcher sent a copy to the Rectors of the Colleges of Education with another letter introducing himself, the purpose of the study and ethical issues related to the study (see Appendix B, C & J).

Meriam (1988) observed that ethical dilemmas were likely to emerge at two points during a study, “during the collection of data and in the dissemination of findings” (p.179). From the start, participation in this research was voluntary. Participants were assured that the information received from them would be kept confidential and would only be used for the purposes of the study. Permission to tape record the interviews was also sought from the participants and none of them had a problem with this. They were assured that

information would be treated confidentially. In cases where the researcher found documents relevant to the study, the researcher always asked the participants if he could keep a copy. Fictitious names were assigned to all participants. This was done to protect the identity of the participants as advised by Bogdan and Biklen (1998), that identities should be protected so that information collected does not embarrass or in other ways harm the research participants.

3.10 Summary

This chapter described the methodology used in this study. The sample in this study consisted of 100 teacher educators and 220 student teachers from four Colleges of Education in Namibia. Teacher educators who were teaching IMTE were purposively selected while teacher educators who were teaching other subjects were randomly selected. Student teachers were selected through cluster sampling. The research instruments included interviews, classroom observations, questionnaires and document analysis in order to substantiate and triangulate the data. A pilot study was carried out with similar participants to establish the reliability and validity of these instruments. Results obtained by using these instruments are presented in the next chapter.

CHAPTER 4: PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction

This chapter examines and analyses data in accordance with the research questions that guided this study. The data is presented in line with the themes which set out to uncover the following:

- (1) Biographical information on teacher educators and student teachers;
- (2) Teacher educators' and student teachers' perceptions of the use and integration of ICT in teaching and learning;
- (3) The extent to which teacher educators integrated and used ICT in their teaching and professional development;
- (4) Constraints that hindered the use and integration of ICT;
- (5) The impacts of ICT on the implementation of the teacher education curriculum;
- (6) The extent to which specific e-learning methodologies were being implemented and supported by the available infrastructure; and
- (7) The ICT integration strategies and practices in teaching and learning.

4.2 Part A: Teacher educators' responses

Part A provides the responses from teacher educators as collected through interviews, questionnaires, observations and document analysis.

At the time of this study, 188 teacher educators were employed at all four Colleges of Education, 30 at Caprivi College of Education, 36 at Rundu College of Education, 55 at Windhoek College of Education and 67 at Ongwediva College of Education (Ministry of Education, 2007b). Of the 100 questionnaires issued, 44 were completed and returned from the teacher educators. After a follow up was made, a total of 81 questionnaires were received, representing a response rate of 81% of the sample. When asked why they did not fill out and return the questionnaire in the first place, most teacher educators expressed reservations about the whole issue of ICT integration. They also indicated a lack of knowledge and understanding of what was being asked in the questionnaire as the reason for the delay. Questionnaires returned by teacher educators per college were as follows: 7 out of 15 from Caprivi College of Education, 11 out of 15 from Rundu College of Education, 32 out of 35 from Ongwediva College of Education and 31 out of 35 from Windhoek College of Education.

4.2.1 Biographical information of teacher educators

The section on the background information in the questionnaire for teacher educators consisted of 8 questions that covered issues such as sex, age, college affiliation and department, years of teaching experience, subjects currently taught, employment status and ICT professional training received.

4.2.1.1 Sex of teacher educators

The sex of teacher educators at each College of Education is presented in Table 1.

Table 1: Sex of teacher educators per Colleges of Education (N=81)

*College	Sex of teacher educators per Colleges of Education		Total	%
	Male	Female		
OCE	13	19	32	39.5
WCE	14	17	31	38.3
CCE	5	2	7	8.6
RCE	5	6	11	13.6
Total	37	44	81	100

OCE-Ongwediva College of Education; WCE- Windhoek College of Education; CCE- Caprivi College of Education; RCE- Rundu College of Education

Of the 81 teacher educators who responded to the questionnaire, 37 (45.7%) were males while 44 (54.3%) were females.

4.2.1.2 Age of teacher educators

The distribution of the age of the teacher educators at each College of Education is given in Table 2.

Table 2: Age distribution of teacher educators at Colleges of Education (N=81)

Age	Colleges of Education				Total	%
	OCE	WCE	CCE	RCE		
<30	3	0	0	0	3	3.7
30-39	13	8	6	5	32	39.5
40-49	10	11	1	4	26	32.1
>50	6	12	0	2	20	24.7
Total	32	31	7	11	81	100

Thirty two (39.5%) of the teacher educators were between the ages of 30-39 years, followed by 26 (32.1%) who were between the ages of 40-49 years. Three (3.7%) of the teacher educators were below the age of 30 while 20 (24.7%) were above the age of 50.

4.2.1.3 Teaching experiences

The number of years taught at the Colleges of Education ranged between 1-36 years. The teaching experience of the teacher educators at Colleges of Education is shown in Table 3.

Table 3: Average years of teaching experience of teacher educators at Colleges of Education (N=81)

College	Average years of teaching experience per Colleges of Education	
	Male	Female
OCE	6.8	9.1
WCE	7.9	12.9
CCE	5.6	3.5
RCE	6.0	7.5

The average length of teaching at the Colleges of Education ranged from 4.5 years to 10.4 years. The average teaching experience at OCE was 7.95 years, CCE was 4.55 years, RCE was 6.75 while at WCE was 10.4 years. The sample, therefore, captured a cross section of teacher educators with a variety of years of teaching experience.

4.2.1.4 Teacher educators per subject area for all the Colleges of Education

Table 4 represents the number of teacher educators per subject area.

Table 4: Number of teacher educators per subject area for all the Colleges of Education (N=81)

Subject fields	Number of participants per subject area (%)
Lower Primary Education	9 (9.3)
Mathematics Education	9 (9.3)
Social Studies/Science	8 (8.2)
Namibian Languages	10 (10.3)
English Language	10 (10.3)
Practical Skills	12 (12.4)
Education Theory and Practice	16 (16.5)
Science Education	6 (6.2)
Agriculture and Life Science	2 (2.1)
Integrated Media and Technology Education	11 (11.3)
Commerce	4 (4.1)
Total	*97

Note: *Some participants indicated teaching more than one subject especially the combination of Integrated Media and Technology Education plus another subject e.g. English or Namibian Languages.

4.3 Perceptions on the use and integration of ICT into teaching and learning

Understanding teacher educators' and student teachers' perceptions towards ICT integration might establish the foundation for a clear discourse on ICT use and integration at the Colleges of Education. What emerged from the interviews and responses from the open ended items of the questionnaire were two sets of perceptions from teacher educators. The first set of perceptions was from those who viewed ICT integration as useful to teaching and learning. The second set was from those who expressed feelings of concern about ICT integration. These were not necessarily negative perceptions about

ICT, but rather concerns about personal and infrastructural issues. Participants focused more on the challenges of monitoring and managing ICT, expressed anxieties about their own skills with technology and the perceived need for their Colleges of Education to have more ICT facilities. While access to, and reliability of technology were major concerns, there were also issues related to the quality of the BETD programme. Nevertheless, participants appeared to be willing to overcome their concerns and anxieties and to enlarge their base of ICT use and integration.

4.3.1 Positive perceptions on the use and integration of ICTs

Forty four (54.3%) of the teacher educators viewed ICT integration favourably. These were teacher educators who saw ICT integration as a tool which could facilitate improved teaching and learning. They also perceived the integration of ICT positively because they saw it as an alternative tool that supplemented their teaching methods. One participant described ICT during the interview as follows: “it [ICT] compresses things that you would have said with your mouth or written word by word on the board. Instead it is a flash on a screen, for example, defining technical terms or for labelling parts”.

A summary of the expressions or indicators of positive perceptions on the use and integration of ICT made by the teacher educators is presented in Table 5.

Table 5: Summary of the expressions or indicators of positive perceptions on the use and integration of ICT

1)	The integration of ICT into teaching and learning is an excellent idea.
2)	The integration of ICT into teaching and learning is a good idea as it equips teachers with technological skills.
3)	The integration of ICT into teaching and learning is very useful because it facilitates the dissemination of up-to-date information.
4)	The integration of ICT into teaching and learning is very important and crucial because it facilitates the dissemination of up-to-date information.
5)	The integration of ICT into teaching and learning is a superb initiative.
6)	The integration of ICT into teaching and learning is a must for the realization of the objectives of the Vision 2030.
7)	ICT integration makes teaching and learning more meaningful, easier and effective.
8)	ICT integration enhances teaching and learning and retention of students.
9)	ICT integration makes communication easier.
10)	ICT must be a tool of choice for all educators in the colleges.
11)	ICT integration in teaching and learning should be seen as a prerequisite skill for every teacher educator.
12)	ICT integration empowers students to take full responsibility for their own learning and allow them to learn at their own pace.
13)	ICT integration makes the workload manageable.

A closer analysis of this summary of expressions or indicators of positive perceptions as presented in Table 5, appeared to be associated with three themes; namely, the learning situation, the teaching situation and the general use of ICT in education and social life. The association of these expressions or indicators of positive perceptions to ICT integration is presented in Table 6 in the next page.

Table 6: The association of expressions or indicators of positive perceptions of ICT integration to the learning situation, the teaching situation and the general use of ICT in education and social life.

The learning situation	The teaching situation	The general use of ICT in education and social life.
1) Allows flexibility of learning.	1) Creates opportunity for effective feedback and reflection.	1) Equips people with technological skills needed in today's world.
2) Allows learning at own pace.	2) Provides an opportunity for sharing of educational and research materials.	2) Must be a tool of choice for all educators in today's education.
3) Promotes spirit of learning ownership.	3) Makes the explanations of concepts easier, for example volcano.	3) Contributes to the attainment of national goals, for example Vision 2030.
4) Creates higher expectations for learning.	4) Promotes creativity in the class.	4) Promotes quality education.
5) Makes students responsible for their own learning.	5) Allows modelling of ICT tool to trainees.	5) Allows educators to deal with information efficiently.
6) Allows students to look for more information.	6) Provides hands-on activities.	6) Change is predictable, teacher educators should embrace technology.
7) Motivates students in their learning process.	7) Allows the use of specialized software.	
8) Promotes spirit of learning initiative.	8) Limits teacher centred activities in the classroom.	
	9) Makes the workload manageable.	

When asked to state his perception during the interview with regards to the use and integration of ICT into teaching and learning during the interview, one of the teacher educators with nine years of teaching experience remarked that:

The education sector has no option but to join the ICT integration band wagon since the education and training sector globally is moving in the same direction. I personally therefore embrace ICT and its integration into teaching and training. ICT can be very useful and beneficial to both teacher educators and teacher trainees. It would thus also involve attitude change with regard to methods and strategies of teaching. ICT integration should be embraced.

Similarly, a teacher educator from one of the Colleges of Education in the northern part of Namibia shared almost the same views but referred to the benefits of ICT integration by stating that, “ICT cuts down on planning time, delivery time, and monitoring and assessment time. On top of all that, generated learning materials can be modified, adopted, stored and retrieved with great ease.” As for the future of ICT integration, one teacher educator expressed willingness for his department to explore this issue. He suggested that:

Specifically in Geography, I think, there are lots of possibilities. The finest and excellent software packages are available on the market. We, as lecturers, should explore all these possibilities. With the new lecturers in our department, I think we will do it in the near future. We still have to familiarize ourselves with a lot of things to be able to walk the way (sic).

It is, therefore, reasonable to assume that, based on the positive comments made by the two teacher educators above, there could be hope for the future of ICT integration at the Colleges of Education. The two teacher educators could be a good example of being ICT champions (people who can lead and motivate others on ICT integration) who could spearhead the ICT integration at their respective institutions. Experiences of SchoolNet in Uganda and Namibia have shown that it is important in any institution to have ICT

champions who are enthusiastic and could motivate other people to get involved in the use of ICT's (<http://www.schoolnetuganda.sc.ug/homepage.php>; <http://www.schoolnet.na>).

4.3.2 Concerns on the use and integration of ICTs

This section presents the second set of perceptions of the teacher educators who expressed feelings of concern about ICT integration. Thirty two (39.5%) of the teacher educators expressed reluctance and were not really in favour of ICT integration because of certain concerns as summarized in Table 7 below.

Table 7: Concerns expressed by teacher educators on the use and integration of ICT in teaching

1) The concept of ICT integration is relatively new and less understood.
2) There is a lack of training in ICT integration by teacher educators.
3) There is a lack of monitoring of ICT policy implementation with regard to ICT integration.
4) Teacher educators are less motivated towards ICT integration.
5) The level of ICT literacy skills of students makes it difficult to integrate ICT in teaching and learning.
6) The current prevailing shortage of ICT equipment in Namibian schools makes the integration of ICT not so relevant and useful.
7) Teachers educators do not have the courage to use and integrate ICT.
8) Teacher educators are concerned about the lack of time to integrate ICT.
9) Teacher educators do not receive support from the management.
10) Management of colleges does not clearly articulate the expectations of technology usage.
11) The BETD programme does not deliver what the people/nation expects.

As can be seen from Table 7, it was clear that the feelings of concern on the use and integration of ICT were influenced by a number of issues ranging from the lack of

resources, lack of motivation and support, lack of time to integrate ICTs and the perceived poor BETD programme.

4.3.2.1 Concerns with regard to lack of resources and training in ICT integration

In order to illustrate this concern, one teacher educator's answer to the questionnaire as quoted below described the situation well: "the current overall level of ICT integration is not sufficient, but given ample resources and training, lecturers can make a very effective jump in disseminating up-to-date and relevant information and approaches in their subjects." Another teacher educator from a different College of Education expressed almost the same feelings of concern, but noted that the concept of ICT integration was new. He claimed that "the concept of integration is relatively new. Given a situation that we don't have enough equipment in terms of computers and so forth, there is a limited attempt to integrate ICT." With regard to the concept of ICT integration, another teacher educator also seemed to express the same sentiments but pointed to the fact that the teacher educators lacked understanding of the concept owing to a lack of training in ICTs. She said, "we are also not trained on the whole idea of integration. I also do not understand the whole idea of integration. We are not yet trained. Like, you know, integration is supposed to be the seventh module, and we have not yet trained in this integration of ICT. We just did these other ICT modules."

4.3.2.2 Concerns with regard to lack of ICT policy implementation and motivation of teacher educators

Lack of monitoring of ICT policy implementation and lack of courage and motivation by teacher educators to commit themselves towards ICT integration were indicated as concerns that prevented full integration of ICT at the Colleges of Education. The following comment from one teacher educator illustrated this concern clearly:

What is lacking are the forces that can ensure ICT policy is integrated into actual teaching. The capacity to implement and the courage and or motivation to move towards ICT integration into teaching is less. Again, teacher educators only seem to be willing to integrate ICT or even to become ICT literate because the studies [further studies] they are undertaking require them to do so. After that we all become relaxed and unmotivated to make use of ICT.

It is, therefore, fair to assume that, based on the comment above that there is a lack of vision for the integration of ICT at Colleges of Education. It appeared that expectations with regard to the integration of ICT were not being expressed to teacher educators and student teachers by the management at the Colleges of Education. A research study conducted by Marshall (1995) found that having a vision for technology integration was a key to successful integration of technology.

4.3.2.3 Concerns with regard to the level of ICT skills of student teachers and shortage of equipment in basic education schools

There were 10 (12.3%) teacher educators who were concerned with the level of ICT literacy skills of student teachers, which in their opinion, was not up to standard and thus made it difficult for them to integrate ICT into their training. One of the teacher

educators indicated that the level of ICT literacy of the student teachers was sometimes too low for a teacher educator to integrate ICT into the lessons or assignments. Teacher educators also questioned the relevance of training student teachers in the integration of ICT given the shortage of ICT equipment in Namibian schools. “The shortage of ICT materials/equipment in schools throughout Namibia makes it irrelevant for us [teacher educators] at the college to integrate ICT into our teaching”, noted one teacher educator. Similarly, another teacher educator noted that, "ICT will be beneficial but since we are training or educating teachers there is a need to face reality. Not a lot of these schools where we will send our students have computers". According to one teacher educator, ICT integration was of little value for student teachers if they were not going to use it in their teaching.

4.3.2.4 Concerns with regard to the emphasis placed on the integration of ICT rather than improving the quality of the BETD programme

This section presents the concern expressed by the teacher educators that too much emphasis was put on the use and integration of ICT's instead of improving the quality of the BETD programme. There were four teacher educators who were concerned that priority was given towards implementation of the integration of ICT instead of improving the quality and the standard of the BETD programme. A teacher educator who supported this notion observed that:

ICT (is given) too much emphasis. Colleges still have more urgent problems of standards in terms of the teachers. BETD is a unique programme whose reputation leaves so much to be desired. It is the only course in the world whereby there is very little or no failing at all. As such, issue of assessment

needs serious attention. Otherwise ICT is not an end in itself. Even with all the ICT from heaven, the BETD can never deliver what the people/nation expects. We need to give people what they want by developing a programme that is recognized outside the boundary of Namibia.

Another teacher educator expressed the same views but linked them to her subject, which was Mathematics:

I am very concerned that ICT becomes so important that the basic concepts in Mathematics are not corrected out and taught to students. To work and use a computer is one thing but to be able to understand and apply mathematical concepts is another issue. For educators, it should be of vital importance to make sure that future teachers are equipped with basic ICT skills and with advanced content knowledge. This [subject content knowledge] carries more weight for me.

It could, therefore, be inferred from these comments that some teacher educators felt that ICT integration would do little to improve the quality of content of the BETD programme, which according to the two teacher educators was low. The apparent negative views of the teacher educators of the BETD programme seemed to contradict the views of the World Bank Report compiled by Graig, Kraft and du Plessis (1998) which found that the BETD programme was one of the few international programmes which was presenting "the promising practices of teacher education programs that have been particularly successful in enhancing student learning in their own context" (p. 32). Despite this acknowledgement from the World Bank Report, the teacher educators still felt that the quality of the BETD programme needed to be improved before ICT integration could be seriously considered and implemented in their teaching.

While almost no teacher educator thought that ICT had a very negative impact on their teaching and the student teachers' learning, a closer analysis of the last comments, seemed to overshadow the overwhelming positive attitudes towards the relevance of ICT integration in teaching and learning. The only logical explanation to this could be that teacher educators were trying and struggling to come to terms with the reality of the lack and non-functioning of ICT equipment found in most of the basic education system (grades 1-12). Further, teacher educators seemed not to have fully grasped the concept of ICT integration. The data from the teacher educators appeared to put much emphasis on '*learning about ICTs*' rather than learning '*with or through the use of ICTs*' (Jonassen, Peck and Wilson, 1999). Teacher educators thought that displaying information through a PowerPoint Presentation tool or just typing a neat handout with a computer for student teachers was a full way of integrating ICT. In literature these activities are not regarded as intergration. As pointed out by Hokanson and Hooper (2000, p. 547):

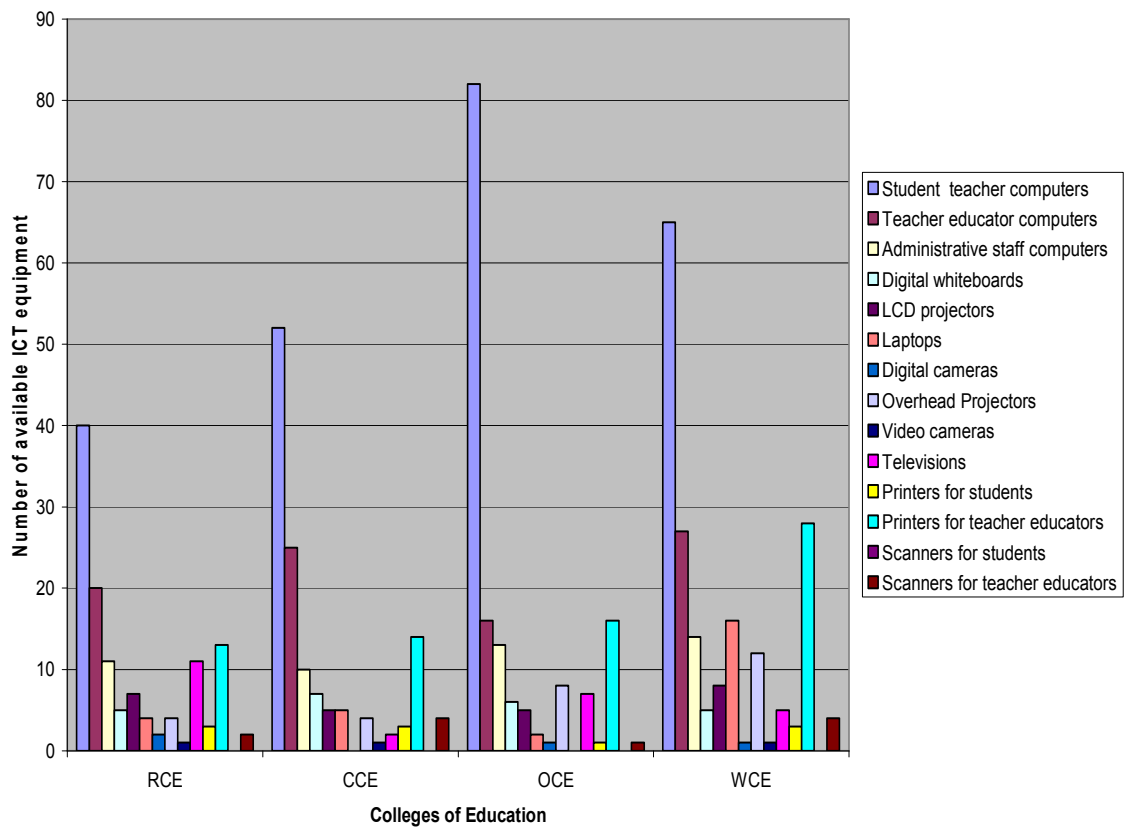
What is important about computer use is not being able to word process, or view a multimedia presentation, but the ability to interact with the computer in the manipulation and creation of knowledge through the rapid manipulation of various symbol systems. The value is not in more efficient representation but in improving the capability to generate thought.

4.4 The extent to which teacher educators currently integrate and use ICT in their teaching and professional development

The situation of ICT equipment at the time of this study at the Colleges of Education as provided by the colleges is shown in Figure 2. This was conducted through document analysis in order to establish the availability of ICT equipment at all four Colleges of

Education with an understanding that its availability might affect the use and integration of ICT in teaching and learning situations.

Figure 2: ICT equipment available at the Colleges of Education



Keys: OCE-Ongwediva College of Education; WCE- Windhoek College of Education; CCE- Caprivi College of Education; RCE- Rundu College of Education

It is important, however, to point out that ICT use and integration might be difficult with regard to other limited ICT tools such as scanners and video cameras, as seen in Figure 2.

Where these tools were available, the integration was observed to be limited because of

their lack of accessibility to teacher educators and lack of technical know-how by the teacher educators.

In order to reach the targeted ratio of one computer per teacher educator and one computer per five students as indicated in the Namibian ICT Policy for Education (MoE, 2006b), Rundu College of Education (RCE) would need 16 more computers for teacher educators, Caprivi College of Education (CCE) would need five more computers, Ongwediva College of Education (OCE) 51 more computers, and Windhoek College of Education (WCE) would need 28 more computers. For colleges to reach a targeted ratio of one computer per five students, RCE would need 36 more computers, CCE would need 25, OCE would need 103 more and WCE would need 59 more. A total of 100 computers for all the four Colleges of Education would be needed to reach the required ratio for teacher educators while 223 computers would be required to reach the ideal ratio for student teachers. The student teacher computer ratio and teacher educator computer ratio at each College of Education at the time of the study is given in Table 8.

Table 8: Student teacher- computer ratio and teacher educator - computer ratio at each College of Education

Computer ratios	RCE	CCE	OCE	WCE
Student teachers: computer ratio	9.5:1	7.4:1	11.3:1	9.6:1
*Teacher educators: computer ratio	1.8:1	1.2:1	4.2:1	2.0:1

*Note: The teacher educator-computer ratios did not include the number of the laptops teacher educators have received as part of an incentive for passing the ICDL course.

Despite the limited ICT resources and equipment that were acknowledged, observed and presented in Figure 2, the teacher educators during the interview sessions gave quite a diverse overview of the ICT integration taking place at their colleges. Some teacher educators were wary of internal factors which acted as barriers in their efforts to integrate ICT. These factors included their lack of knowledge in ICT lesson planning, lack of time, heavy teaching loads and other administrative duties teacher educators were expected to carry out. As a result of these factors, ICT integration at Colleges of Education was quite limited according to the teacher educators.

In light of the factors mentioned, the extent to which the ICTs were integrated at the Colleges of Education is discussed under the following themes which emerged from the interview sessions with the teacher educators: the rationale for ICT integration to teaching and learning, the necessity for provision of ICT resources for ICT integration, the importance of proper planning in ICT integration and the need for the provision of time for ICT integration.

4.4.1 The rationale for ICT integration

Teacher educators discussed the need for them to understand the rationale for the ICT integration first because that would influence the extent to which they integrated ICTs.

When asked their perceptions regarding the extent to which they integrated ICT into their teaching and in student teachers' learning, one teacher educator wanted to explain first how he was supporting other teacher educators to integrate ICT and how he was making them understand the concept of ICT integration. He started off by saying, "one teacher educator for Arts asked me how ICT integration fits into Arts. I told her that Arts is a broad field and within Arts there are lots of ICT tools available which one can use."

He further stated that:

Very few teacher educators know what to do. For example, when we were looking for IMTE teacher educators very few were willing to teach the subject. Let me say, probably only lecturers in Mathematics and Sciences who use ICT equipment in many cases. People just think ICT is just computers but there are other ICT tools like videos and cell phones.

His views were in agreement with another teacher educator who was looking at herself in relation with other teacher educators. She said:

Because we really do not understand the whole idea of ICT integration. We may not also see the importance of doing it. If people do not understand that maybe they may develop a negative attitude towards ICT integration. And they may look at ICT integration as something very big like they cannot achieve it within a short time. Maybe they need training and also a bit of motivation.

One of the teacher educators explained why he was integrating ICT in his lessons. He indicated that, "for myself I integrate it quite often. The reason being that I get the

materials from the Internet to supplement my printed information. I also use the projector that is connected to the laptop. The reason why I use it is that I think it is much more effective that way.”

Another teacher educator justified his reasons for integrating ICT into his teaching as being to get the students involved and to model ICT equipment to students. He said, “like myself I always integrate ICT. In my planning of lessons, I make sure that there are one or two aspects of ICT integration. I want them to get involved in the lessons. I had the feeling that students must also see what I am doing and must feel it.” This finding is in agreement with those by Hadley and Sheingold (1993) who found that the main reason for teachers to integrate ICT was for students to benefit from it.

4.4.2 The necessity for provision of ICT resources for ICT Integration

Teacher educators talked about the need for the management personnel to understand that the provision of sufficient ICT resources had an influence on the extent to which teacher educators integrated ICTs. A Visual Arts teacher educator talked of difficulties and limitations in integrating ICT and e-learning in her specific subject which raised other issues such as a lack of ICT resources and curriculum-related software. She stated that:

Integration of ICT and e-learning in Visual Art is limited mainly because the focus is on practical work and on the creativity of the student. Computers limit this as students just use computer simulations. It is about how the student interprets. We have no software for art programmes such as Corel draw, etc. For this, each student would need his/her own computer in the classroom. Although “paint” is available there are no facilities to paint in colour and to print bigger than A4. I have no training in Computer Art programmes and only know what I have taught myself ... the only knowledge;

information was in Art magazines, which the college library does not acquire any more because of financial constraints.

Almost the same sentiments were expressed by another teacher educator. She noted that:

ICT integration is a superb initiative but resources and support is lacking in Namibian Colleges, especially CCE. Teacher educators are willing to integrate ICT in their lessons but it becomes practically impossible because of a shortage of hardware and Internet connectivity. Work on these shortcomings and see how successful this initiative will become.

One of the teacher educators (despite limited resources and also facing the possibility of her computer getting infected by computer viruses) was still determined to use what was available to her in the Social Science lessons. Her explanation could serve as an example of useful strategies for the integration of ICT to other teacher educators. This is how she explained it:

Like now, even before the college was connected to the Internet, the reading articles that I use with my students are coming from the Internet. When I downloaded an article from the Internet I first find out whether it is relevant. Then I take it to my students to use it. I even actually stopped visiting the library. Yes, I download a lot of articles and when I get time I will go through the entire file. And also the issue of computer software- the pre-loaded software like Encarta software – these Encyclopaedias, I use that a lot with my students. I also expect my students at times to search for information using this Encarta Encyclopaedia. Because that is the only one that is available at the moment. If we were having Internet, I will send them to use the Internet. But, because of that we are just using the Encyclopaedia.

Sometimes I also work out some PowerPoint slides. I would make summaries and prepare some slides and work through them with the students. That, I usually do in the afternoons. Like now, with those students with computer facilities, they could also submit their assignments electronically. Like now I have a set of lesson plans that one student submitted. Instead of submitting it in the file, a student submitted a soft copy. So, I am working on that soft copy, making comments and will send it back. If there was Internet I would send it via the e-mail. If students submit soft copies, I accept it although we have a problem of viruses. If the stick is infected or the machine on which

the student worked on is infected, this machine would delete everything. So, if by any chance it is not infected like a set of lesson plans that were sent to me, I am able to work through that. I think that is one way how I integrate ICT in Social Sciences. But, I would (change around) if we have Internet available to the students because I use track changes to mark the students' work.

But, what seemed also to emerge from the study was that the majority 16 out of 20 (80%) of the teacher educators interviewed viewed ICT integration as the use of computers only. Emphasis was placed on computers and not on all other ICTs such as radio, video, television, audio cassettes, DVDs and others. This finding was similar to those by Grace and Kenney's (2003) findings that in teacher training, ICTs have been on many occasions interpreted in a very limited way of using computers and the Internet. On the other hand, it seems justifiable for teacher educators to think that way because computers form a major part of ICT at their Colleges of Education (see Figure 2).

4.4.3 The importance of proper planning and training in ICT Integration

Fifteen out of 20 (75%) of the teacher educators (interviewees) underlined the significance of proper planning when it came to the integration of ICT and e-learning. This view is supported by the studies of Shelly, Cashman, Gunter and Gunter (1999) which found that technology integration required an immense amount of preparation and planning. The results also appear to support those by Jhuree (2005) who notes that if ICT integration is to be successful, careful planning is of utmost importance and those who are involved in policy creation should also understand and value the integration initiative.

The statements given by the teacher educators in this study epitomized the importance placed on planning when integrating ICT and e-learning. One of the teacher educators warned that, "insistence on its use without proper guidance and training can also be frustrating and can lead to resistance." A teacher educator who teaches Mathematics at one of the colleges in the North, was even more specific of what she expected of ICT integration in terms of planning and teaching the lessons. She had this to say:

For me when I consider giving or teaching IMTE, there are three important things. Being able to teach the content, being able to know how to teach it that is pedagogical knowledge, and being able to speak in the language of technologies. If students, for example, ask me what it means to upload, download or computer multimedia applications - this is something I need to know. For me, a two days workshop is not just enough. I might know how to integrate computers and how to send and read emails but it does not mean that I know how the emails work.

These findings partly support the claim made by Mhyre (1998, p. 102) that proper planning, guidance and training on pedagogical approaches in using ICT in teaching and learning is crucial. The same study recommends that:

We must address the use of computers together with the teachers' understanding of pedagogy and subject matter in order for the technology to play a significant role in improving our schools. If not, the investment in computer technology for our children's classrooms will end up as another example of a failed attempt to reform and renew our schools.

Considering that ICT is also part of teaching media, what is revealed above is in line with Otaala's (1999, p. 73) observations that, "media selected and used without proper planning and organization can be more of a hindrance than an aid to learning". Maurer (1998, p. 251) also notes that, "without effective planning, technology will remain a

solution in search of a problem.” Therefore, it is vital for teachers to plan carefully when integrating ICTs.

4.4.4 The need for the provision of time for ICT integration

The lack of time was an issue that teacher educators mentioned repeatedly by pointing out that they did not have enough time to plan for the ICT integration. As one teacher educator put it, "it (ICT) should receive more attention. To set up everything in the beginning is time-consuming.” One teacher educator from the college in the North also complained by saying that, “college teacher educators have little time due to work load to integrate ICT in their daily teaching.”

The heavy work load of teacher educators, the pressure for teacher educators to complete the syllabus on time and other administrative duties they have to perform made it difficult for them to have enough time to integrate ICT and e-learning activities in their teaching. The following remarks by one of the teacher educators represented the majority (16 out of 20) of the teacher educators interviewed:

When it comes to (time), I am thinking now of my other colleagues, they are so busy every day to cover content. They are so busy to cover that content and to complete that content. They do not have time to sit in the computer lab there in the Admin. Block to plan their lessons on the computer. They are so busy teaching the content. What I have experienced with the recent circular from NIED is that they want to come to the colleges and give training to lecturers which they call ICT Education Training. In the timetable we do not even have time to accommodate that training which we know will be very valuable, because it focuses on how lecturers can gain skills in planning of integration of ICT.

He further remarked that, “but if administration duties can be minimized, for instance, if lecturers can be supported by administration staff when it comes to calculation of or even recording of grades. Really, admin duties we have a lot, that take time from us.”

What the teacher educators said regarding their teaching loads is confirmed by a recent study conducted by Bennell, Sayed and Hailombe (2008). The study noted that the teaching loads of teacher educators were “quite high, which reflects the fact that colleges operate the same sort of timetables as senior secondary school (p. 30)”. The same study also found that “average teaching loads at Caprivi College were 25 periods, Rundu 20 periods and Windhoek 27 periods (p. 30)”. What this means is that the teaching load at the Colleges of Education is preventing the teacher educators from developing ICT related lessons as well as get involved in ICT professional development activities as they would have liked to do.

4.5 Reasons why teacher educators integrate and use ICT in their teaching and professional development

In the questionnaire, teacher educators were asked to indicate from a list of 13 possible reasons why they were integrating ICT in their classes. The reasons selected by teacher educators are presented in Table 9.

Table 9: Reasons for integrating ICTs in lessons (N=81)

Item number	Reasons for integrating ICTs in lessons	*Number of teacher educators and percentage	
		<i>n</i>	%
A	to organize and store information	35	43.2
B	to collect data and perform measurements	23	28.4
C	to manipulate/analyze/interpret data	16	19.8
D	to communicate information	32	39.5
E	to create visual displays of data/information (for example, graphs, charts, maps)	32	39.5
F	to plan, draft, proofread, revise written text	42	51.9
G	to create graphics or visuals of non-data products (for example, diagrams, pictures)	23	28.4
H	to create visual presentations	21	25.9
I	to perform calculations	13	16.1
J	to create models or simulations	5	6.2
K	to support individualized learning	29	35.8
L	to access information as part of lessons	48	59.3
M	other (please specify)	6	7.4

*Teacher educators chose more than one reason for integrating ICT in lessons

As seen in Table 9, seven reasons for integrating ICT in lessons which received the highest scores were: to access information as part of lessons given by 59.3% of the teacher educators, to plan, draft, proofread, revise written text cited by 51.9% of the teacher educators, to organize and store information given by 43.2% of the teacher educators, to create visual displays of data/information (for example, graphs, charts, maps) cited by 39.5% of the teacher educators, to support individualized learning

indicated by 35.8% of the teacher educators, to communicate information cited by 39.5% of the teacher educators and 28.4% said to create graphics or visuals of non-data products (for example, diagrams, pictures, figures). Other reasons are given in Table 9.

4.5.1 Teacher educators' responses on how ICT applications/tools

Teacher educators were asked to indicate the frequency of their integration of the following common ICT applications and tools in their teaching and learning and in their own professional development. Table 10 presents the frequency of integration of ICT applications and tools as indicated by teacher educators.

Table 10: Estimate of relative frequency of integration of each identified ICT applications/tools by teacher educators (N=81)

ICT applications/tools	Daily	Weekly	Monthly	Once or twice a year	Never	Not available
Computers in general	15	18	7	17	8	10
Word processing packages	10	15	5	16	13	7
Spreadsheets	1	7	5	9	30	8
Databases	0	6	0	6	38	8
Graphical applications	1	6	7	17	25	8
Presentation software (for example, PowerPoint)	0	10	11	19	29	8
Desktop publishing	1	1	5	14	37	11
Any Internet activity	5	9	13	20	18	12
Search engines for the Internet (for example, Google, Yahoo)	6	9	15	12	12	12
Drill/Practice Programmes, Tutorial	0	9	3	8	32	10
Other specify (OHP)	1	0	0	0	0	0

The ICT applications and tools listed included the use of computers in general, word processing packages, spreadsheets, databases, graphical applications, presentation software, desktop publishing, internet and drill and practice programmes (see table 10). All these are common ICT applications and tools that can support teaching and learning.

Teacher educators who participated in this study were generally frequent users of computers. Fifteen used it on a daily basis, 18 weekly, 7 monthly and 17 once or twice a year. Most teacher educators used computers to do word processing such as typing of documents, exam papers, lesson presentation and others. As one teacher educator revealed, “at the stage where I am currently, I only use a computer to type and print my tasks and class activities as well as when I enter my term grades only.” Becker’s (1991) findings that computers in schools in the United States were used for word processing are confirmed in this study. Presentation software (such as PowerPoint) seemed also to enjoy considerable usage by teacher educators (10 weekly, 11 monthly, 19 once or twice a year). Interestingly, most teacher educators indicated that they still used the Internet despite it often being slow and/or sometimes not available at all at the Colleges of Education.

From Table 10, it appeared that desktop publishing was not used much. The reason could be that the teacher educators were not knowledgeable enough to integrate this type of application software as it requires some special skills, for example, in designing flyers, posters, newspapers or worksheets. The other reason could be that teacher educators had

little or no understanding of how this software could be of relevance to their subject areas. However, during one of the observations in an IMTE class, student teachers were observed using Desktop Publishing software to design newspapers for their own schools. With regard to drill/practice programmes and tutorials, it was clearly mentioned during the interviews that these software, which were meant to give student teachers an opportunity to interact with concepts and contents and provide immediate feedback, were not readily available in all four Colleges of Education. This software also required specialized skills to handle and apply.

4.5.2 Teacher educators' ratings of experience and comfort levels in using ICTs

Teacher educators' personal experiences and confidence in using ICTs are seen as important elements in the integration of ICT into teaching and learning situations (Clark, 2000). Thus, teacher educators were asked in the questionnaire to rank their experience on a scale of one to four (4-"a lot of experience", 3-"some experience" allocated, 2-"little experience", 1-"no experience") and their comfort levels also on a scale of one to four (4-"very comfortable", 3-"moderately comfortable", 2-"would need some help to feel comfortable", 1-"would need a lot of help to feel comfortable") in areas such as the general use of computers, word processing packages, spreadsheets, databases, graphical applications, presentation software (for example, PowerPoint), desktop publishing, Internet software (for example, Netscape, Internet Explorer), Search engines for the

Internet, simulation programmes, drill/practice programmes/tutorials and e-learning initiatives. The results are presented in Table 11 in the next page.

Table 11: The average rating of experience and comfort levels of teacher educators in using ICTs (*N=81*)

ICT applications	Av. rating of experience	Standard deviation (sd)	Average rating of comfort	Standard deviation (sd)
Computers in general	3.3	0.699	3.1	0.784
Word processing packages	3.2	0.823	3.1	0.784
Spreadsheets	2.5	0.959	2.4	0.991
Databases	1.9	0.894	1.7	0.854
Graphical applications	2.0	1.006	1.9	0.928
Presentation software (for example, PowerPoint)	2.6	1.053	2.4	1.087
Desktop publishing	1.9	0.928	1.8	0.937
Internet software (for example, Netscape, Internet Explorer)	2.9	1.010	2.8	0.978
Search engines for the Internet	2.9	1.002	2.8	0.978
Simulation Programmes	1.7	0.798	1.6	0.741
Drill/Practice Programmes/Tutorials	1.7	0.889	1.7	0.798
e-learning initiatives	1.6	0.741	1.6	0.741

Note: The standard deviation was calculated on the actual number of responses per item.

Some participants did not respond to some items and reasons were not provided.

It is evident from Table 11 that a consistent pattern emerged across the responses in the two columns illustrating that the experience and the comfort levels in using ICTs were linked. As can be seen from the table, aspects that have high average scores on the experience level column namely, the general use of Computers, Word Processing packages, Presentation software, Internet software and Search engines for the Internet, also received high scores on the comfort level column. The same observation is applicable to areas which scored low on the experience level column as they also scored low on the comfort level column. Another general observation from this table is that programmes and software that required in-depth skills, for example, Desktop publishing and Simulation programmes, Drill/Practice Programmes/Tutorials and e-learning initiatives scored low in both columns. The implication for this is that the teacher educators needed to gain adequate experience in the use and integration of ICTs in order to feel more comfortable in handling them in the classroom.

The standard deviations were calculated on the actual number of responses per item. It is evident from Table 11 that the variance ranged from 0.741 to 1.053 for experience and 0.741 to 1.087 for comfort. The small standard deviations suggest that the ratings were close to the mean in both experience and comfort.

One teacher educator doubted the ICT comfort level of the lecturers by saying, "also not all lecturers are comfortable with ICT and I am not really sure how enthusiastic they are about the courses that are offered to them like ICDL." The teacher educator proposed that

a "specific time slot in the timetable" be created for every teacher educator to integrate ICT technology." This, according to him, would increase the teacher educators' enthusiasm towards ICT integration.

4.6 The Extent to which teacher educators integrate and use e-learning in their teaching and professional development

When asked about e-learning, close to 12 (60%) of the teacher educators interviewed indicated that they had either a limited understanding of what constituted e-learning or did not have the time to integrate e-learning in their teaching owing to lack of facilities. The extract below from one of the teacher educators clearly illustrated this.

Teacher Educator: The second part of the question perhaps you could elaborate on what you mean by e-learning. I have seen the definition but perhaps you can just elaborate on that.

Researcher: Ok, e-learning in short is anything that is supported by ICT. Lets say you have an example of a lesson, then you put information on the web for students to see later. Or as you said present the information using PowerPoint and later make the information accessible to the students to view.

Teacher Educator: Does "e" stand for electronic?

Researcher: Yes. It stands for electronic information.

Teacher Educator: What I do in my class for example when I give an assignment, I expect students to use a wide range of sources, including going into

the Internet. Yeah, that is what I do. I encourage them to go to the Internet and look up information to supplement the information I give in class, you know. Sometimes I get the evidence that they have really done it. Sometimes they come up with legitimate excuses that they do not have sufficient access to the Internet or computers are not sufficient for everybody. But the idea is there.

One of the teacher educators of Design and Technology and IMTE understood e-learning as, “basically learning by using the internet tools. It helps because you have access to the information and it is less expensive compared to enrolling at the university. It is the best option when you are working full time.” He then went on to discuss his involvement and his future plans with regard to e-learning integration. He indicated that:

I am not directly involved in the e-learning. I have attended some courses and workshops where the concept of e-learning was talked about. I have to think about it, for example, using it for my students too. For example, whether they can have access to modules and study them at their own paces and so on. But I have not done much on that one. It is just an idea.

There were only five teacher educators interviewed who seemed to have a good understanding of e-learning. One of these teacher educators perceived e-learning as:

... when students are connected to their lecturers based on the assignments the lecturers give to them, students would log into that specific site and respond to the information accordingly. Lecturers might also create WebQuest for students. There is no face to face contact but students have the feeling that they are talking to their lecturers. Students and lecturers with laptops can always log in anywhere on campus. It will make work easier.

He also discussed why it was difficult to implement e-learning at his college and what his plans were despite the limited resources. He believed that:

At this college it can only work if you are having good internet facilities, wireless connection and stable electricity. My plan is also to put content materials and assignments on the WebQuest with links to HIV/AIDS information, Computer Studies, ICT in Namibia and things like that. Due to poor internet facility, I plan to make it in such a way that students will access information offline.

One of the teacher educators said that she did not integrate e-learning sections into lessons because of time constraints. She explained her actions thus, “I would say time limitations because at the college I have to stick to covering the syllabus, especially the IMTE, and I did not, to be honest, I did not have time to sit and work out or draft a project, you know, where I can involve other teacher educators or teachers at schools to offer a course through e-learning.” She also explained her reasons for not integrating e-learning, “when it comes to e-learning, I have not tried that one because of the facilities. We do not have e-learning facilities at the college.”

4.6.1 Teacher educators’ responses on how they use and integrate e-learning as one aspect of ICT

Teacher educators were asked to identify from a list of six factors on the questionnaire how they used and integrated e-learning as one aspect of ICT either in their teaching or professional development. Table 12 gives the teacher educators’ responses.

Table 12: Teacher educators' use and integration of e-learning in their teaching or professional development (N=81)

		Number of teacher educators and percentage	
Item number	Item description	*n	%
A	to post course information and resources	15	18.5
B	to communicate with others outside of the school	27	33.3
C	to supplement face-to-face instruction	26	32.1
D	to collaborate with others	21	25.9
E	to deliver a course	11	13.6
F	to support teaching and learning	43	53.1
G	Other: Research for new current information	1	1.2

*Note: n = Actual number of teacher educators who selected that specific item. Teacher educators chose more than one item description.

As was the case during the interview, the majority (53.1%) of the teacher educators chose the reason to integrate “to support teaching and learning”. About 33% of the teacher educators cited to communicate with others outside of the school, 32.1% indicated to supplement face-to-face instruction and 25.9% indicated to collaborate with others. About 15 (18.5%) and 11 (13.6%) of the teacher educators gave the reasons to post course information and resources and to deliver a course respectively. The findings on the last two factors were consistent with what 17 out of 20 of the teacher educators had said during the interviews that they had not as yet posted any course information on the

web nor delivered a course through the Internet facilities. Most of the respondents claimed lack of technical know-how, lack of time and insufficient Internet facilities as reasons that prevented them from doing so.

From the foregoing, it appears that the teacher educators in the study understood the importance of embracing technological development. Therefore, Colleges of Education have the responsibility, as one participant said, to “equip student teachers with all the necessary ICT skills”. The question that arises, however, is why the teacher educators were not integrating ICT into their teaching. The answer to this question might partly be answered that the lack of ICT resources at the Colleges of Education made it difficult for teacher educators to do so. The main finding to this research question was therefore that access to ICT equipment coupled with training and guidance would pave the way for the use and integration of ICT in Colleges of Education.

4.7 The constraints that hinder the use and integration of ICT in delivering effective teaching and learning activities/programmes

The third research question of this study tried to identify the constraints that hindered the use and integration of ICT in teaching and learning at the Colleges of Education. Table 13 presents the results from the questionnaire on this research question.

Table 13: The perceived constraints that hinder the use and integration of ICT in teaching and learning at the Colleges of Education as identified by the teacher educators (N=81)

Item number	The constraints that hinder the use and integration of ICT	Number of teacher educators and percentages	
		*n	%
A	lack of training in ICT pedagogy	59	72.8
B	lack of technical know-how of ICT applications	52	64.1
C	lack of computers	61	75.3
D	lack of the basic equipment for the establishment of ICT i.e. network equipment	55	67.9
E	limited Internet access	60	74.1
F	limited support for the development of ICT skills of teacher educators	44	54.3
G	lack of technical support provided at the college	45	55.6
H	lack of adequate awareness about ICT by the management of the college	35	43.2
I	insufficient budget allocation in place for use in procurement of ICT tools such as hardware and software	55	67.9
J	lack of time to learn and incorporate ICT skills and tools into lessons	51	63.0
K	fear of ICT tools	10	12.3
L	lack of collaboration with other teacher educators to design lessons that accommodate ICT integration across subjects	43	53.1
M	the workload makes it impossible to use and integrate ICT tools	44	54.3
N	unreliable power supply makes access to ICTs difficult	29	35.8
O	the information technology bandwidth makes the downloading of information slow and difficult	42	51.9
P	training budgets for ICTs are often not sufficient	33	40.7

*Note: *n* = Actual number of teacher educators who selected that specific item. Teacher educators chose more than one constraint.

When asked to identify from a list of sixteen constraints in the questionnaire that hindered the use and integration of ICT in the teaching and learning at their Colleges of Education, the following 13 constraints were chosen more often: 75.3% of the teacher educators indicated lack of computers, 74.1% of the teacher educator cited limited Internet access, 72.8% of the teacher educators chose lack of training in ICT pedagogy, 67.9% of the teacher educators indicated insufficient budget allocation in place for use in the procurement of ICT tools such as hardware and software, 67.9% of the teacher educators cited lack of the basic equipment for the establishment of ICT i.e. network equipment, 64.1% of the teacher educators said lack of technical “know how” of ICT applications, 63% of the teacher educators selected lack of time to learn and incorporate ICT skills and tools into lessons, 53.1% of the teacher educators said lack of collaboration with other teacher educators to design lessons that accommodated ICT integration across subjects, 51.9% of the teacher educators cited the information technology bandwidth which made the downloading of information slow and difficult, 54.3% of the teacher educators indicated limited support for the development of ICT skills of teacher educators, 54.3% of the teacher educators indicated that the workload made it impossible to use and integrate ICT tools, 55.6% of the teacher educators indicated lack of technical support provided at the college and 43.2% of the teacher educators cited lack of adequate awareness about ICT by the management of the college as major hindrances to ICT integration.

As can be seen from Table 13, the majority of constraints which were selected by more than 50% of the teacher educators consisted of a combination of equipment and non equipment related factors. About 61 (75%) of the teacher educators selected lack of computers. This result appears to be in line with the findings by Pelgrum, Reinen and Promp (1993) and Ertmer (2001). In addition, equipment related constraints included also limited Internet access, insufficient bandwidth, lack of basic ICT equipment such as network, inadequate budget allocation for use in the procurement of ICT tools such as hardware and software. Non-equipment related constraints included lack of training in ICT pedagogy, lack of time to learn and incorporate ICT skills and tools into lessons, lack of collaboration with other teacher educators to design lessons that accommodated ICT integration across subjects, limited support for the development of ICT skills of teacher educators and lack of technical support provided at the college. The following factors appear as barriers to the integration of ICT in the teaching by teacher educators at the Colleges of Education: limited Internet access, lack of information on the availability of ICT tools and equipment, limited support for the development of ICT skills, lack of collaboration on ICTs, insufficient budget allocation for ICTs and the lack of room space for ICT tools and equipment. These factors are discussed further in the next sections.

4.7.1 Limited Internet access

Item E of Table 13 on limited Internet Access was indicated by about 74% of the teacher educators, which clearly indicated the lack of access to the Internet in the Colleges of Education. Bennel, Sayed and Hailombe (2008) also found poor and limited Internet

access as one of the main shortcomings in delivering effecting teaching and learning at the Colleges of Education. A closer look at the number of computers connected to the Internet seems to suggest that the Windhoek College of Education was better off than the other three colleges. As from 4th July 2008, the actual number of computers connected to the Internet for each college was: RCE 40, CCE 8, OCE 17 and WCE 64. The student teachers from CCE and OCE did not have access to the Internet, however, at the time of collecting data, OCE was busy negotiating with a local Internet provider to connect its two computer labs to the Internet. RCE has 20 computers connected to the Internet for student teachers. For WCE, the Internet was accessible to the student teachers. Further, the WCE is the only college with a larger accessible Internet wireless facility around the campus. Student teachers and teacher educators with computers with Internet wireless capabilities could, therefore, connect to the Internet on the WCE campus. CCE has a limited Internet facility within the administration building accessible only to the staff members, hence, making it impossible for student teachers to utilize this important learning tool.

One of the teacher educators expressed his frustration at always facing unreliable electricity supply, and having limited access to Internet at his college. He said, “sometimes you do not have electricity or you are in the middle of doing something and the electricity goes off without warning. Another problem is the limited access to the Internet. Only the HOD’s have Internet in their offices and the rest of the staff don’t have it. We have to always go to these offices and sometimes you find that a person is busy.

So, you cannot always use it when you need it.” There seemed to be some logical explanation, when one teacher educator talked about the Internet access at his institution. He observed that, “you have to calm your nerves to have access to the Internet and computer” at his college. He added further:

As lecturer I have access to the Internet likely by coming to the office at night. But a colleague of mine who is lecturer and a day scholar (not staying in college houses), even little opportunity (to have access to the Internet) is frustrating (sic). Out of five days maybe one hour in the morning it (Internet) is on, other times is off. My observation of the Internet is that in the evening it can be fast and over the weekend it is fast. On a normal working day, four of us are in this room, and one person will take something and that is what goes for the day before you even realize that classes are over and in the afternoon we have meetings. In smaller ways we tend to compete for the one computer, and postpone your work, come back at night and come back in the weekend. I am very definite (sure); you always have to calm your nerves to have access to the Internet and computer.

4.7.2 Lack of information on the availability of ICT tools and equipment

It also became evident during the interviews that some teacher educators were not properly informed about the availability of ICT equipment in their Colleges of Education. They sometimes complained that some ICT equipment was not available when in fact they were available. The following interview excerpt with one teacher educator serves as an example:

Researcher: Some of these factors you have mentioned as constraints that prevent you from integrating ICT, specifically what are those in your opinion that prevent you at the College to integrate ICT and e-learning?

- Teacher educator: There is no internet connection. We do not have LCD projectors.
- Researcher: But yesterday when I was observing IMTE lessons, I saw two LCD projectors.
- Teacher educator: Well, if they are there, I am not aware of them because we have asked and demanded for them. If they are there, we were not told that they were now available.
- Researcher: When you said that you were not informed that the equipment were now available, does the college send circulars about the availability of resources?
- Teacher educator: I do not want to get involved into that (with a loud laugh).

4.7.3 Limited support for the development of ICT skills

The responses on item F (Table 13) with regard to limited support for the development of ICT skills of teacher educators also came out strongly during the interview. Most participants felt that they were not getting the support they needed to develop their ICT skills. This issue of limited support for the development of ICT skills was blamed partly on the management of the Colleges of Education for not really creating a good technology enabling environment for teacher educators to develop their skills. As one participant observed during the interviews:

I am not sure at the moment. In the past it was very difficult. I think even now because it is like they (management) know what the committee (ICT) needs in terms of ICT needs. But when you get to them (management) it is like they look at them (ICT needs) as secondary. It is not very important.

Like, for example, in the past I remember we were told why should we receive computers if government would not give them/us computers. Even Internet, so many years ago we were deprived to get the Internet. It is like when you bring it up there, it is like not really an issue. Yet for the committee it is very important because we know if we are connected we are connected to the world. Not much support. I am not very sure with the current management. But in the past we had problems. But now every time you go there they will tell you the budget or the money is not yet released. We do not know how much support they (management) are going to give us this year.

For one of the English Language Education teacher educators, the management of her college did not really support them when it came to ICT related issues. She commented on the treatment that she had received from her management:

For me I see there is no support whatsoever. It is easy to preach, it is easy to say facilities are there, you do not use it. But to get a laptop to prepare for a presentation, even a portable OHP for one to walk around with it and if you go and look for the person who has it then they will tell you that this one is only used by this specific lecturer or management. You guys should use the old ones.

4.7.4 Lack of collaboration on ICTs

A total of 43 (53.1%) of the teacher educators responded to item L (Table 13) regarding the lack of collaboration with other teacher educators in designing lessons that accommodated ICT integration across subjects. This result was not really surprising because during the interviews it emerged that lecturers were not collaborating with each other on ICT issues across subjects. As one teacher educator put it: “Unfortunately at this college, the reality is that the knowledge of computer literacy sometimes is carried around like a secret, as an elite privilege. You can see a colleague has materials on a disc or on a memory stick. That material is carried strictly as private property, as money in his purse.”

Another factor that came out during the interviews relating to the lack of collaboration among the teacher educators was their reluctance to share some ICT resources across the subject areas. Some teacher educators interviewed complained that some ICT tools and equipment were only being used by specific individuals or certain departments of the college. When they asked to use this equipment, they were told that they were not allowed to use it because the equipment was meant for certain individuals or departments. This, eventually leaves them frustrated and without hope in their efforts to integrate ICT into their lessons.

4.7.5 Insufficient budget allocation for ICTs

About 68% of the teacher educators responded to item I (Table 13). The teacher educators indicated that the budget allocated for the procurement of ICT tools was not sufficient at the Colleges of Education. Teacher educators pointed out that there was need for the colleges to invest more on ICT and e-learning facilities. According to them that is where the "the future lies." They bitterly complained that the Colleges of Education relied too much on the handout of government funds and were always reluctant to use their own available funds. They suggested that college managers should be made aware of the importance of ICT in teaching and learning and should take the lead.

The researcher carried out a document analysis of each college budget allocated in the Teachers Education Training Fund (TETF) for 2008 financial year for RCE, OCE, CCE and WCE. Tables 14 and 15 present the summary of ICT budgets for all four Colleges of Education.

Table 14: Summary of ICT budgets for RCE and CCE

RCE ¹		*CCE ¹	
ICT items	Amount budgeted	ICT items	Amount budgeted
Internet Facilities (monthly subscription and maintenance of internet cables)	N\$60,000	For ICT committee (ink, cartridges, toners, peripherals and accessories)	N\$130,000
Memory sticks (for every lecturer and some admin staff)	N\$16,620	ICT equipment and hardware for Prevocational Dept	N\$43,000
Anti-virus software	N\$15,000	ICT budget : Hostel and Student Affairs	N\$20,000
Pastel software (for the accountant)	N\$2,500	ICT budget : Library Dept	N\$28,000
IMTE	N\$2,000	ICT budget : LP Dept	N\$28,350
IT maintenance	N\$10,000	ICT budget : Professional Dept	N\$41,500
College website and host	N\$10,000	ICT budget : Languages and Social Dept	N\$88,870
		ICT budget : Maths and Science Dept	N\$45,140
		Admin. (General Services)	N\$23,500
Total ICT budget	N\$116,120.00	Total ICT budget	N\$448,360
Total College budget	N\$1,970,530.00	Total College budget	N\$3,058,336.00

Note: * The CCE budget for 2008/9 was not yet finalized at the time of collecting data. The budget for 2007/8 was used instead.

¹Rectors of the Colleges of Education granted permission to include in this study information on their college budget since it was a public document.

Table 15: Summary of ICT budgets for OCE and WCE

*OCE¹		WCE¹	
ICT items	Amount budgeted	ICT items	Amount budgeted
General ICT budget	N\$300, 000.00	Internet and website	N\$48,000
Administration: Internet, computers and Printers	N\$66,000	ICT maintenance	N\$35,000
ICT budget: Languages Dept	N\$64,385	Caretakers	N\$6,000
ICT budget: Maths and Sciences Dept	N\$53,000	Software, licenses and virus protection	N\$20,000
ICT budget: Professional Studies; SBS	N\$38,769	Insurance of ICT equipment	N\$30,000
ICT budget: Skills Dept	N\$120,500.00	ICT projects	N\$26,000
ICT budget: Social Sciences Dept	N\$59,5000.00	Computerizations	N\$50,000
Total ICT budget	N\$707,154.00	Total ICT budget	N\$215,000.00
Total College budget	N\$3,690,748.30	Total College budget	N\$2,173,200.00

Note: *OCE budget followed the government financial year cycle (starts from April to March 30, of the next year), while WCE's financial year starts in January and ends in December of the same year.

¹Rectors of the Colleges of Education granted permission to include in this study information on their college budget since it was a public document.

For CCE, the figures were from the 2007/8 budget as the budget for 2008 was not yet finalized. As can be seen in Tables 14 and 15 respectively, RCE's total ICT related expenditure was N\$116,120.00 out of an estimated total expenditure of N\$1,970,530.00 which was 5.9% of the total budget. The total 2007/8 budget for CCE was

N\$3,058,336.00 of this N\$448, 360.00 was allocated for ICT equipment, which is 14.7% of the total budget. The OCE for the year 2008/9 budgeted N\$707,154.00 for ICTs, which was 19.2% of the N\$3,690,748.30 of the total college budget while for the WCE for 2008 budgeted a total amount of N\$215,000.00 for ICT issues which was 10.1% of the N\$2,173,200.00 of the whole college budget.

Looking at the ICTs budgets on paper, the investment being made on ICTs did not appear to match the quality of the current existing infrastructure, hardware and software available at some colleges (see Figure 2 and Table 8). With this amount of investments from the TETF combined with the amount allocated in the Ministerial budget to the colleges, one expected the situation to show a different picture in terms of the available ICT equipment at Colleges of Education. Some of the budget allocations made by the Colleges of Education management did not seem to take into consideration the student teacher population. For example, CCE which had a budget of N\$448,360.00 for ICT expenditure had almost the same number of student teachers as RCE, which only allocated N\$116,120.00 for ICT. It is interesting to note that even at the Colleges of Education where the ICT budget appeared to be higher, the use and integration of ICT was still not at the level where it is supposed to be.

4.7.6 Lack of room space for ICT tools and equipment

Another factor that had serious negative impact on the use and integration of ICT at Colleges of Education, which became evident during the interviews and was further

supported by what was observed during field work, was the lack of room space for ICT tools and equipment. One teacher educator reflected on the issue of ICT space at her college at length during the interview, which she suggested created barriers for teacher educators who wanted to integrate ICT or were willing to assist others in setting up ICT equipment at her college. She explained as follows:

One of the constraints for both students and staff to have access to ICT and e-learning is lack of space. This college has been repeatedly told by the Ministry and donor agencies to create space for donated ICT equipment. Look, for example, in this room we are four lecturers with one computer. We do not have a printer. The printer is in another room and you have to queue up there to print – all four of you plus others. Their room is congested and intruded (sic). Sometimes you have to tell somebody, stand up I am in a hurry. The person will say I am just checking my e-mails.

The photocopier is in a room around the open corner in the library. The computers were also put in an open space in the corner of the library and that is where the photocopier is and that compromises the documents to be photocopied. Lecturers and students will ask, what is that being photocopied?

When you are presenting the lesson you have to bring in the laptop and the projector and set it up so that we can show the materials. After the lesson, you have to pick up again all your personalia (referring to all personal properties) and scramble. We do not have a special room where you can keep all the materials there. Because of that and the lab technicians know that they will set up something that will be dismantled after two or three periods. The fact is also that they (lab technicians) do not have an office in which they can keep things. They have to lock some tools here and lock the other one there. The tearing (dismantling) away process makes things unpleasant. The technicians, without being malicious, help you to realize that. There is a limit to what they can help, not because they are not willing but because the space does not work.

At one college, the college management had decided to use two rooms in the dining hall as computer labs because no rooms were available on the classroom block which could be used for ICT purposes. Some interactive whiteboards at this college were still in their

original boxes as they were still searching for a safe space on campus to install them. In another college, a house that was meant to accommodate staff members was turned into what the college called it's 'ICT Media House' because of to shortage of room space on campus. The original idea of the ICT Media House was for this house to be turned into a fully fledged Media Centre that housed all the ICT equipment as well as other teaching media. According to the Chairperson of the ICT Committee, the purpose of the ICT Media Centre was that any teacher educator who wanted to integrate ICT would go to the Media Centre with students without worrying about bringing and setting up the equipment themselves, a process which sometimes frustrated them. Unfortunately, due to the limited space in the Media House, the realization of the Media Centre "died out" according to the ICT chairperson. At present, this house accommodates the offices of the Chairperson and Vice Chairperson of the ICT Committee, the analyst programmer and computer technician. The ICT equipment was supposed to be kept in this house but due to lack of space they were stored at various places around the campus.

The problem of classrooms not meeting the requirements of ICT specifications seemed to be also related to this factor. This was expressed well by one of the teacher educators who said that:

They (classrooms) are not very well suited for the use of ICT. For example, not all classes have a place where you can project the images if you are using the projector. Some of our classes do not have power - so there is no connection to power. If I talk of other ICT equipment like videos and the like - some of our classes are upstairs and we do not have the means to carry the ICT equipment there. You cannot carry the video and the screen upstairs and then downstairs. I think it is very time-consuming.

It is worth noting, however, that the constraints mentioned by college teacher educators were similar to those found by Granger, Morbey, Lotherington, Owston and Wideman (2002). The findings were also consistent with the internal (or second) barriers and external (or first) barriers identified by Ertmer, Addison, Lane, Ross and Woods (1999). Also, Bennell, Sayed and Hailombe's (2008) study found a lack of suitable teaching space for ICTs at the Colleges of Education in Namibia as impacting negatively on the integration of ICTs.

4.8 The impacts of ICT on the implementation of the curriculum at Colleges of Education

The fourth research question on the impact of ICTs on the implementation of the curriculum at teacher training institutions. This question addressed the government's vision in reforming a curriculum that was traditionally based on giving knowledge through a transmission mode to that of a learner centred mode. This reform implied a shift in the role of the teachers from a transmitter of knowledge to a 'facilitator', 'guide', or 'mediator' of learning experiences (Ministry of Education and Culture, 1993). It is possible that most teacher educators were aware of what was expected of them when integrating ICT in their teaching and how the nature of this teaching practice contributed to learner-centred education. Teacher educators also mentioned that the Integration of ICTs promoted constructivist views and promoted learner-centred approaches in learning and teaching. The main ideas that emerged under the impact of ICTs on the curriculum were: ICT integration changed the role of the teacher educator, promoted constructivist

views and promoted the learner-centred approach. These main ideas are discussed further in the next sections.

4.8.1 ICT integration changed the role of the teacher educator

In the interviews, most of the teacher educators 15 (75%) mentioned words such as “guider”, “facilitator” and “helper” which are illustrative of this theme (see also notes taken during classroom observation in Appendix K). When asked how ICT and e-learning had changed their approach to the teaching of their subjects, one of the teacher educators responded that, "it makes the role of the teacher more of the facilitator in that you just give directions to students what they should do." He even went as far as to say that "it makes the syllabus more open and not that restricted." Another teacher educator strongly felt that with ICTs “there is always something new and there is a lot that you as a teacher educator can use.”

The same question was posed to another teacher educator and his detailed response provided insight into the teaching and learning processes as facilitated and supported by ICT:

ICT ... is not something that creates curriculum knowledge or whatever but a source of transmission, for example, a vehicle which can facilitate your teaching and learning. Basically, knowledge is just knowledge either we change it a little bit here and there, but for me it is much easier and correct to simplify what is here and try to link it to modern times, for example, to today. That is where then ICT plays a bigger role and tries to make it more practical of what constitutes knowledge and how it applies to today’s world. ICT makes the transformation of information easier, gives students more freedom to explore using ICT tools, concepts they are learning in the classroom. And

try to integrate both the knowledge and their daily lives into their projects that they are doing in their courses.

However, the information from the questionnaire seemed to contradict what came from the interviews. The results showed that 74 (91.4%) of the teacher educators indicated that they still relied heavily on the traditional way of lecturing as a way of giving information to the student teachers. Seventy (86.4%) of the teacher educators indicated facilitating instruction, 58 (71.6%) cited coaching, 66 (81.5%) said mentoring and 52 (64.2%) of the teacher educators indicated mediating. This finding was not surprising considering the fact that most of the teacher educators were trained in the past South African teacher-centred education system, hence they clung to the methods that they were comfortable with and used to. It is interesting to note from the information presented above that what some of the teacher educators said and the observed classroom practices were not congruent.

4.8.2 ICT integration promoted constructivist views

Taking into consideration that much of the education reforms in the Namibian education system were informed by constructivism theory, a direct question was posed to the teacher educators during the interviews to find out whether they thought ICT integration promoted constructivism. All the teacher educators interviewed were of the opinion that ICT integration and e-learning promoted the concept of constructivism. When asked, one of the teacher educators responded in the following way, “it tries to encourage learners to construct their own knowledge, be creative, be involved in the development of their own

learning. I think it promotes that in a way that you give students independence to look for their own information and to select their own information. There is also a lot of collaboration with one another.” Another teacher educator supported these views by saying, "because ICT is practical, while doing, students construct real examples. They also think during the process, they use the knowledge to enhance learning and teaching."

The use and integration of ICT in promoting a constructivist learning environment calls for teachers to go beyond their usual traditional ways of teaching (Bhattacharya & Richards, 2001). Collins (1991, p. 29) argued that, "the introduction of a third party, the computer, into the situation encourages the teacher to play the role of a coach, in much the same way that a piano encourages the teacher to play the role of a coach in a piano lesson." Collins (1991) recommended which teaching methodologies that teachers apply in their classrooms need to change for ICT integration to benefit the students.

4.8.3 ICT integration promoted learner-centred approach

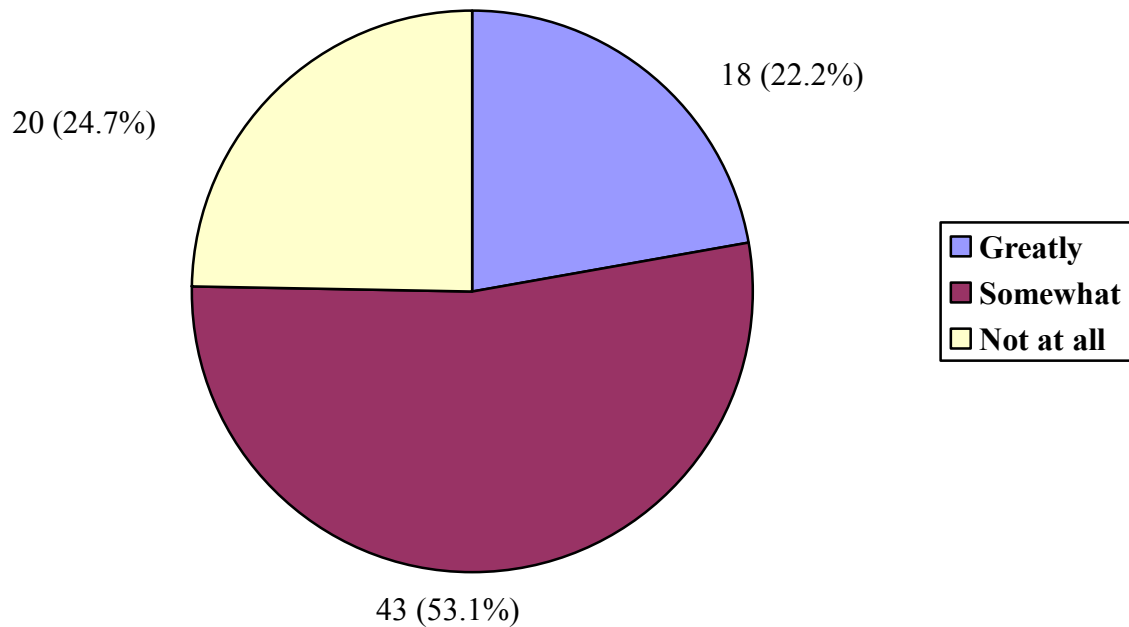
It appeared that the teacher educators in this study understood their roles when technology was used within the broad contextual framework of a learner-centred approach. During the interviews, one of the teacher educators gave a detailed explanation of how ICT integration was linked to the philosophy of learner centred education which was the main approach to teaching in Namibia:

It basically widens the access to a variety of learning materials. Students will realize that they should get information from more sources, e.g. television, cell phones, internet. There are some cell phones with internet facilities. And that perhaps help students to get exposure to as much information as possible,

which of course would make them more active in classes. They would not rely on the lecturer as the only source of information but they have other methods of access to information, and so on. I would expect students to take responsibility for their own learning to be more active in classrooms. Therefore, a lecturer would be more likely to be successful to implement activities that are more learner-centred, because students would be able to participate more because they have more access to information on their own. I can say it widens the dimension from which information is gained, therefore one would definitely say it is in support of constructivism.

The quote above appeared to imply that the teacher educators were encouraging active involvement and greater participation of student teachers in their lessons, as well as encouraging the student teachers to take full responsibility for their own learning. These specific teacher educators had taken a role of the facilitator or guide for learning activities at their Colleges of Education. The teacher was no longer the only source of all knowledge that awaits to be poured into the “empty vessels”, the students. The teacher educators provided learning activities that required more thinking and stimulated students’ desires to explore things on their own. Given that background, the teacher educators were then asked (in the questionnaire) whether ICT integration had made significant changes in the way they delivered their lessons. The teacher educators’ responses are shown in Figure 3.

Figure 3: How much ICT has changed the way the lessons are delivered (N=81)



*The word “somewhat” in this study means two things (1) to a small degree or extent (2) to a moderately sufficient extent or degree.

As shown in Figure 3, 43 (53.1%) of the teacher educators believed that ICT had made important changes in the way they presented lessons. This seemed to be a contradiction in the sense that 91.4% of the teacher educators had indicated that they still relied heavily on the lecture method as a way of giving information to students. The 22% and 25% of the teacher educators who indicated that ICT has ‘greatly’ and ‘and not at all’ respectively changed the way they delivered lessons appeared to be consistent with the findings from the interviews.

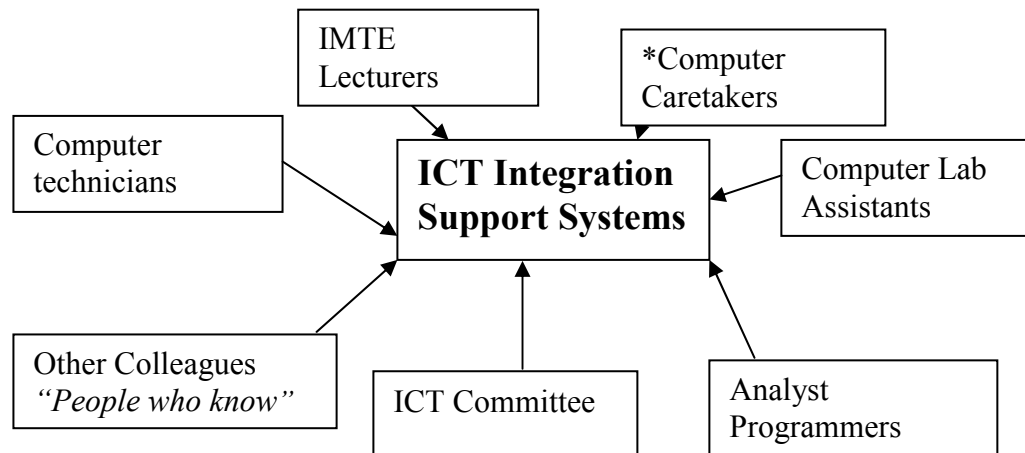
4.9 The extent to which specific e-learning methodologies are being implemented and supported by ICT

During the interviews, the teacher educators were asked to indicate, “To what extent are specific e-learning methodologies implemented and supported by the available infrastructure in the preparation of teachers?” Having onsite technical support and continuous professional development programmes were two things which were identified by teacher educators as the two crucial factors in supporting the success of the implementation of ICT at Colleges of Education.

4.9.1 On site Technical Support System

Table 10 shows that 52 (64.1%) of the teacher educators at the Colleges of Education were not knowledgeable about the technical aspects of ICT hardware. The teacher educators acknowledged and valued the on site technical support systems that they were receiving when they tried to integrate ICT and e-learning activities. At the Colleges of Education, the researcher observed that some of these ICT support systems were in place which offered specific support for the Integration of ICT at different levels. The examples of these ICT systems are presented in Figure 4. These were also mentioned during the interview.

Figure 4: The on site technical support systems in place that support the ICT integration at the Colleges of Education



* Although ‘computer caretakers’ is not an appropriate ICT term, it could not be replaced because that was how these people were called at the colleges.

Having a technical person available to provide technical support ensured the success of ICT integration because it eased the fear of technology. One teacher educator acknowledged the value of having this technical support on site thus; “I think one of the problems, I do not know whether to call it fear of technology. There are a number of lecturers who are not comfortable of (with) operating the equipment. That is what I mean by fear of technology.”

One of the teacher educators who was from the group of ‘people who know’ as they were known at his college, seemed to be unhappy about his colleagues who were even reluctant to operate basic ICT equipment and relied on those who knew for most of their technical assistance. He gave one example during the interviews as follows:

Some people will call you on some things that in my own opinion are easy to handle. I was called one day to the media room for the TV which was not working. I had a class at that time. I could not leave the class. I simply asked them whether it was not working or was it not on? So they just gave up. When I arrived after the class I noticed that the TV was not switched on but working. It means that people have that phobia.

One teacher educator during the interviews related how they depended at their college on either the ‘people who know’ or ‘the IMTE teachers.’ He noted:

We attended some workshops concerning ICT integration and some colleagues are good at it. For example, in IMTE they are really good at it. Basically we rely on them to help out. And they are so patient. Most of the time when you go to them, they do help. Just to mention one guy Simon (pseudonym). He is one of the most flexible guys. He is always rendering assistance when it is needed.

At one college, the ICT committee members availed themselves to help other staff members who needed help. One of the female teacher educators described how the ICT committee members “were like on call” to assist any staff member who, for example, “is stuck on how to use an LCD or can’t print (a document) or just wants to design some PowerPoint presentations for the class.” However, because of the appointment of the computer technician and computer analyst, some of these basic responsibilities were now being performed by these people, which according to these committee members was a great relief on their part as they claimed to be too busy with their teaching responsibilities.

All four Colleges of Education have appointed an analyst programmer and a computer technician. Close to 12 (60%) of the teacher educators interviewed felt strongly that the

technical support that they were getting from these technicians was quite sufficient. One of the teacher educators who held this view commented:

We have a computer technician, whom we ask for technical support and he is always willing to assist in setting up equipment or when we experience technical problems during the lesson session. He is always willing to come, you know. At this stage at the college we have also an analyst programmer who is always willing to assist, although it is not part of his job description. He is always willing to technically support us because he also has the technical knowledge.

Besides the support from the computer technician and the analyst programmer, she also mentioned that she valued the technical support and general assistance from the students (See also notes taken during classroom observation in Appendix K). She said:

What is also good now is that we have nine (9) computer caretakers. They are like computer lab assistants. They are all students - first, second and third year students. They are also willing to help whenever they are in the class, you know, like I have Johannes (pseudonym) the other day in my class. So, then he helped. Yesterday I had Silas (pseudonym) in my class. Sometimes it happens that when we enter the class, the computers have not been turned on, so they can start helping to switch on the computers. That is the technical support that we have even from the students.

What was said above by the teacher educator was consistent with the findings of Harel (1990) who found that when students were using technology they were eager to help one another in solving problems and in sharing ideas related to the lessons being taught.

Although teacher educators acknowledged and valued the assistance of their student teachers, there were also those who were cautious in using them. They claimed that sometimes the student teachers tried to show off a bit and did a little more than the

teacher educators had asked them to do. As a result, this sometimes caused confusion among other student teachers.

One teacher educator talked about other technical support systems available with regard to the integration of non-computer based ICT equipment at the college, "we have one person who went to this workshop on the equipment that was donated by Multichoice Namibia. He sometimes helps with the setting up of this equipment and recording programmes which we want to use".

4.9.2 Continuous Professional Development Opportunities

Literature found that professional development opportunities do have a lot of influence on how the integration of ICT is accepted and embraced in the classroom (Bylor and Ritchie, 2002). Teacher educators talked about the importance of continuous professional development opportunities in the area of ICT integration. The teacher educators' responses with regards to professional training in the integration of ICT and e-learning strategies during 2004 to 2007 revealed that 50 (61.7%) of them had received some sort of training, 44 (33.3%) reported that no training was offered to them and 4 (4.9%) did not answer the question. Table 16 on the next page gives the list of trainings/workshops that were mentioned by the teacher educators.

Table 16: Names/types of ICT trainings or workshops the teacher educators had taken part in as part of staff development opportunities

1)	Introductory Basic Microsoft Package (Word, Spreadsheets, Publisher, Excel)
2)	Basic Literacy training in ICT by CECS Namibia
3)	International Computer Driving License (ICDL) CECS Namibia
4)	PIL- offered by NIED
5)	UNESCO ICT training workshop
6)	Introduction to the use of WebQuests
7)	Workshop on the Internet search
8)	Workshop on PowerPoint Presentations
9)	A short course on teaching for understanding with new technology
10)	A workshop on new IMTE syllabus
11)	Technology infused lesson plan workshop offered by an International Foundation for Education and Self-Help (IFESH) volunteer from NIED
12)	Use of televisions in lessons by Multichoice Namibia
13)	Integrated Media and Technology workshop offered by NIED
14)	Training in e-learning and global gateway sponsored by the British Council
15)	A workshop on how to include ICT in teaching offered by the Prime Minister's office
16)	INWENT Course focusing on HIV/AIDS

One of the training programmes that supported the integration of ICT at Colleges of Education was the International Computers Driving Licence (ICDL). As from August

2008, the number of teacher educators per college who have completed the ICDL thus far is reflected in Table 17.

Table 17: Number of teacher educators at the Colleges of Education who have successfully completed the International Computers Driving Licence (ICDL)

Institutions	Start ICDL Certificate	*Full ICDL Certificate	Total Certificates
RCE	1	1	2
CCE	5	1	6
OCE	9	0	9
WCE	7	13	20

*Note: A Full ICDL certificate is awarded when a person has completed all seven modules while Start ICDL certificate is given to a person who has completed a minimum of four modules. A person who receives a full ICDL certificate is given a laptop by the Ministry of Education in order for that person to do his/her work better. The laptop remains the property of the college.

The ICDL training was referred to by the participants a number of times during the interviews. The minutes of the ICTs in Education Steering Committee of 17 August 2007 of the Ministry of Education reported the highest pass rates of 89% for the ICDL modules assessed at WCE (Ministry of Education, 2007a). As shown in Table 17, WCE has more teacher educators with ICDL compared to the other three colleges namely, RCE, CCE

and OCE. During the interview, one teacher educator said, “Ok, well as far as training is concerned, we have some training going on like lecturers are being trained on ICDL. I think that has somewhat helped me, and has improved my computer skills in general.”

Another teacher educator talked about her training at her previous university and how her training and experience was more useful for what she was able to do. She described it as follows:

I consider myself lucky. The University where I went I had a course called *Introduction to Learning Technologies for Teachers I and II*. This was the course that taught me what I am able to do today. We also got a two day workshop. For me, the training is quite sufficient. Other colleagues are saying they are not sufficient.

Another teacher educator explained in detail:

... in terms of training, as lecturers, you cannot complain that we do not, that there are no courses offered which can help us with the ICT integration. Of course we have CECS here, although they will be moving soon. They have been supporting us whenever we needed training. The Ministry of Education also, you know, offers courses and that helps also via NIED like the ICTED that I have talked about. They are always prepared to come to the college to train us. We also have ICT courses which UNESCO offered. I think we were 10 or so who participated in these courses. Well, in terms of training, there is much training being offered. It is just sometimes we do not have time or maybe we do not make time.

As mentioned already, 50 (61.7%) of the teacher educators acknowledged the fact that they had received some ICT (Table 16). A possible conclusion to be drawn from this finding is that if the training is being offered, the 27 (33.3%) of the teacher educators who indicated that they had not received any professional training in the integration of ICT and e-learning strategies during the past four years (2004-2007) might have considered the training they obtained to have been of no use to their specific subjects/courses. It

could also be possible that the teacher educators were not invited to participate in the training sessions.

The teacher educators were asked to explain their reason(s) for answering “Yes” or “No” to the question on whether they were offered professional training opportunities. One teacher educator said, “yes, the training has been offered. But, ... I already have acquired technological knowledge as a result of my 1st degree education and I have been using these”. Another reason could just simply be, as one teacher educator stated, “sometimes when people register for the course e.g. ICDL, others are not aware”. Other reasons mentioned were lack of time as most of these once off trainings took place during their teaching time and limited spaces were available for teacher educator training. As Burge (2000, p. 76) warned, “once-off only training sessions for teachers are usually not very effective. Professional development, especially that is squeezed into already busy schedules, will work best if it is designed as an on-going, incremental, and cumulative process, a continual cycle of renewal and growth.”

4.10 The ICT strategies and practices that might be employed to enhance the use and integration of ICT and e-learning

According to the teacher educators, in spite of limited resources identified in Figure 2 and Table 8, practices that might be employed to enhance the use and integration of ICT and e-learning could still be done. In this study, the participants were asked to suggest best strategies and practices that could be implemented to enhance the use and integration of

ICT and e-learning at the Colleges of Education. The following aspects emerged from the responses of the teacher educators during the interviews: change of attitudes, having a well structured ICT integration programme in place and the training of teacher educators on the use and integration of ICT pedagogy. These are discussed in the next sections.

4.10.1 The need to change attitudes of the teacher educators towards ICT integration

The literature indicates that the teachers' attitudes towards the utilization of ICT influence how ICT is applied in the classroom (British Educational Communications and Technology Agency (BECTA), 2004). If teacher educators do not have an interest in the use of ICT then one would expect less than optimal use of ICT. The teacher educators appeared to have recognized this view themselves since it was often mentioned during the interviews that there was a need for an attitude change within individual teacher educators with regard to ICT integration and e-learning. As one teacher educator explained, “the attitudes as well need to change. Although we talk quite often of learner-centredness and constructivism, sometimes we lecturers do not practice what we preach. I mean lecturers should also give students more activities that require students to use ICT, and also require students to do ICT related activities on their own”

The negative attitudes of some teacher educators towards those who brought in their personal ICT equipment to be used for class purposes was also pointed out by some teacher educators as something that needed to change as it discouraged technology

enthusiasts. One teacher educator complained about these sorts of attitudes that were not receptive to the ICT idea, “the attitude that we have, you are coming with your own computer is seen by other people as weird. They would say I have mine but I would not bring it here.”

The teacher educators talked of giving small assignments that required integration of ICT during micro-teaching sessions, report writing and classroom presentations. As one teacher educator said, “I think one can still, let say, lower the expectations a little. I mean still give assignments, which will require students to use ICT. For example, going to the internet or requiring all assignments to be typed. I will not see the excuse for students not doing that.”

The issue of total commitment of the college management to ICT use was also something that was mentioned frequently during the interviews. The teacher educators talked about their leaders’ attitudes of saying there was no money available. As pointed out and emphasized in the literature, the commitment of all the stakeholders in an organization structure is essential if technology initiatives are to be successful (Switzer, 1992; Albirini, 2006).

4.10.2 Having a coordinated and well structured ICT integration programme in place

It was also suggested that a coordinated and well-structured ICT integration programme for both the students and the teacher educators should first be put in place in order to ensure successful integration of ICT and e-learning in teaching and learning at Colleges of Education. The teacher educators' views seemed to be in line with Levine's (1998) studies which underline the importance for schools to have an ICT integration plan which is designed on the needs of the school. This plan according to Levine should be reasonable, feasible and efficient. As suggested by one of the teacher educators, "the literacy level of the students, you know and the teachers should be at a certain level. To get to that level one needs a well structured programme in place and every student and teacher has to go through it and once they have done that their confidence level would ensure that they would use ICT as expected."

In addition, the teacher educators cited an overloaded with other administrative duties as one of the reasons that they do not have sufficient time to plan for the integration of ICT and e-learning activities. They suggested that if administrative duties such as entering student teachers' grades on the computer system and other committee duties that had little to do with the teaching responsibilities could be reduced and/or delegated to administrative staff, they would be able to find time to integrate ICTs in their lessons.

4.10.3 Training of teacher educators in the use and integration of ICT pedagogy

Except for IMTE teacher educators whose syllabus requires them to understand and train their students in ICT pedagogy, 59 (72.8%) of the teacher educators indicated in the questionnaire (see Table 13) that they did not know how to integrate ICTs meaningfully and effectively in their subjects. They claimed that they lacked pedagogical skills in the use and integration of ICT. This made them to have little or no understanding of how to link ICTs to learning and teaching strategies. The teacher educators' views appeared to confirm that lack of ICT pedagogy may hamper ICT integration (Windschitl, 1998; Mergendoller, 1996).

The Colleges of Education want to integrate ICTs across the curriculum, as appears from the interviews with the participants and also from document analysis, particularly the Broad Curriculum of the BETD programme, and also from the global perspective. The tendency globally is to move towards ICT integration across the curriculum rather than restricting ICT integration to a single course. Therefore, the teacher educators at the Colleges of Education must be trained in ICT integration pedagogy (Society for Information Technology and Teacher Education (SITE), 2002).

4.11 Part B: Student teachers' responses

Part B provides the data from the student teachers as collected through interviews, questionnaires and document analysis. The data is presented following the same four themes as for the teacher educators outlined on page 59. These themes are:

- (a) Biographical information on student teachers;
- (b) Student teachers' perceptions on the use and integration of ICT into teaching and learning;
- (c) Subjects that integrate ICT most and reasons for the use and integrations of ICT; and
- (d) The impact of ICT integration on student teachers' learning.

There was a fairly good representation of the student teachers' population across all four Colleges of Education, based on the student teachers' population size. A total of 199 questionnaires were completed and returned. This represented a response rate of 90.5%. The numbers of questionnaires returned per College of Education were as follows: 94 out of a 100 from OCE, 57 out of 60 from WCE, 22 out of 30 from RCE and 26 out of 30 from CCE.

4.11.1 Biographical information of the student teachers

The section on the background information in the questionnaire for student teachers comprised six questions that covered aspects such as sex, age, college and major, year of study and the subject (s) in which the teacher educators regularly integrated ICTs.

4.11.1.1 Sex of the student teachers

One hundred and one (50.8%) of the student teachers were females, while 98 (49.2%) were males. The sex of the student teachers who participated in this study is shown in Table 18.

Table 18: Sex of student teachers (N=199)

Colleges of Education	Sex of student teachers		Total	%
	Male	Female		
OCE	48	46	94	47.2
WCE	25	32	57	28.6
CCE	14	12	26	13.1
RCE	11	11	22	11.1
Total	98	101	199	100

It should be pointed out that females are the majority at the Colleges of Education (Ministry of Education, 2007). Therefore, the response rate reflected well on the male and female distributions in the population.

4.11.1.2 Age of the student teachers

The age distribution of student teachers per Colleges of Education is given in Table 19.

Table 19: Age distribution of student teachers per college (N=199)

Age	Colleges of Education				Total	%
	OCE	WCE	CCE	RCE		
<18	0	0	0	0	0	0
18-25	84	51	22	18	175	87.9
26-33	7	4	3	3	17	8.5
>34	3	2	1	1	7	3.5
Total	94	57	26	22	199	100

One hundred seventy five (87.9%) of the student teachers were between the ages of 18-25, 17 (8.5%) of the student teachers were between 26-33 years and 7 (3.5%) of the student teachers were above 34 years of age.

4.11.1.3 Majors of study of the student teachers

The student teachers who were selected to participate in this study came from all the subject majors offered at the Colleges of Education except for Arts Education which was only offered at one of the colleges. Majors of study of the student teachers per Colleges of Education are presented in Table 20.

Table 20: Majors of the student teachers per colleges of Education (N=199)

Majors	Colleges of Education				Total	%
	OCE	WCE	CCE	RCE		
Mathematics Education	21	9	2	9	41	20.6
Social Studies/ Sciences Education	2	13	1	1	17	8.5
Language Education	0	22	13	4	39	19.6
Lower Primary Education	7	1	0	3	11	5.5
Commerce Education	4	1	0	0	5	2.5
Integrated Natural Science Education	38	5	5	3	51	25.6
Mathematics and Integrated Natural Science Education (5-7)	21	6	0	2	29	14.6
Agriculture and Life Science Education	1	0	5	0	6	3.0
Total	94	57	26	22	199	100

Fifty one (25.6%) of the student teachers were majoring in Integrated Natural Science Education, 41 (20.6%) in Mathematics Education, 39 (19.6%) in Language Education, 29 (14.6%) in Mathematics and Natural Science Education, 17 (8.5%) in Social Studies/Science Education, 11 (5.5%) in Lower Primary Education, 6 (3.0%) in Agriculture and Life Science Education and 5 (2.5%) in Commerce Education.

4.11.1.4 Years of study of the student teachers

There was no good representation of the student teachers' population across all three years of study. The majority of participants were first and second year student teachers. The years of student teachers per Colleges of Education is presented in Table 21.

Table 21: Years of study of the student teachers per Colleges of Education

	Years of study of the student teachers per Colleges of Education					
Year of study	OCE	WCE	CCE	RCE	Total	%
Year 1	27	21	10	7	65	32.7
Year 2	67	28	16	10	121	60.8
Year 3	0	8	0	5	13	6.5
Total	94	57	26	22	199	100

Only 13 (6.5%) of the third year student teachers completed the questionnaire, 121 (60.8%) of the student teachers were in the second year of study and 65 (32.7%) of the student teachers were in the first year of study.

Since third year student teachers had been in the BETD programme the longest, their insights and experiences with regard to ICT integration could have been more relevant and practical. It could also provide for different approaches and viewpoints as shown in the notes in Appendix F taken during observations of a third year student teacher during teaching practicum.

4.12 Student teachers' perceptions on the use and integration of ICT into teaching and learning

Perceptions from both the interviews and from the open ended section of the student teachers' questionnaire seemed to point to the fact that ICT integration was having a positive impact on their learning process. The themes that were important to the student teachers during the interviews with regard to the ICT integration were: ICT integration

makes learning easier and interesting, ICT integration makes the storage and retrieval of information easier, ICT integration facilitates the improvement of writing skills and ICT integration serves as a source of motivation for further learning.

4.12.1 ICT Integration made learning easier and interesting

With regard to this theme, the student teachers' views on how ICT integration made lessons easier and interesting are given in Table 22.

Table 22: How ICT integration made lessons easier and interesting as indicated by the student teachers (N=25)

1) Make lessons attractive.
2) Creates meaningful learning environments.
3) Captures students' attention.
4) Allows for the effective transfer of knowledge.
5) Makes the workload easier to handle.
6) Makes work easier to manage.
7) Allows the browsing of latest information.
8) Helps in doing research.
9) Provides technological skills.
10) Appeals to different learning styles.
11) Promotes curiosity in learning.
12) Promotes the culture of wanting to explore.

Table 22 lists the reasons given by student teachers for their belief that ICT integration made lessons easier and interesting. They indicated that they learned new things which they had not known before and discovered some things on their own. As one student teacher claimed ICT could “enhance their limited knowledge and open up a whole new world.” Another student teacher said “the use of ICT in a lesson can make it much more interesting for a learner than a normal textbook. ICT can also make a lesson for a teacher much easier since you can get all the information from the Internet with only one click, where you as a teacher have to go to a library and search for books which you sometimes do not find.” Another student teacher agreed with the views of the two other student teachers, “the classroom is always interesting. The students, including myself, seem to enjoy it because it makes the lessons very interesting and this helps us to learn more.” Another student teacher explained that, “integration of ICT in lessons makes lessons interesting and gives a variety of e-learning styles. This was because a person learns ‘double’ – the knowledge of the subject matter and skills of using technological equipment.” The following excerpt from the interview is instructive:

Student Teacher: Well it is eye catching. If you see a lecturer having a laptop, you suddenly become curious asking yourself what is really going to happen. It draws the attention.

Researcher: And then? What happened during the lesson?

Student Teacher: Most of them are eye-catching and productive. If a lecturer just stands there and preach from there, you sometimes might doze off or sleep. If somebody is there you are eager to know what is going

to happen next or how is the next slide going to be presented, unless the presenter is not boring.

These findings are in line with Machmias, Mioduser and Shemla's (2000) argument that the use of ICT, specifically computers and Internet, has now entered the education field with educators anticipating that it (computers and Internet) would make learning easier and more enjoyable.

4.12.2 ICT integration makes the storage and retrieval of information easier

The student teachers also observed some improvements in their learning processes specifically in storing and retrieving of information and also in typing academic papers and assignments. One student teacher noted that, "I can now store and retrieve any sort of information easily. For now I can use a computer to make successful teaching aids." Another student teacher expressed similar sentiments, "I enter, store and print out information from the computer on my own." This sort of feeling appeared to mean a lot in the learning process of the student teachers as they were able to cope with technical aspects of ICT because they were provided with knowledge and skills.

4.12.3 ICT integration facilitates the improvement of writing skills

Regarding writing, all 25 student teachers interviewed reported that, in one way or another, technology, specifically the computer, had a positive impact on their writing abilities. The student teachers mentioned that typing their reports at the end of teaching

practice, writing more attractive lesson plans, creating teaching media, and setting up of question papers of good quality were as all a result of using computers. One student teacher claimed that, “typing is helping us write clear and more legible documents.” It seemed that when student teachers saw their work typed, they found it to be neat and more attractive compared to the hand written work. Previous studies on the use of computer technology in the classroom have found computers to be of great importance in motivating students to write more because students “were proud to exhibit what they have written” (Gooden, 1996, p. 46). What students described is also in line with Simonson and Thompson’s (1997, p. 167) study which argued that computer technology “can improve student attitudes toward writing, increase the amount of time students spend writing, and also increase students’ willingness to revise their writing.” Simonson and Thompson also suggested that spelling and grammar checking software provided students with opportunities to obtain suggestions for change in their work and enabled changes to be made quickly and easily. This software is significant to the Namibian student teachers because English is their second or third language and also the medium of instruction.

4.12.4 ICT integration serves as a source of motivation for further learning

Another theme that became evident during the interviews, observations and information from the open ended section of the questionnaire was that ICT served as a source of motivation to the student teachers’ learning process. The student teachers became motivated when they learned and did activities embedded in practical and real life problem situations. In one mathematics class observed, the student teachers set up

learners' worksheets on fractions using a computer. The activity involved drawing diagrammes (shaded and unshaded) divided into two equal parts. The diagrammes were mostly circles and rectangles. This was a lesson where the student teachers practiced shapes and related these to real life situations. This motivated them and as one student teacher said, "enhances their specific subject learning." The student teachers observed often got stuck in the process but were motivated to keep restarting the programme over and over again until they achieved their goal. Motivation was observed to originate from the teacher educators' comments or encouragement. When teacher educators were present and encouraged student teachers to use and learn ICT tools, they seemed to have reduced their student teachers' feelings of failure and anxiety. The student teachers felt that what they were learning was valuable to them personally. This finding appears to agree with the findings of Cox, Preston and Cox (1999, p. 7) that, "if they (teachers and learners) perceive ICT to be useful to them, their teaching and their pupils' learning, then they are more likely to have a positive attitude to the use of ICT in the classroom".

In spite of the lack of access to ICTs, a positive perception of ICT integration in relation to teaching and learning situations was found. The student teachers generally appeared to be conscious of possible contributions of the ICTs towards their learning. They also remained excited by the opportunities created by the ICT tools - providing individualized learning, providing current information, making research easier, making learning and teaching easier and making lessons enjoyable and fun.

4.13 Subjects that integrate ICT most and reasons for the use and integration of ICT

The student teachers' responses on the subjects that integrated ICT the most are presented first. The responses on reasons for the use and integration of ICT are presented second and responses as to whether student teachers were using the Internet as one of the ICT tools in their learning are presented third.

4.13.1 Subjects that integrated ICT most at the Colleges of Education

When student teachers were asked in which subjects ICT was integrated most, one of the student teachers indicated that, “in many subjects we are not exposed to them (ICT). It is mostly in IMTE.” Another student teacher pointed out that, “the problem is that it is mostly used only in IMTE classes and makes it difficult for students as we get IMTE only once in a cycle.” There seems to be an appreciation of what student teachers were learning with regard to ICT integration in the IMTE classes. One of the student teachers noted, “we have been taught since our first year especially in the IMTE subject. I can now browse the Internet on volcanoes for example and present a full lesson with pictures on overhead projectors or on a PowerPoint.” Another student teacher observed:

Students are always interested and they are always active. When the projector is used in a classroom, the classroom is fully closed (in order to have few light entering the class) for the students to have a clear view, but a hindering factor is that in most cases the subject whereby these types of lessons are given is when we have IMTE (sic).

A second year student teacher interviewed felt that, “most lessons at the college are not that well integrated with the use of e-learning and ICTs. The only subjects that I have

come across that made use of e-learning and ICTs within the lessons were IMTE and ETP2.”

The student teachers then went on to propose that IMTE should be allocated more time in the timetable as it presently does not enjoy enough time. Table 23 presents some comments and suggestions made with regard to the IMTE subject.

Table 23: Student teachers’ comments and suggestions on IMTE

Student teachers	Comments and Suggestions on IMTE
Student teacher 1	If we get enough time to study ICT, we need more periods of ICT in a cycle, because at the moment we only get two periods per cycle which is not enough.
Student teacher 2	They must add more hours for IMTE classes.
Student teacher 3	I think as teachers we need to undergo real computer courses and not IMTE which is only a bit of information.
Student teacher 4	The student teachers should be taught how to use the computer as a subject not only to be introduced to some of the things in IMTE.

The views of the student teachers as seen in Table 23 with regard to the type and level of ICT training in teacher education has been part of the debate in teacher education. Numerous studies in the literature have pointed out that one impediments to teachers wanting to use technology in their classrooms is the lack of sufficient teacher training (Yildirim, 2000).

Fifteen student teachers acknowledged during the interviews that ICT integration was also happening in some subjects other than IMTE. One of the student teachers admitted that, “I think some lecturers try to integrate it in their lessons although they are very few. I still think we can make a difference because if we learn how to do it, we will also integrate it in our lessons when we go out to work.” Another student teacher specifically mentioned ETP as one of the few subjects where lecturers tried to integrate ICT into their teaching, “we were given an assignment in ETP where we have to come to present in class in our school as organization assignment. In this assignment, student teachers used different ICT tools and the surprising part was that they mostly integrated ICT equipment such as LCD projector and laptops for a PowerPoint presentation. The presentation was mostly done in groups and it was interesting.”

In the questionnaires also, the student teachers were asked to indicate the subject(s) where ICT was commonly integrated. The results are indicated in Table 24.

Table 24: Subjects where ICT was integrated most according to the student teachers (N=199)

Subject	*Number of student teachers	Percentage
Lower Primary Education	6	3.0
Mathematics Education	20	10.1
Social Studies/Science Education	18	9.1
Language Education	24	12.1
Practical Subjects (Arts, Home Ecology, Human Movements Education, IMTE)	9	4.5
Education Theory and Practice	54	27.1
Commerce Education	6	3.0
Integrated Media and Technology Education	159	79.9
Integrated Natural Science Education	24	12.1
Agriculture and Life Science Education	6	3.0

*Note: Actual number of teacher educators who selected a specific subject. The student teachers chose more than one subject.

The findings in Table 24 confirmed the information from the interviews that ICT was mostly integrated in IMTE and to some extent in ETP. It is, therefore, fair to say that the integration of ICT at the Colleges of Education is not implemented across the curriculum. This lack of integration across the curriculum has been found to be problematic because it does not expose student teachers to realistic ways of relating ICT integration to their classroom situations and practices (Brownell, 1997).

4.13.2 Reasons for integration of ICTs at the Colleges of Education

When student teachers were asked to choose from a list of 12 factors they were given as general reasons for the integration of ICTs in their classes, a pattern of responses similar to those obtained with the teacher educators on the same question emerged. These are given in Table 25.

Table 25: Reasons for integration of ICTs in classes by student teachers (N=199)

Item	Reasons for integration of ICTs	Frequency	
		*n	%
A	to organize and store information	120	60.3
B	to collect data and perform measurements	64	32.2
C	to manipulate/analyze/interpret data	51	25.6
D	to communicate information	93	47.7
E	to create visual displays of data/information (for example, graphs, charts, maps)	96	48.2
F	to plan, draft, proofread, revise, written text	76	38.2
G	to create graphics or visuals of non-data products (for example, diagrams, pictures, figures)	65	32.7
H	to create visual presentations	83	41.7
I	to perform calculations	50	25.1
J	to create models or simulations	36	18.1
K	to support individualized learning	90	45.2
L	to access information as part of lessons	96	48.2
M	other (please specify)	10	5.0

*Note: *n* = Actual number of student teachers who selected that reason. The student teachers chose more than one reason.

In table 25 the student teachers indicated the following reasons for the integration of ICTs: 60.3% of the student teachers chose organizing and storing learning information, 48.2% of the student teachers indicated creating visual displays of data/information for example, graphs, charts, maps, 48.2% of the student teachers indicated accessing information as part of lessons, 47.7% of the student teachers said to communicate information, 45.2% of the student teachers indicated to support individualized learning, 41.7% of the student teachers cited the creating of visual presentations while 38.2% of the student teachers indicated planning, drafting, proofreading and revising written text. Other reasons cited were: to type assignments, send e-mails, build website, play games and search for information.

Of particular interest, however, was the significant difference in the reasons that received the highest responses from both the teacher educators and the student teachers. Forty eight (59.3%) of the teacher educators chose the reason “accessing information” as part of lessons, while 120 (60.3%) of the student teachers chose organizing and storing information as their main reason for integrating ICTs in their lessons. The responses of the student teachers might have been influenced by their own experiences and practices of ICTs in and outside the classroom or by their overall perceptions of what they thought should be the most important reason for integrating ICTs. Further, the responses of the student teachers could also have been influenced by the way in which the teacher educators used and integrated ICTs.

The student teachers were also asked to indicate whether they were likely to use ICT in their teaching upon graduation from the Colleges of Education. Eighty percent of the 20 teacher educators interviewed said, if given the resources, they would integrate ICT in their teaching. Their responses regarding the likely use of ICT upon graduation are presented in Table 26.

Table 26: Reasons why the student teachers were likely to use ICT in their teaching

1) To save time in projecting information rather than writing on the chalkboard.
2) To motivate learners to become interested in the lesson.
3) To communicate and explain concepts easily.
4) To make learning more real since learners can see what is happening.
5) To practice and implement what they had learned from their teacher.
6) To keep records, calculate learners' performances and design teaching aids.
7) To meet the teaching and societal demands of living in a technological era.

As shown in Table 26, five out seven reasons given by the student teachers had to do with ICT as an important tool in creating an environment that could support teaching and learning. One reason focused on ICT as an administrative tool, for example, to store and calculate learners' grades while the last reason acknowledged the challenges of teaching

in a technological era where there is wealth of information available for the society to use it for different purposes.

4.13.3 Student teachers’ responses on whether they use Internet as an ICT tool

The student teachers were asked also to indicate from the list in Table 27, the most important reasons for using the Internet as one aspect of ICT tools. Table 27 shows their responses.

Table 27: Student teachers’ responses regarding the use and integration of Internet as one aspect of ICT tools (N=199)

Item	Reasons for using and integrating Internet	Frequency	
		*n	%
A	to gather information from a variety of sources	140	70.4
B	to communicate with others outside of the school	69	34.8
C	other (please specify)	13	6.5

*Note: *n* = Actual number of student teachers who selected the specific reason. Student teachers chose more than one reason.

As can be seen from Table 27, 140 (70.4%) of the student teachers indicated that they used the Internet to gather information. Sixty nine (34.8%) of the student teachers claimed that they used the Internet to communicate with others outside the school. Thirteen (6.5%) of the student teachers gave other reasons such as to “google for soccer”,

“have fun”, “play games”, “be updated on the changing world”, “search for updated data”, “download software”, “build and update website”, “for IMTE class work” and “to access latest information.”

With regard to a follow up question on how the student teachers understood e-learning, 22 (88%) of the student teachers interviewed did not have either a full understanding of what e-learning was or they did not know what it meant. These findings were similar to the teacher educators. The following extract from the interview with one of the student teachers is a good example:

Researcher: Do you know the meaning of e-learning?

Student Teacher: Oh, e-learning, what is that sir?

Researcher: Well, it stands for electronic learning, and most learning and teaching are given through the medium of technology, example Internet.

Student Teacher: Is it like someone on the other side and you try to communicate with him, something like a teleconferencing?

Researcher: No, that is just teleconferencing. Let me give you another example. You have a pre-loaded software and you try to look and get information for the class.

Student Teacher: Oh, I know that but I did not know the term e-learning.

Researcher: Have you experienced that?

Student Teacher: Yes.

Researcher: Tell me how you have experienced it?

Student Teacher: For example Encarta. My major is Social Sciences. If, for example, my History lecturer teaches about United Nations, I will go back to it and browse it. I remember there was one statement that the lecturer made and it was wrong. I remember coming back to him with the information that I got from the Internet and Encarta.

4.14 The Constraints that hinder the use and integration of ICTs in lessons at the Colleges of Education

Student teachers were asked to indicate the constraints they thought hindered them from using and integrating ICTs. The results are presented in Table 28.

Table 28: Constraints that hinder the use and integration of ICTs in teaching and learning at the Colleges of Education as identified by the student teachers (N=199)

Item	Constraints that hinder the use and integration of ICT in teaching and learning at Colleges of Education	Frequency	
		*n	%
A	lack of training in ICT pedagogy	156	78.4
B	lack of technical know how of ICT applications	115	57.8
C	lack of computers	162	81.4
D	lack of the basic equipment for the establishment of ICT i.e. network equipment	115	57.8
E	limited Internet access	158	79.4
F	limited support for the development of ICT skills of teacher educators	116	58.3
G	lack of technical support provided at the college	135	67.8
H	lack of adequate awareness about ICT by the management of the college	110	55.3
I	insufficient budget allocation in place for use in procurement of ICT tools such as hardware and software	107	53.8
J	lack of time to learn and incorporate ICT skills and tools into learning activities	122	61.3
K	fear of ICT tools	39	19.6
L	lack of collaboration with other teacher educators to design lessons that accommodate ICT integration across subjects	116	58.3
M	the learning load makes it impossible to use and integrate ICT tools	60	30.2
N	unreliable power supply makes access to ICTs difficult	52	26.1
O	the information technology bandwidth makes the downloading of information slow and difficult	74	37.2
P	training budgets for ICTs are often not sufficient	5	2.5

*Note: *n* = Actual number of student teachers who selected that specific reason. Student teachers chose more than one constraint.

With regard to the constraints that held back the use and integration of ICT in teaching and learning at colleges, consistencies in the teacher educators' responses and student teachers' responses emerged except for items M and O as shown in Tables 13 and 28 respectively. In similar findings to those from teacher educators, the 10 top constraints

according to the student teachers were: 81.4% of the student teachers indicated lack of computers, 79.4% of the student teachers cited limited Internet access, 78.4% of the student teachers said lack of training in ICT pedagogy, 67.8% of the student teachers chose lack of technical support provided at the colleges, 61.3% of the student teachers indicated lack of time to learn and incorporate ICT skills and tools into lessons, 58.3% of the student teachers cited lack of collaboration with other teacher educators to design lessons that accommodated ICT integration across subjects, 57.8% of the student teachers said lack of the basic equipment for the establishment of ICT i.e. network equipment, 57.8% of the student teachers indicated lack of technical know how of ICT applications, 55.3% said lack of adequate awareness about ICT by the management of the college, and 53.8% of the student teachers cited insufficient budget allocation in place for use in procurement of ICT tools such as hardware and software. Other factors that were identified as possible constraints by the student teachers are presented in Table 28.

It can, therefore, be concluded from the results, that the teacher educators' responses on items M and O of Table 13 focused more on the heavy teaching loads and the slow downloading of information. On the other hand, the student teachers seemed to focus more on the lack of computers and lack of training in ICT pedagogy.

The data in Table 28 also show that there were some inconsistencies in the student teachers' responses. About 61% of the student teachers indicated lack of time to learn and incorporate ICT skills and tools into their learning activities while 30.2% of the student teachers cited the learning load as another possible factor that made it difficult to integrate

ICT tools. The possible explanation of different answers in the student teachers' responses might be explained by the fact that they might have been overwhelmed by various extramural activities on which they spent their time rather than looking at their study load as the main possible factor hampering the use and integration of ICT tools.

The issue of having no access to ICT was a recurrent issue being mentioned repeatedly by most student teachers. Table 29 presents some of the general comments made by the student teachers regarding access to ICT facilities.

Table 29: Comments by the student teachers regarding access to ICT facilities

1) We do not have access to computers because our computers are not working, the computer lab is locked.
2) This is helpful. It's only that the computer lab is not functioning any more since this year. It's only some individuals who have access to the computer lab.
3) Is helpful but the main issues are that we do not have access to computers. Our college computer lab is closed and no lessons for computers.
4) With limited places in the lab and Internet not working every second day it makes learning difficult if you have to search for information.
5) Computers are available but they are not enough for students and also the Internet is not connected.
6) Not everyone has access to computers; the ratio of computer to student teacher is too low.
7) The computers are available but the Internet is not yet connected, meaning that we don't have access to the Internet.
8) If our Internet in the student computer lab it happens to be on, you again have to refresh for about five minutes to get your information or your emails.

The student teachers indicated that they did not have access to the ICTs because of non-functioning computers at their colleges. In addition, the computer labs were closed most of the time, the computers were not connected to the Internet and there were few computers available for the student teachers. From these comments (Table 29), it was clear that the issue of ICT access caused serious problems to the student teachers' efforts

to integrate ICT into their learning process. The student teachers were also generally aware of how lack of computers and the Internet contributed to their frustrations during the learning situations. During one of the interviews, one student teacher said:

Student Teacher: The common problems are the availability of computers and of course the Internet, like the reliability of the Internet as well. Like most of the time it is off and the lecturer has again given you an assignment and you can't really do anything about it. The major problem is the quantity of the computers available to students.

Researcher: But the availability of ICT equipment – lets say you want to take them to the class. How available are those? For example, presenting using PowerPoint, how available are those?

Student Teacher: They are really rare. Because you have to book. I give you an example, none of my classmates have ever used any of those ICTs in my three years of experience except one student that was moderated. She has to use it during SBS. It is very difficult to get hold of one.

The issue of computer labs being closed and not accessible to the students is well documented in literature. Morrison and Lowther (2002, p. 15) commented that, “to use a computer lab, teachers have to schedule the lab in advance and move the class between rooms. These labs are not always available and might require scheduling several weeks

in advance. This lack of easy access makes it difficult to plan a lesson integrating computers.”

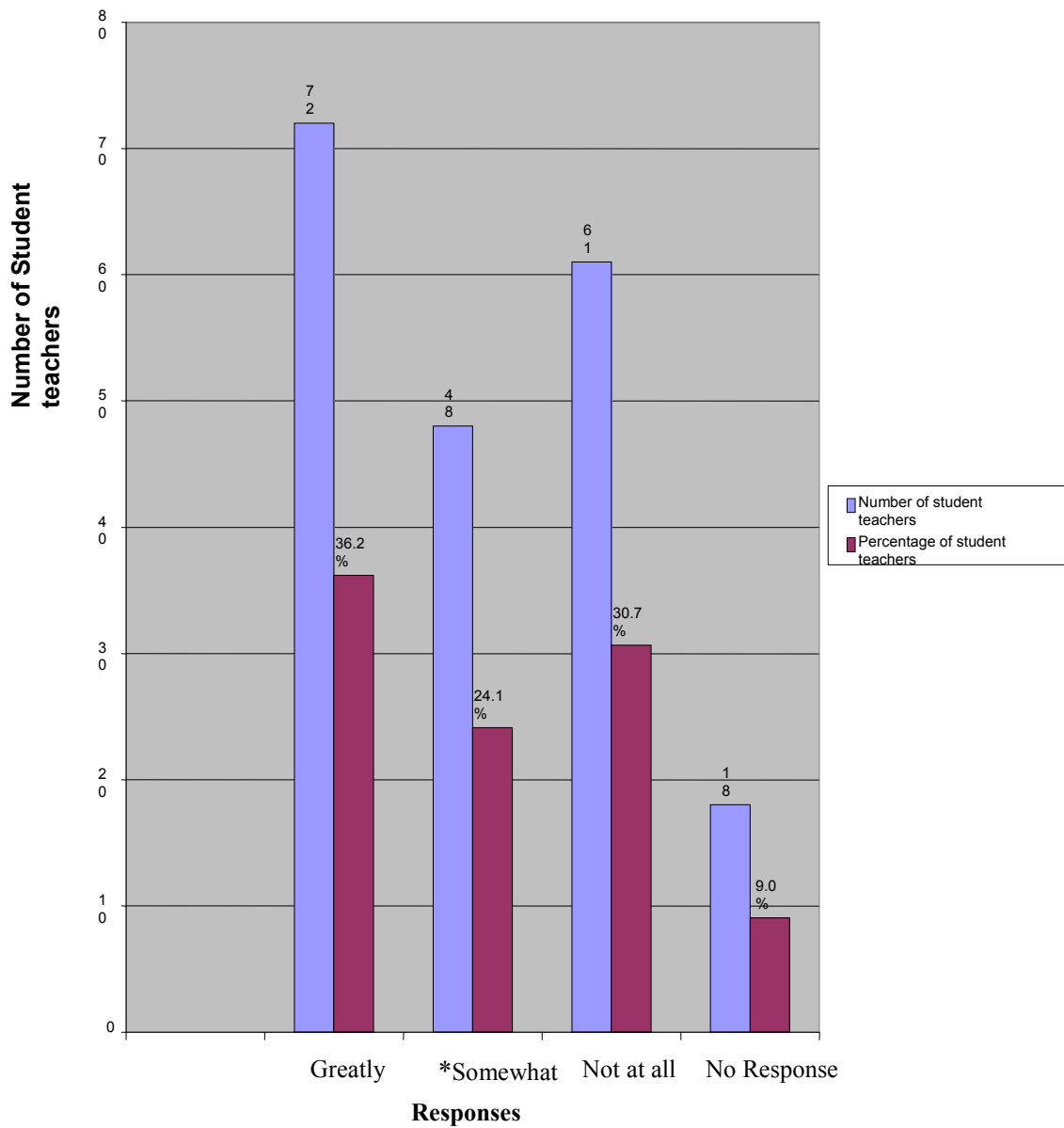
4.15 The Impact of ICT integration on the student teachers’ learning.

This section presents the perceptions of the student teachers on the impact of ICT integration on their learning. The information is presented in two parts. The first part reports on the responses whether they believed that ICT integration has changed the way student teachers do their school work. The second part presents the student teachers’ rating of their experience and comfort levels in using ICTs for their school work.

4.15.1 Student teachers’ responses on ICT integration has changed the way they do their school work

When the student teachers were asked to indicate whether they believed that ICT integration had changed the way they did their school work, 36.2% of the student teachers responded ‘greatly’, 24.1% of the student teachers responded ‘somewhat’, and 30.7% of the students teachers responded ‘not at all’. About 9% of the student teachers did not respond to this question. The results are given in Figure 5.

Figure 5: How ICT integration has changed the way the student teachers do their school work (N=199)



*The word “somewhat” in this study means two things (1) to a small degree or extent (2) to a moderately sufficient extent or degree.

If one looks at the responses of 'greatly' and 'somewhat' in Figure 5, it can be concluded then that ICT integration had changed the way the student teachers did their school work. The responses in the "not at all" category might have been due to the lack of computers or properly functioning computers at the Colleges of Education, which was the answer selected by 81.4% of the student teachers on the questionnaire as given in Table 28. Another conclusion is that ICT technical problems and ICT classroom experiences had an influence on the way the student teachers perceived the integration of ICT in supporting their school work. Another possible conclusion is that student teachers were not simply convinced that the integration of ICT had changed the way they did their school work.

4.15.2 Student teachers' rating of their experience and comfort levels in using ICTs

Similar to the teacher educators, the student teachers were also asked to rate their experience on a scale of one to four (4-"a lot of experience", 3-"some experience" allocated, 2-"little experience", 1-"no experience") and their comfort levels also on a scale of one to four (4-"very comfortable", 3-"moderately comfortable", 2-"would need some help to feel comfortable",1-"would need a lot of help to feel comfortable"). The student teachers' responses are given in Table 30.

Table 30: The average rating of experience and comfort levels of the student teachers in using ICTs (N=199)

ICT applications	Av. rating of experience	Standard deviation (sd)	Av. rating of comfort	Standard deviation (sd)
Use of computers in general	2.4	1.029	2.3	1.153
Word processing packages	2.1	1.134	2.0	1.115
Spreadsheets	1.9	0.982	1.8	0.965
Databases	1.6	0.904	1.5	0.820
Graphical applications	1.7	0.955	1.7	0.926
Presentation software (for example, PowerPoint)	2.0	1.146	1.9	1.048
Desktop publishing	1.6	1.163	1.6	0.884
Internet software (for example, Netscape, Internet Explorer)	2.1	0.892	1.9	1.121
Search engines for the Internet	1.9	0.893	1.8	1.116
Simulation Programmes	1.5	0.808	1.4	0.800
Drill/Practice Programmes/Tutorials	1.4	0.875	1.3	0.636
e-learning initiatives	1.5	0.775	1.4	0.802

Note: The standard deviation was calculated on the actual number of responses per item. Some student teachers did not respond to some item and reasons were not provided.

As can be seen from Table 30, the student teachers' average rating scores in the experience column were consistent with the ratings in the comfort column. Not surprisingly, this pattern of ratings was similar to that of the teacher educators shown in Table 11. The same inferences could, therefore, be made from Table 30 that the student teachers needed to have the experience in the use and integration of ICT in order to feel more comfortable in handling it in the classroom.

The average rating scores between three and four which did not appear in Table 30, would have meant the experience and comfort levels of student teachers to be more at ease in using and handling ICTs. Average rating scores between one and two meant that the levels of experience and comfort of students in using ICTs did either not exist or were minimal.

When analysing, the standard deviation presented also in Table 30, the variance ranged from 0.775 to 1.163 for experience and 0.636 to 1.153 for comfort. The small standard deviations suggest that the ratings were close to the mean in both experience and comfort. These findings were similar and consistent to Table 11 which provided the mean and standard deviations of experience and comfort levels of teacher educators in using ICTs.

4.16 Summary

This chapter provided the data on the perceptions of teacher educators and student teachers on the use and integration of ICT. The data was collected through the interviews, questionnaire, observations and document analysis. The next chapter discusses the findings of the study.

CHAPTER 5: DISCUSSION OF FINDINGS

5.1 Introduction

One of the main reasons for conducting this study was the perceived limited use and integration of ICTs in teacher training programmes in Namibia. This chapter provides and discusses the main findings of this study. The discussion is presented according to the themes outlined in Chapter 4. These themes are:

- (i) Teacher educators' and student teachers' perceptions of the use and integration of ICT into teaching and learning;
- (ii) The extent to which teacher educators integrate and use ICT in their teaching and professional development;
- (iii) Constraints that hinder the use and integration of ICT;
- (iv) The impacts of ICT on the implementation of the teacher education curriculum;
- (v) The extent to which specific e-learning methodologies are implemented and supported by the available infrastructure; and
- (vi) The ICT strategies and practices in teaching and learning.

5.2 Teacher educators' and student teachers perceptions on the use and integration of ICT into teaching and learning

As shown in Table 5 and Table 7, the teacher educators' perceptions of the use and integration of ICTs fell into two categories namely, positive perceptions and feelings of concern. The reasons to call these feeling of concern were explained in Chapter 4. A total of 54.3% of teacher educators held positive perceptions while 39.5% of the teacher

educators expressed feelings of concern on the use and integration of ICTs in teaching and learning. It was interesting to note that the positive perceptions as summarized in Table 6 appeared to fall into three categories which were seen as useful to the learning situation, teaching situation and general use of ICTs in education and social life.

The feelings of concern, however, appeared to be influenced by diverse factors centred on the lack of time, limited understanding of the concept of ICT integration, lack of ICT resources and other factors (see Figure 2, Table 8 and Table 13). The findings confirm what has been reported in the literature, that negative attitudes towards the use and integration of ICTs may result among teachers mainly because of the lack of resources and not necessarily because of the lack of skills of the individual person (Lawton & Gerschner, 1982; Harrison & Rainer, 1992). It is also shown in the literature that attitudes and perceptions of teacher educators are influential in driving ICT integration forward (Almusalam, 2001). Teachers who have positive perceptions on the integration of ICT have been found to use ICT in their own teaching and learning (Albirini, 2006).

This study revealed important characteristics that the feelings of concern teacher educators and student teachers hold towards the use and integration of ICTs could cause some reluctance to implement ICTs in their teaching and learning activities in the classroom. The teacher educators and student teachers who displayed a more positive perception and/or attitudes towards ICT integration affected the level of the use of ICT integration activities that occur in their classrooms. Muffoletto and Knupfer (1995, p.

163-164) have observed that, “it is important to realize that the teachers’ existing attitudes, skills and working habits will have a great influence on their acceptance, style of implementation, and outcome regarding educational computing”.

A study by Delcourt and Kinzie (1993) has noted that teachers might have positive attitudes towards the use of technology. However, this did not make them qualified to teach with it or put them at ease in using and integrating it. Teachers should exhibit one element of attitudes – self-efficacy. If teachers are to use and integrate technology into their teaching, they must feel “self-efficacious” about using and integrating it (Dupange & Krendl, 1992; Office of Technology Assessment, 1995). Self-efficacy is defined as “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is not concerned with the skills one has but with the judgments of what one can do with whatever skills one possesses” (Bandura, 1986, p.391).

In concluding this section, the findings painted a relationship between teacher educators’ and student teachers’ skills and attitudes towards ICTs and their use of ICTs in teaching and learning. The more confidence in their ICT skills teacher educators and student teachers had, the more enthusiastic they were and the more likely they were to use and integrate ICTs in their teaching and learning activities.

The overall perceptions of the student teachers towards the use and integration of ICTs were positive. The student teachers viewed the use and integration of ICTs as one of the ways that made their lessons easier to understand and more interesting for students. Statements from the student teachers on how ICT use and integration made lessons easier to understand and interesting are presented in Table 22. The student teachers also indicated that the integration of ICT made the storage of information easier, facilitated the improvement of writing skills and served as a source of motivation. This finding confirmed what is reported in the literature that technology integration has the potential to increase the motivation of learners (Anderson, 2000) as well as having positive effects on the writing skills of learners (Cochran-Smith, 1991).

5.3 The extent to which teacher educators integrated and used ICT in their teaching and professional development

The second research question addressed the extent to which teacher educators integrated and used ICT in their teaching and professional development activities. The degree to which teacher educators integrated ICTs in teaching and learning appeared to be hampered by a lack of ICT resources available at the Colleges of Education as shown in Figure 2 and Table 8. About 53.1% of the teacher educators indicated that they were using ICT and e-learning to support teaching and learning. The factors that were perceived to facilitate the successful adoption of ICT integration at the Colleges of Education were:

- (i) The technical support systems that have been put in place, that is, appointments of computer technicians, analyst programmers, computer caretakers, continuous professional development and support opportunities (assistance from colleagues who were knowledgeable or ‘who know’, ‘whom on call’ as they were called at some colleges).
- (ii) The continuous professional development and workshops on ICT, specifically designed to accommodate the level of ICT innovation and adoption amongst various groups of teacher educators at the Colleges of Education.

In addition, the extent to which the ICTs were integrated was affected by the limited understanding of the rationale of ICT integration in teaching and learning, lack of understanding that the provision of ICT resources was critical in the integration of ICT, lack of proper planning and lack of time for ICT integration.

Although teacher educators and student teachers were generally optimistic about the integration of ICT in teaching and learning, the integration of ICT concentrated mostly on using the common productive software package like Word Processing, PowerPoint, Excel and Spreadsheet. Both teacher educators and student teachers seemed to see the function of technology as tools for displaying and presenting information, for example, visual presentation of complex information, modelling of information and others. This finding is similar to what Bialobrzeska and Cohen (2005, p. 32) called functional practice because “learners (student teachers) use the computer in basic and functional ways to do things

that the computer can do well such as word processing, document presentation, spreadsheets, producing graphs, and searching for information on the Internet". It is also representational function because it illustrates how computer technology is used to "re-present or reproduce information" and not necessary to "generate thought" (Hokanson & Hooper, 2000, p. 547). The concept to "generate thought" briefly means that technology is used to create a platform for new learning opportunities that stimulate critical and higher thinking skills. Teacher educators and student teachers from all the Colleges of Education pointed out the advantages of integrating ICT in teaching and learning such as, making work easier, saving time, allowing for modification, storing and retrieving of information with great ease, allowing sharing of skills and knowledge of subject content through co-teaching, supplementing printed materials and others. It should be pointed out that during the interviews and observations, teacher educators seemed to perceive integration of ICT as something 'additional' rather than making it part and parcel of instruction. This seems to pose some dangers to accepting the use and adoption of ICT integration as they would think it is their choice to do it or not.

With regard to the subjects in the BETD programme that integrated ICT most, the majority of student teachers (79.9%) reported that ICT integration was mainly taking place in IMTE, which made sense in that ICT integration was a curriculum requirement for IMTE. There was, however, a significant number of student teachers from all the four Colleges of Education who expressed dissatisfaction with their experiences with regard to the use and integration of ICTs in IMTE. The major dissatisfaction appeared to be

associated with inadequate teaching time for IMTE classes which was perceived to be short, the style and a lack of in-depth covering of the course content which was perceived to be too basic, staff limitations (staff perceived as not possessing sufficient ICT knowledge and skills) and lack of practical application of activities and skills related to other subjects offered in the BETD programme. Moreover, if much of the ICT integration is only happening in the IMTE subject, then this is a problem because “technology (ICT) is meant to be cross-curricular rather than become a separate course or a topic itself” (Flanagan & Jacobsen, 2003, p. 124). The Society for Information Technology and Teacher Education (SITE) (2002, online) has also recommended that:

Technology should be infused into the entire teacher education program. Throughout their teacher education experience, students should learn about, learn with, and learn to incorporate technology into their own teaching. Restricting technology experiences to a single course, or to a single area of teacher education, such as the method courses, will not prepare students to be technology-using teachers.

With regard to insufficient knowledge and skills of IMTE teacher educators, this could probably be attributed to the current teaching arrangements in place at some of the Colleges of Education. Most IMTE teacher educators indicated during the interview that they were teaching subjects than those which they were originally appointed for but because they did not have enough teaching periods on their timetables and showed interest in ICT, they found themselves offering IMTE classes (see also Table 4). At Windhoek College of Education, teacher educators were allocated to teach IMTE based on their expertise on the components of the syllabus, for example, library information skills were taught by the librarian. With this scenario, one teacher educator was

specifically responsible for one component of the syllabus. The advantage of having this arrangement was that the student teachers were given an opportunity to be taught by a specialized person in that particular syllabus component. The disadvantage, however, was that there would be no capacity building for teacher educators in the subject as they would only teach what they knew best and probably would not learn other components of the syllabus.

As to the use of ICT for professional development, there was little evidence to indicate how teacher educators were using it for professional development activities. This could be attributed to the fact that teacher educators did not have the knowledge and skills that are required to use ICTs to enrich their professional development activities. The lack of ICT resources at the Colleges of Education also hindered the use of ICTs for professional development activities by teacher educators.

5.4 Constraints that hindered the use and integration of ICT

The third research question looked into the constraints that hindered the use and integration of ICT at the Colleges of Education. Looking at the results of this study, the constraints and challenges that were perceived by participants seemed to fall into two categories namely, organizational and individual.

Some examples of the organizational and individual constraints to the successful adoption of ICT integration identified by the teacher educators and the student teachers in this study could be divided between individual and organization:

(a) Constraints to the individual

- (i) lack of time,
- (ii) lack of ICT knowledge, and
- (iii) lack of motivation and interest.

(b) Organizational constraints

- (i) limited ICT and e-learning facilities/infrastructures,
- (ii) lack of computers,
- (iii) limited internet facilities,
- (iv) insufficient budget allocation to ICT equipment,
- (v) classroom set-up/design, and
- (vi) class size.

Organizational constraints were those which were concerned with the challenges and responsibilities that were related to the administration of the colleges as organizations, while individual constraints had to do with the abilities, skills and creativity of a person to facilitate the integration of ICT into teaching and learning. With regard to organization constraints, the teacher educators felt there was nothing that they could do since they did not have power to make decisions.

Further analysis that negatively impacted ICT integration seemed to be divided into four broad categories. These categories were: ICT background, infrastructure, access and college administrative issues.

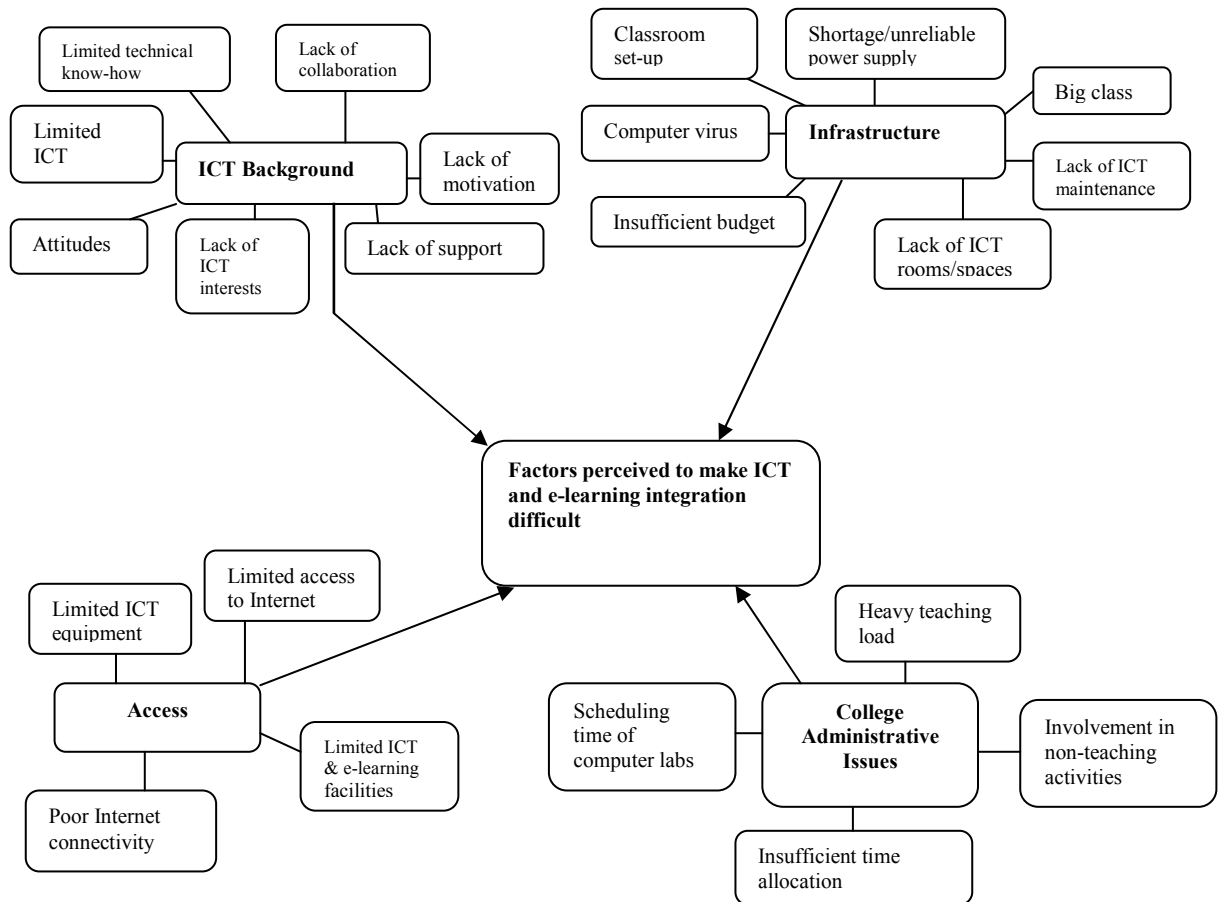
ICT background involved issues related to limitations in the areas of ICT pedagogy of teacher educators, technical know-how for both teacher educators and student teachers, technical support of ICT staff members, attitudes of both staff and student teachers, interest for both staff and student teachers and motivation for staff members and student teachers.

Infrastructure included issues of ICT sustainability such as computer viruses, lack of ICT maintenance and insufficient budget allocation to ICT issues. Other issues that fell under the infrastructure category included big class sizes, lack of ICT rooms/space, classroom set-up and shortage and/or unreliable power supply. Factors that were perceived to make access to ICT integration difficult included poor Internet connectivity, limited access to Internet, limited ICT and e-learning facilities and limited ICT equipment.

College administrative issues that were perceived to make ICT integration difficult were heavy teaching loads, scheduling time of computer labs, insufficient time allocation for ICT integration or overcrowded timetable and involvement of teacher educators in non-teaching activities at the colleges (see Figure 6).

These barriers seemed to be faced by teacher educators and student teachers across all the four Colleges of Education. The finding on these barriers was similar to studies done in other parts of the world (Ertmer, 1999). What the Colleges of Education need to bear in mind is what Ertmer (1999, p.51) said who warned that if even these barriers are removed, “teachers would not automatically use technology” because it had been observed that such barriers would “continue to ebb and flow throughout the evolutionary integration process (Ertmer, 1999, p.52).

Figure 6: Visual drawing illustrating the factors perceived as the most problematic that made ICT and e-learning integration difficult.



Another constraint which was seen as a barrier to the integration of ICT was the location of ICT equipment and tools. The way in which ICT equipment were organized at the Colleges of Education was causing some problems concerning its accessibility. The teacher educators and student teachers in this study complained of having little access to ICT equipment (see tables 13 and 28). In all four Colleges of Education, ICT equipment, especially computers, were placed in computer laboratories except for Keyboard and Word processing classes which were offered at Ongwediva and Windhoek Colleges of

Education. The two institutions have their own dedicated computer classrooms for Keyboard and Word processing classes, where about 15 students from each college majoring in that area had access to these venues. In all colleges, computer labs were timetabled for IMTE which is a curriculum requirement for ICT integration. The research studies conducted by Mann, Shakeshaft, Becker and Kottkamp (1999) have pointed out that the use of computers placed in the classrooms in contrast to the ones placed in the laboratories can lead to an increase in improvement of student accomplishment, add to teacher self-confidence level, and promote a broad spectrum of ICT integration within the curriculum. Another study by Sheingold and Hadley (1990) found that the location of technology can be a barrier to the integration of ICT. Their studies have suggested that schools, if possible, should make computers available in both labs and classrooms. Their views were also supported by Pisapia (1994, p.3) who observed that placing computers in the classrooms was becoming a popular choice because “the classroom frees the teachers to use them as needed” unlike the labs that would need some sort of arrangement in terms of scheduling. Colleges of Education can consider choosing the best ICT arrangement based on their teaching and learning needs and priorities.

Another constraint was the computer virus infections at the Colleges of Education. For sustainability of ICT resources and tools, especially computer technology, Colleges of Education need to regularly do live-updates and install anti-virus softwares onto all of their computers. At the moment, live-updating was not happening as required. Seventy five percent of the teacher educators who were interviewed complained of computer

viruses at colleges that often deleted their files or corrupted the whole operating system which eventually resulted in disrupting their efforts at integrating ICT in their teaching and learning. This created a fear, especially amongst teacher educators, of taking work home and using their own personal computers as they became afraid that their home computers would also become infected. At one college, the student teachers were not allowed to bring memory sticks and discs into the computer labs as there were no anti-virus software installed on these computers. The student teachers only saved their work on the desktop folders created for them by their teacher educators. This made it extremely difficult for student teachers to modify their work at a later stage as they would only get time to continue their work when the computer labs were open and that was often restricted to class time.

Another problem related to viruses was that participants, in particular teacher educators, complained that at one college one could find different anti-virus softwares installed on computers. For example, one department would have Norton Anti-Virus and another department will have Trend Micro PC – Cillin or Symantec Anti-virus. This, according to participants, made it difficult to control as most of these anti-viruses softwares did not have the same features and capabilities to detect and remove the viruses. To sustain college computers, sufficient funding should be allocated to acquire effective anti-virus software and standardize the software throughout the Colleges of Education.

Another constraint that did not really come from teacher educators, but was picked up from the discussions with the student teachers and which the researcher found crucial, was that of copyright. The student teachers talked of downloading music, software, games and other educational content materials. In one assignment given, the student teachers were asked to integrate texts, audio and graphics into the lesson. Most of the music and graphics were downloaded from the Internet. Student teachers were, however, made aware of copyright issues through a topic in IMTE entitled, *Understanding appropriate ethical, legal, social and safety usage of ICTs for teachers and learners*. Through this topic, student teachers were expected to demonstrate competency in creating an “Appropriate User Policy (AUP) for learners which specifies requirements for them in terms of cyber-ethics, cyber-safety, and using computer protection procedures (anti-virus software and others)” (Ministry of Education, 2006, p. 13). There was still a need to continuously alert the student teachers on proper Internet and educational software citations, because if not intensively addressed, it might lead to the exploitation and abuse of other people’s original work, which is a clear violation of copyright. This might also limit their thinking capabilities and creativity as most of the time they might depend more on the Internet for information than producing their own ideas.

Another challenge that seemed to pose some problems to the ICT integration was the lack of awareness about ICTs by the Colleges of Education management. About 43.2% of the teacher educators and 55.3% of the student teachers indicated that there was a lack of adequate awareness about ICTs by the Colleges of Education management. This is a

worrisome result. If the Colleges of Education management are neither supportive nor familiar with the ICT issues, then ICT integration would not be able to take-off at the expected level. This was also acknowledged by the Technology Standards for School Administrators which indicated that leadership and vision were important ingredients in the ICT integration development (Knezek, Rogers & Bosco, 2001). College management needs to be critically engaged in ICT issues to provide moral support and an enabling environment which will result in ICT integration becoming part of the college culture as suggested by Martinez (1999). It is the opinion of this researcher that the Colleges of Education's management and leadership needs to ensure that ICT innovations are made possible, promoted and mainstreamed into the college curriculum. This would help inspire and create enthusiasm towards the integration of ICT. Their low involvement and lack of awareness of ICT issues could create apathy and resistance towards the integration of ICTs at the Colleges of Education.

5.5 The impact of ICT on the implementation of the teacher education curriculum

The fourth research question looked at the impact of ICT integration on the implementation of the teacher education curriculum at the Colleges of Education. In some lessons during the field observations, the researcher observed the process of ICT integration strategies and practices that linked the three important aspects of teaching and learning. That is, the curriculum, which has knowledge and skills at the centre, the unit outlining the topic to be taught forming the next layer and the lesson planning and

delivery which includes lesson objectives and competencies making up the outer layer. These findings are consistent with Wang and Woo's (2007) research results which indicated the same three layers. A clear illustration of this was when a student teacher during the SBS used a PowerPoint Presentation as an ICT tool to support his Life Science content and his learners' activities in a lesson on plant and animal cells in Grade 8. A slide show showed the arrangements of bricks in the wall to explain that cells in organisms were arranged like bricks. ICT was applied to broaden the learners' understanding of the concept of cell structures, while an additional handout of the PowerPoint presentation was used to supplement the textbook information which has been taught.

There were also some elements of curriculum issues that appeared to be grounded in the constructivist learning theory emerging from this study such as collaboration, responsibility, exchange of ideas, learner-centredness, recognition of prior learning experiences, mutual learning and knowledge construction. Statements from the teacher educators and student teachers such as 'learning by doing', 'it makes it possible for independent thinking and learning', 'changes the role of the teacher to that of facilitator', 'it enhances collaborate learning', 'creates an atmosphere for students to take responsibility of their own learning,' 'allows students to construct real examples,' 'it opens up the curriculum' all belong to the mode of teaching and learning which is better facilitated by constructivist approaches. The following two quotations from different

teacher educators expressed some important elements of the constructivist values and approaches to teaching and learning situations.

It (ICT integration) tries to encourage learners to construct their own knowledge, be initiative, and involved in the development of their own learning. I think it promotes that in a way that you give students an independence to look for and to select their own information. There is also a lot of collaboration with one another (sic).

I would expect students to take responsibility of their own learning to be more active in classrooms. Therefore, a lecturer would likely be more successful to implement activities that are more learner-centred because students would be able to participate more as they have more access to information on their own. I can say it widens the dimension from which information is gained, therefore one would definitely say it is in support of constructivism.

Constructivist learning theory advocates learning through meaning creation. The following quotation from another teacher educator illustrates this point.

On the other hand learning is adaptive. Learning cannot be forced on someone. It is me who should try to find meaning to what I am learning and then apply it to my everyday life. For whatever you are giving me, I make meaning of what it means to me. But if you bring in ICT, it promotes the concept of 'learning by doing' because they would be allowed to practice it. Whether they see it on TV, practice makes them perfect.

In an IMTE test given to second year student teachers at one college, a teacher educator asked the student teachers two direct questions on how the use and integration of ICT linked to the constructivist learning theory. The first question asked: *“The use of technology in our classrooms is central to constructivism, the two concepts are married. The Namibian education system emphasises that learning should be centred in/around the learner and the application of technologies (ICTs) in education should be encouraged.*

What are your views on this aspect?" In attempting to answer this question, one student teacher wrote:

My views on this aspect are that I totally support the Namibian education system, as we all know learner-centred education means learners should be more involved in their learning but not to rely only on the teacher but on their experience as well and ICT makes this easier. ICT makes it easy because it involves activities that promote learner-centred education by offering a lot of different information regarding all subjects and development for knowledge through the vast amount of knowledge that the learners will be exposed to. ICT relates or links what learners are learning to real world e.g. using a video to teach learners about how volcanoes erupt will promote learning and learners will be more aware of how a volcano erupts from seeing it on the video. ICT broadens learners' understanding of concepts through providing different research web-sites which learners can use to engage in collaborative learning. Learners can use ICT to design different learning sets where they can continue building up on the information they learn in class outside their classrooms independently without the involvement of their teachers, these reasons given alone make me believe that ICT not only improves learner's learning into meaningful and constructive learning but it also widens their understanding and knowledge through different types of ICT equipment such as television, radios etc.

In the second question, the teacher educator tested the students by asking them to answer the following question: *"Technology integration methods are based in both learning theories and teaching practice, thus as teachers we have to have sufficient knowledge on these learning theories and technology skills to apply them to achieve our instructional objectives. Describe how a teacher would ensure that his/her learners achieve the following constructivist's characteristics while using ICTs to aid the learning process: construction of knowledge, learners' active engagement, reflective learning, collaborative learning and inquiry based learning. Reference to ICTs is crucial in attempting this question."*

In a sample of answers on this question, one student teacher showed a clear understanding of designing ICT integrated learning activities on each of the above mentioned elements of the constructivist learning theory. To highlight a few, the student teacher related the lesson to learners' previous knowledge, used a variety of resources to facilitate better understanding of the lesson, encouraged dialogue among the learners and promoted learners' responsibility towards their learning (see Appendix L).

About 72 (36.2%) of the student teachers indicated that the integration of ICTs has changed the way they did their school work (see Figure 5), while Table 27 provides evidence of how the student teachers' used and integrated ICTs into the curriculum.

Another impact of ICT integration into the teacher education curriculum was when the teacher educators and student teachers acknowledged the core elements in the theory of adult learning such as shared learning, flexibility, hands-on activities, collaboration, self-learning, responsibility for own learning, recognition of prior experience and motivational factors. Knowles (1980, p. 44) assumes that adult learners are self directed and as such, argued that, "as a person matures, his or her self-concept moves from that of a dependent personality toward one of a self-directing human being". Based on this supposition, adult learners are more inclined towards the concept of self-directed which would make them refuse to accept any type of learning that is forced on them. Caffarella (1993, p. 25-26) compared the concept of self-directed learning to a "self-initiated process - whereby the learner takes primary responsibility in planning, implementing and evaluating his or her

own learning”. The following two quotations from two different teacher educators are used as examples to link some common issues the teacher educators mentioned during the interviews to Knowles’ theory of adult learning with regard to the integration of ICT in teaching and learning.

Teacher educator 1:

These are young adults and some of them just graduated from schools. I am now speaking on my own specific students in Design and Technology. Most of them are from vocational schools such as Valombola, VTC WHK, Rundu and so forth. None of them were employed before. They just finished and then they come to the college. I have four students from secondary schools only. The motivation is still there to work with modern technology. I do not really have a problem of trying to motivate them to adapt to new technology. They are already willing and eager to use them.

Teacher educator 2:

These are adults but one can see that they are different types of adults. Students nowadays when they come to colleges, you will find some students who are more knowledgeable in some ICT tools. And you could clearly observe that they have an interest in ICT. Is just that you as a teacher educator should use that opportunity to train that person on how to use it better in the classroom or in a teaching environment. So, when students come, some of them are even more computer literate. You have now to direct them on how to make good lesson plans by integrating ICT. For example, those in LP (Lower Primary) can learn how to make some drawings and diagrams for small children. The other day I showed students how to teach some concepts in mathematics – multiplications and divisions. So, the generation tells you that the interest is there now in comparison to the older generation. We should try then to exploit that opportunity. For me, ICT is not for the lecturer doing the work but lecturers and students coming together to come up with a good product.

In the first quotation, the teacher educator has reflected on the past formal experiences of students and valued it as an opportunity that motivated his students and could serve as a

starting point to organize learning materials and activities. He has also established a need and a reason why these students wanted to study as well as recognizing that these design and technology students have the experience of being at vocational schools and would bring that experience to their future classroom practices. Finally, the teacher educator has developed a better consciousness of different needs of students, which influenced his teaching techniques because he acknowledged that students were already motivated to study and learn.

In the second quotation, the teacher educator has also recognized the different types of adults in terms of their ICT experience and knowledge in ICT tools. He has thought about how to make learning activities more relevant and practical to classroom situations and education. He understood his role with regard to planning teaching strategies and learning activities, which were collaboration, support and team learning. The same teacher educator has created a sense of responsibility of adult students' own learning in terms of designing or coming up with media which could later be used in their classrooms.

Furthermore, adult education theory also talks about the issues of authority and divergence. Teacher educators and student teachers are, therefore, expected to deal with the issue of authority and disagreement in their learning development. The second teacher educator quoted above seemed to be aware of his authority when facilitating teaching activities. Knowing and acknowledging issues related to authority and other principles in

adult learning would add value to the way teacher educators approached the student teachers and the way they designed their ICT learning activities.

The findings of this study also indicated that all 20 teacher educators and the 25 student teachers interviewed felt empowered and emancipated when using and integrating ICT into their teaching and learning, which is an indication of ICT integration in the teacher education curriculum. This finding is in line with Saye (1997) who found that technology creates learning situations that empower students because it provides them with alternatives in their learning, contributes to building of knowledge and meaning, improves their problem solving capacities and assists them in making their own decisions. Since critical theory emphasises social transformation, according to Marrow (1994), changes brought about as part of ICT integration into teaching and learning processes are important in understanding how technology serves as a 'vehicle' which contributes to concepts of emancipation and empowerment.

The concepts of emancipation and empowerment are two critical components of critical theory discussed in relation to the integration of ICT in to teaching and learning which has created in teacher educators and student teachers a desire to learn and explore things from a variety of different sources. It has created a need for knowledge which is based on the social reality of wanting to search for more information, for students to think for themselves in order to improve their social performance, which is teaching. In support of the above, one teacher educator observed that:

There is a feeling among my students that they can do things their own ways, for example, the other day I gave them an assignment to design some safety posters. Almost all of them went to the internet and looked at how things could be done. They really came up with things that I never heard of even. It is somehow contributes to the concept of emancipation. Students are not limited to the information from the library and textbooks. They go out and search for more information.

What has also been observed in relation to the critical theory, is the creation of a more genuine democratic involvement of students in decision-making in their learning process. Teacher educators and student teachers seemed to see each other as equal partners in making decisions, thus the need for consultations with regard to learning activities was seen as important.

Looking further at the curriculum issues arising from this study, there were two older teacher educators who felt that ICT, as a part of teaching media, was mainly a vehicle which delivered learning instructions but did not really change and/or contribute towards curriculum knowledge. This finding supports those of the National Centre for Education Statistics (2000) in the United States of America that reported that teachers with many years of teaching experience were less likely to use computers in their lessons compared to teachers with fewer years of teaching experience. This could be because teachers who have just graduated recently from universities might have been exposed to ICT issues in their training as compared to those teachers who completed their training a long time ago when ICTs were not part of their classes. In contrast, a study by Albirini (2006) found that age was not an important factor in the use of ICT as compared to the teachers' attitudes towards ICT.

In addition, the two older teacher educators seemed to support an old argument that was made by Clark in 1983 and later heavily debated in the literature. Clark (1983, p. 445) argued that media, including ICT are, “mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition.” The researcher sees the danger of such kinds of argument as this might lead people to unnecessarily question the relevance and the need for ICT integration into teaching and learning. As Kozma (1994, p. 18) advised, we need to change from asking questions such as whether media, and in this case ICT, influenced learning to; “In what ways can we use the capabilities of media to influence learning for particular students, tasks and situations?”

ICT should be used as a source of transmission of information in order to improve teaching and learning or as one teacher educator put it, ‘a vehicle which can facilitate teaching and learning’. However, the majority 74 (91.4%) of the teacher educators in this study relied heavily on giving information through lecturing. The teacher educators resorted to the teaching method that they were familiar with and did not really adopt an ICT integration based approach in their teaching. This result was similar to that propounded by Becker (1991, p. 18) who suggested that, "the way that teachers teach is a product of their own schooling, training, and experiences as teachers". In addition, Murray and Kabayashi (1987, p. 18) noted that changing old classroom teaching practices in order to master new ones, "entails not only the expenditure of energy but also

the risk of a teachers looking foolish by committing embarrassing errors when attempting new techniques in the classroom". In Namibia, Ilukena (1998, p.7) noted that, "we tend to be comfortable with what we know and understand. We establish routines and become comfortable with procedures. The moment there is a shift in the relationship, the moment we are confronted with a paradigm shift, our comfort zones are being challenged, and this may lead into uneasiness because we will be required to adjust our position". He continued, "... in this process there is a tension because of the uncertainty of the situation. There is confusion because it is a new situation requiring new thinking and approach. There is anxiety because we may be breaking new grounds, there is pain and fear because starting anew can easily be understood to mean experimenting". As indicated by Fullah (1992, p. 24) with regard to changes in education as a result of reform "when complex change is involved, people do not and cannot change by being told to do so. Effective change agents neither embrace nor ignore mandates. They use them as catalysts to reexamine what they are doing".

ICT integration can be a complex teaching and learning endeavour as it demands that teachers embrace changes and challenge the unknown. As argued by Bangkok (2004), it is important that teacher educators are given the support that is needed for them to integrate ICT because ICT integration cannot be fully implemented if there is no change in the learning and teaching paradigm (Bangkok, 2004). Such ICT innovation requires, "people with flexible enquiring minds and critical thinking skills, capable of adapting to new situations and demands and continuously learning from own initiative" (Government

of the Republic of Namibia, 2004, p. 30). Because of these innovations, Vision 2030 is therefore calling for, “the education system to shift from imparting knowledge in the form of large quantities of information to imparting learning competencies that would enable learners to cope with and take advantage of the rapidly changing world” (p.30).

5.6 The extent to which specific e-learning methodologies were being implemented and supported by the available infrastructure

The fifth research question looked at the extent to which specific e-learning methodologies were being implemented and supported by the available infrastructure at the Colleges of Education. The findings on this specific research question indicated that having onsite technical support systems and continuous professional development programmes for teacher educators were two important elements that could support the use and integration of ICT successfully. The supporting systems in place at the Colleges of Education are presented in Figure 4. Although these systems were in place, teacher educators indicated during the interviews that they were relying more on their colleagues for the immediate support than other support systems as presented in Figure 4. This situation seemed to suggest that even if the supporting systems were put in place, they were inefficient in providing the technical support that the teacher educators needed. Forty five (55.6%) of the teacher educators and 135 (67.8%) of the student teachers indicated that there was a lack of technical support provided at the Colleges of Education. This situation frustrated and discouraged teacher educators and student teachers from integrating ICT in their teaching and learning because they were not sure whether the

support would be available to them immediately should they experience a problem. This was also noted in Tong and Trinidad's (2005) study, that the lack of technical support caused the teachers to adopt ICT reluctantly. It is, therefore, clear that technical support systems at the Colleges of Education needed to be reviewed as they play a major role in the adoption of ICT by both student teachers and teacher educators.

Another issue related to support was when some teacher educators pointed out that the management at their Colleges of Education was reluctant to support the use and integration of ICT activities and needs. Such a situation would not enhance the integration and use of ICTs at Colleges of Education. The leadership and management of an institution are the most important factors in ensuring that technology becomes part of the institution's culture (Anderson and Dexter, 2000) and in the implementation of any innovation (Fullan, 1992). One would, therefore, expect the college management by nature of their positions and responsibility for driving the strategic vision of their institutions, which includes the use of technology, to be sensitive and supportive of ICTs use and integration in their institutions. In order to promote the integration of ICT at the Colleges of Education, college management needed "to join in rather than sit (ting) by the side" (Baylor & Ritchie, 2002, p. 412). This is also in line with Namibia's Vision 2030. In order to achieve Vision 2030, Colleges of Education need to develop a vision that drives and embraces the use and integration of ICTs. The vision is important because it "gives us (Colleges of Education) a place to start, a goal to reach for, as well as a guidepost along the way" (Ertmer, 1999, p.54).

With regard to continuous professional development programmes, teacher educators expressed the need for training. As cited by Nakuta (2000), most teacher educators at the Colleges of Education were familiar with the concept of continuous professional development and it is a concept that has been around at the Colleges of Education for a long time and widely accepted as part of college activities. The findings of this study revealed that in today's teacher education, there was a growing demand for possessing and updating knowledge and information. One way of achieving this was through a proper continuous professional development programme. Nakuta (2000, p. 3), a former teacher educator at one of the Colleges of Education in Namibia, views a continuous professional development programme as a "process of educating and training, which should help individual staff members to grow, and to acquire and apply newly found information, knowledge, skills and attitudes". The same sentiments were expressed by Dusseldoff and Lazarus (1997, p. 137) quoted in Nakuta (2000) who noted that, "without on-going programmes and processes to encourage and support staff development, educational institutions or schools become out of touch with educational trends and teachers lose the sense of renewal and inspiration which is such an essential part of meaningful education". It is, therefore, imperative that teacher educators are offered professional development opportunities in ICT integration in order to support their teaching activities.

Fifty (61.7%) of the teacher educators indicated that they had received training on the integration of ICT and e-learning, while 27 (33.3%) of the teacher educators said that they

had not received any training. The list of trainings/workshops cited by the teacher educators is presented in Table 16. Looking at the training workshops that were mentioned in Table 16, 90 to 95% of these workshops were conducted by people outside the Colleges of Education and facilitated by NIED. Teacher educators complained that they did not attend training workshops because they were teaching when the workshops were being conducted. As pointed out by some teacher educators, it is important that the skills that are available within the staff at the colleges be utilized so that the chance to learn from one another is maximised. Teacher educators interviewed for this study said that there were some teacher educators at the colleges who were knowledgeable, especially members of Info-Tech Committee/ICT Committee and IMTE lecturers who could be used to train others. As one teacher educator suggested, “the Info-Tech Committee should help. Why do we have to search so called experts from outside. Why not use our own human resources that we are blessed with. I think that is where we should begin with”. Identifying the right people from within the college might also be more effective as they would always be available for immediate support. Based on both my prior teaching and college leadership experiences, teacher educators were more likely to be receptive to a colleague and a peer than a person from outside the institution. This was also revealed in a study by Angers and Machtmes (2005, p. 784) where one of the teachers remarked that, “peer tutoring has been a great way to boost confidence of some of my students”.

Three teacher educators believed that student teachers should be able to experience and see their teacher educators using and integrating ICT in their lessons at the college, if one expects them to integrate ICT in their classes at schools. These views are consistent with those by Russel and Korthagen (1995, p. 6) who suggested that, “teacher educators need to be learners so that they can respond to the changing circumstances of their work and constantly learn to do it more effectively. Teachers need to be learners for the same reason that the students of those teachers need, in turn, to be learners. Never before has the importance of learning been as vital to humanity as it is in these times of upheaval, uncertainty and change”.

However, what seemed to be a contradiction was when teacher educators complained that they did not have time to conduct and attend workshops, while at the same time they wanted colleagues from within the institutions to facilitate the ICT training workshops. Given these contradicting views, it is difficult to draw a conclusion. The interview excerpt from one of the teacher educators who complained bitterly during the interview serves as an example. He complained as follows:

I remember, because of time, you check on the college calendar we plan some ICT related activities. We wanted like a lot of ICT workshops, for example, we have this DSTV donated equipment. Because of time, we cannot achieve that. We are so busy. The other thing that, I would really advise and I do not know how many times I will repeat it, this ICT committee needs to be lead by someone who is not a teacher. A person who is a full administrator. Not someone who is also teaching. Because me heading it, you look at my timetable; I have 30 periods per week. I have classes in the mornings; I have classes in the afternoons; I have classes after break. I do not have time to pay attention to ICT. But if I was a full time ICT officer heading it, I think it would make a big difference. It (ICT committee) should be a division or a department on its own. So, the person would be responsible for all these

ideas, showing how to integrate. But that person should have some educational teaching experiences. But it should be someone who is not teaching. Free from all teaching duties. I know I am failing. I cannot head this. I have so many ideas which I cannot even carry out. Like now, I am working on a template of ICT activities. I can't even finish it. I am so busy. There are so many things like live updates. I am a senior lecturer and I am given full responsibility like a junior lecturer. I can't. I am so busy.

With regards to ICT resources, Colleges of Education need to identify and purchase these so that they are readily available to teacher educators. Teacher educators complained that specific software for their subjects was not available and if it was available they did not know how to use it. For example, if the training required the use of Microsoft Publisher to create a booklet or Microsoft PowerPoint to produce a lesson presentation, the software should be installed on computers. Presenting a training workshop without participants practising it would not help them that much. The lack of up-to-date software/hardware would adversely affect the training programme important to the integration of ICTs (Gulbahar, 2007).

5.7 The ICT strategies and practices in teaching and learning

The sixth and last research question investigated the practices that might be employed to enhance the use and integration of ICT and e-learning in delivering educational programmes in the Colleges of Education. The teacher educators suggested three strategies and practices that could be used to enhance the use and integration of ICT and e-learning in delivering educational programmes at the Colleges of Education. The first one was the need to change the attitudes of teacher educators to a more positive attitude towards ICT. This was also noted by Lawton and Gerschner (1982) who argued that the

successful use of technology in classroom situations depended to a certain degree on the teachers' attitude towards technology tools. The assumption here is that if teacher educators want to successfully use technology in their classes, they need to have positive attitudes to use and integrate ICTs.

The second strategy and practice suggested by the teacher educators was that a well structured ICT integration programme needed to be put in place at Colleges of Education. The teacher educators were not satisfied with the way ICT integration activities were planned and conducted at the moment at the Colleges of Education. They indicated that they sometimes could not attend to some ICT integration training and workshops owing to lack of time and heavy teaching loads. Five (25%) of the teacher educators interviewed said that they could not attend because they were not informed at all. The finding of this study revealed that programmes that involved ICT adoptions and innovations must be properly planned.

The third strategy and practice suggested by the teacher educators relates to training on the use and integration of ICT pedagogy. The teacher educators felt that they did not have the knowledge and skills to integrate ICT fully in their specific subjects. This finding is in line with Mandell, Sorge and Russel's (2002) study. They found that the pedagogy in the integration of ICT was instrumental when it came to influencing learning. It is important for Colleges of Education to conduct workshops that include pedagogical activities on the integration of ICT. This would serve as a good model for

student teachers to apply in their own classroom practices later. One must also take into consideration the fact that the technical personnel at the Colleges of Education such as the computer technician and analyst programmer, who provided most support to the teacher educators, were not pedagogically competent to support teacher educators. If the teacher educators do not have the understanding of ICT integration pedagogy, they would put much emphasis on 'learning about ICTs' than 'learning with or through the use of ICTs' (Jonassen, Peck & Wilson, 1999).

5.8 Using the theory on diffusion of innovations for ICT integration in teaching and learning

This section discusses the main elements in the theory of Diffusion of Innovations for ICT integration in relation to the findings of this study. An innovation such as integration of ICT and e-learning in any institution should take into consideration the rate of adoption of innovation amongst all the classical groups of the institution - innovators and adopters, early and late majorities and the laggards (Rogers, 2003). The researcher found this theory to be relevant because it addresses how various teacher educators at different levels adopt innovations. Looking at the results in this study presented in the previous chapter, Rogers's (1995; 2003) Diffusion of Innovation theory uses five attributes of an innovation which are essential in establishing the rate and acceptance of innovation. These attributes include: Relative advantage, compatibility, complexity, trialability and observability.

(i) Relative advantage

The underlying principle of this attribute is that if teacher educators are not able to detect the benefits of using the innovation, then the success of the adoption of the innovation will be suppressed. In this study, there were a number of examples from both teacher educators and student teachers which clearly pointed out the advantages of ICT integration in teaching and learning (see tables 5, 6 and 22). This was also observed with the two IMTE teacher educators who always tried to relate learning activities and assignments to the fields of study of the student teachers in the class. For example, if the student teachers were majoring in Social Sciences, most of the information that was used in the assignments and activities were related to Social Sciences so that the student teachers could see the benefits as related to their major subjects.

(ii) Compatibility

The assumption here is that the innovation should be compatible to the values, experiences and needs of individuals who should adopt the innovation. For example, the teacher educators who place value on the traditional ways of teaching and think that it is just as good as the innovation may not be able to adopt the innovation. In this study, there was only one teacher educator who did not really attach importance to ICT integration in his subject. He was convinced that ICT integration was not relevant to History as a subject. The challenge, however, is how do the Colleges of Education change

the views of this teacher educator to accept the innovation. The findings of this study imply that teacher educators need to learn new ICT skills and change the way they work in the classroom. As suggested by Harris and Sullivan (2000, p. 12), such changes involve two things:

When teachers are asked to integrate technology they are really being asked to change in two ways. First, they are asked to adopt new teaching tools such as the computer and the Internet. These are vastly different tools from the classroom tools many currently use such as the chalk, the chalkboard, overhead projector, or television. Second, teachers are asked to change the way they teach their students, which may include changing the role they play in the classroom and the way their classrooms are physically arranged.

(iii) Complexity

The supposition in this attribute is that if an innovation is perceived to be complicated and difficult for the teacher educators to comprehend, the end result will be the slow pace of adoption of that particular innovation. Perhaps this is why it is important that the learning activities which the teacher educators give should always build on one another in terms of previous skills gained and the equipment to be used. In this study, there were lessons and assignments especially in IMTE that were illustrative of this attribute.

(iv) Trialability

The fundamental assumption here is that participants should partake in testing and practising the innovation over a period of time to see whether it is bringing the intended results. This is believed to result in teacher educators adopting the innovation at a higher rate. The example from the findings of this study was the ICDL course which was being offered by the Ministry of Education to the Colleges of Education. Most teacher educators

were enrolled in this course because they were taken through several practices of ICT modules and when a person was ready, testing was conducted in which an immediate feedback was given. Another example of practical experience from the findings of this study, was that several training workshops In ICT had been held in which 61.73% of the teacher educators had taken part.

(v) Observability

Here the idea is that if the effects of the innovation can be seen and observed straight away and good supportive systems are in place, for example, a dialogue on the access of the innovation, then the acceptance and adoption of the innovation is likely to be faster. Teacher educators and the student teachers repeatedly stated that Colleges of Education should create a technology friendly environment first which could allow teacher educators to model and demonstrate ICTs.

It must be pointed out that accepting innovation is a process and as such it takes time for people to adopt it. As argued by House (1974) and Schon (1971), the advancement of accepting an innovation is dependent on the level to which the social system as a whole reacts to it. Schon's (1971, p. 12) holistic theory of organizations pointed this out well thus:

Social and technological systems interlock. An apparently innocuous change in technology may emerge as a serious threat to an organization because it would force it to transform its theory and structure. Technological, theoretical and social systems exist as aspects of one another; change in one provokes change in the others. And change in organizations has its impact on the person, because beliefs, values and the sense of self have their being in social systems.

Throughout this study, one of the issues that was often mentioned in terms of ICT integration was the way some of the teacher educators were slow in responding to the technological changes and how this affected the BETD curriculum and the college as an organization. This is an illustration of how different groups of teacher educators accepted and adopted ICTs. For example, there were teacher educators who would try out different things despite their busy schedules. They were personally motivated and interested in exploring issues around ICT integration. From the observations and discussions with these teacher educators, they supported each other and managed ICT integration with little support. They continuously looked for ways to direct ICTs to increase their teaching and learning as well as enrich their instruction strategies.

There were teacher educators who displayed the characteristic behaviour of the early majorities in the theory, because teacher educators were realistic and practical in their approaches to the innovation of ICT integration. The group of late majorities of the teacher educators were generally conservative in their approaches to the use and integration of ICT as an innovation because they need to be convinced that the particular innovation is better than their traditional ways of doing things and if they have to adopt it, it will not create problems and disruptions to their teaching process. In addition, most of these teacher educators were still left behind in understanding the potential benefits of ICTs and the rapid changes in ICTs, so much so that they commented, “not relevant in History”, or a “concept in the initial stages of growth”. For these teacher educators, there

is the possibility that they would not integrate ICTs because of their knowledge gap about ICTs.

The teacher educators who were in the groups of the laggards were cautious, critically negative, and seemed to be sceptical about the use and integration of ICT. Some even went as far as to criticise the quality of teachers produced through the BETD programme.

It is important for the Colleges of Education to take into consideration the characteristics of an innovation as seen by teacher educators in this study. The theory of diffusion of innovation will have an effect on whether teacher educators adopt the innovation. Teacher educators should be able to see the advantages of the integration of ICT as an innovation. As Dillon and Morris (1996, p. 6) observed, “innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential triability, and observability will have a more widespread and rapid rate of diffusion”. If teacher educators are convinced to see ICT use and integration as something that is not big and difficult to handle, something to complement their teaching methods, then teacher educators would develop positive attitudes towards the integration of ICTs. The Colleges of Education should also take cognisance of the fact that, “although there is little doubt that technological developments will occur at a fast rate, it is not immediately obvious that individual users (teacher educators) of the new technology will be able to adopt and use new technological artifacts at the same pace” (Karahanna and Straub, 1998, p. 238). Finally, the gap between the teacher educators who were in the early adopters group and

late majorities appeared to grow bigger. This should be a concern because the early adopters are likely not to have time to convince potential adopters and thereby increase the innovation's rate at the Colleges of Education.

5.9 Summary

This chapter discussed the main findings of this study using the framework of the research questions and theories that informed the study. The next chapter summarizes, concludes the study and also provides recommendations in order to improve the use and integration of ICTs at the Colleges of Education.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of the most important findings, provides a conclusion and makes recommendations based on the findings of the study. This chapter also identifies possible areas for further research.

6.2 Summary of the study

This study investigated the use and integration of ICT in teaching and learning activities as perceived by the student teachers and teacher educators at the Colleges of Education. Specifically, the study solicited information on six research questions that addressed:

- (1) Teacher educators' and student teachers' perceptions on the use and integration of ICT into teaching and learning;
- (2) The extent to which teacher educators integrated and used ICT in their teaching and professional development;
- (3) Constraints that hindered the use and integration of ICT;
- (4) The impacts of ICT on the implementation of the teacher education curriculum;
- (5) The extent to which specific e-learning methodologies were being implemented and supported by the available infrastructure; and
- (6) The ICT strategies and practices that might be employed to enhance the use and integration of ICT and e-learning.

The sample for this study consisted of 199 student teachers out of a total population of 2318 and 81 teacher educators out of a total population of the 188 at all four Colleges of Education in Namibia. The teacher educators who were teaching IMTE were purposively selected while teacher educators who were teaching other subjects in the BETD programme were randomly selected. The student teachers were selected randomly using cluster sampling techniques. The methods used to collect data were questionnaires, interviews and observations. The qualitative data were analyzed by following the guidelines suggested by Bogdan and Biklen (1982) and Miles and Huberman (1984) while the quantitative data were analyzed by calculating frequency counts of responses of teacher educators and student teachers.

The findings of this study indicated that teacher educators and student teachers were interested and willing to integrate ICT in their teaching and learning situations. The teacher educators and student teachers also perceived ICT to be useful in their teaching and learning despite the lack of ICT equipment and educational software. These findings were more positive towards ICT use and integration compared to those found in American schools by Gormly (1996) and Moesch (1997) on the effect of technology in teaching and learning. The findings from both the teacher educators and the student teachers have, however, revealed that much of the ICT integration was taking place in IMTE and to a lesser extent in ETP, Mathematics and Natural Sciences, while in other subjects little or no integration was taking place. This study has also found that the

integration of ICT focused mostly on utilizing common software packages like Word Processing, PowerPoint, Excel and Spreadsheet.

Both the teacher educators and the student teachers experienced numerous constraints when they tried to use and integrate ICT into teaching and learning. These constraints included lack of computers, insufficient training in ICT pedagogy, lack of support, lack of time to learn and integrate ICTs, limited Internet access and insufficient budget allocation to ICT tools. These constraints appeared to be experienced by the teacher educators and the student teachers irrespective of the College of Education where they worked or studied.

It was also found that the successful implementation of the use and integration of ICT also depended on the acceptance and recognition of the factors and issues which acted as barriers to the integration of ICT by the management of the Colleges of Education. Further, the teacher educators seemed to agree that professional development opportunities in ICT integration would result in more teacher educators becoming more comfortable in its use and integration, hence speeding up the rate of adoption. Finally, the current available ICT infrastructures at the Colleges of Education and a lack of knowledge among the teacher educators in e-learning approaches makes it difficult to create an e-learning atmosphere. Despite these constraints both teacher educators and student teachers still believed that ICT tools provided them with opportunities to get involved in ICT- related learning and teaching activities.

About 75% of the student teachers talked about ICT providing individualized learning, providing current information, making research possible, making learning easier and making lessons fun and enjoyable. The teacher educators said that ICT made teaching and learning more meaningful and effective, provided an opportunity for collaborative learning, changed the role of the teacher to that of a facilitator, promoted collaboration among student teachers, encouraged learning flexibility and promoted responsibility for student teachers' own learning. According to Pisapia (1994), teachers usually, "progress from presenter to coordinator of learning resources, thus freeing them to work individually with students. They move from being the 'sage on the stage' to the 'guide on the side' (Pisapia, 1994, p. 3). These important elements are found in the constructivist learning theory, adult learning theory and learner-centred education.

Finally, the following three strategies and practices of ICT integration in teaching and learning which might be employed to enhance the use and integration of ICT and e-learning were: the changing of attitudes of the teacher educators and the student teachers towards ICT, having a well structured and coordinated ICT integration programme in place and the importance of training the teacher educators and the student teachers in ICT pedagogy.

6.3 Conclusion

This section presents the most significant conclusions drawn from this study.

6.3.1.1 There was a general consensus that ICT tools such as computers, televisions, e-mails, Internet, video and digital cameras, cell phones, multi-media programmes, interactive whiteboards and video-conferencing facilities have major influences on how we work, live, communicate, teach and learn.

6.3.1.2 The concept of ICT integration was not so clear to most teacher educators and student teachers. Most ICT integration activities encouraged drill and practice kind of skills and usually used common software such as Word Processing, PowerPoint, Excel and Spreadsheet.

6.3.1.3 The teacher educators' and student teachers' attitudes toward the use and integration of ICTs had an influence on the extent to which ICTs is used, integrated, accepted and adopted. The teacher educators and student teachers who perceived ICT integration positively were able to see it (ICT) as an alternative that supplemented their teaching methods.

6.3.1.4 Ninety-four percent of the teacher educators relied heavily on giving information through the lecturing method. These teacher educators were comfortable with their familiar method of giving information and did not really integrate ICT in their teaching and learning activities.

6.3.1.5 It is important to note that the use and integration of ICT in teaching and learning activities is an important tool. The teacher educators should include in their plans

learning activities which require ICT integration in their own specific subjects.

These plans will ensure successful technology integration.

6.3.1.6 It is clear from the results of this study that the use and integration of ICTs in teaching and learning activities at the Colleges of Education were not easy because of the many barriers involved, such as lack of ICT equipment, lack of training, lack of ICT supportive systems and heavy teaching and learning loads. It is, therefore, important for the management of the Colleges of Education to provide teacher educators and student teachers with the ICT resources, training and support systems for ICT use and integration.

6.4 Recommendations

The theories that provided the conceptual framework to this study as discussed in Chapter 3, should form the basis for the implementation of the recommendations proposed. For example, the theory on diffusion of innovations by Rogers (1995) included the attributes of an innovation and these could determine the likely rate of use and adoption of ICT by teacher educators and student teachers. The attributes should be seriously taken into consideration when designing ICT learning activities for student teachers and staff development opportunities for teacher educators. The same theory also proposed that people do not accept new innovations at the same speed or in similar ways; therefore, any training opportunity should consider different groups of teacher educators at the Colleges of Education. With regard to constructivist theory by Duffy and Jonassen (1992), it is important that the principles of this theory are considered when implementing the

recommendations too. These principles include being aware of activities that give the participants ample opportunities to actively be engaged in real ‘hands on’ and meaningful activities in a more learner centred environment. This requires that participants are given the opportunity to design their own learning and teaching activities, to collaborate on ICT issues and to finally self- reflect on the experience.

For the adult learning theory by Knowles (1980), it should be considered that teacher educators and student teachers are adults; therefore their ICT needs and learning styles should be identified first before any training could take place. It should also be considered that adults are self-directed and usually take responsibility for their own lifelong learning. When it comes to the critical theory (Peca, 2000), ICT activities and staff development opportunities should empower teacher educators and student teachers with the skills needed to effectively integrate ICT in their teaching and learning as well as to the general use in the society.

The recommendations emanating from this study were grouped into three categories – those directed at the student teachers and teacher educators, those directed at the management at the Colleges of Education and recommendations for further research.

6.4.1 Recommendations for teacher educators and student teachers

The recommendations in this section are directed at the student teachers and teacher educators in order to improve the integration of ICT at the Colleges of Education.

- 6.4.1.1 The Colleges of Education, in consultation with the Department of Professional Studies at NIED, should as a priority train teacher educators in order for them to have an adequate pedagogical understanding of ICT integration as well as the understanding of the ICT concepts. In this way their confidence level with ICT use and integration for both personal and classroom endeavours will be enhanced.
- 6.4.1.2 NIED should ensure that both the teacher educators and the student teachers realise that knowledge of ICT pedagogy and high confidence level in ICT use is a prerequisite for ICT integration. It is, therefore, recommended that investment is placed in both resources procurement and college personnel in order to enable teacher educators and student teachers to use and integrate ICT in their teaching and learning activities.
- 6.4.1.3 The use and integration of ICT in teaching and learning at the Colleges of Education should be ongoing through onsite professional development workshops to support and strengthen the ICT skills of teacher educators. These workshops should be built in to the college calendar throughout the year and should be well coordinated.
- 6.4.1.4 Training and professional development workshops should be conducted on a regular basis. These workshops should be built in to the college calendar throughout the year and should be well coordinated. If training and workshops become an integral part of the college calendar and programmes, teacher educators would be able to plan their schedules in advance. It is recommended that these

workshops should take into consideration the level of understanding of ICT integration of different groups of teacher educators existing within the Colleges of Education. This will ensure effectiveness of the training.

6.4.1.5 Integration of ICT should be implemented across the curriculum in order to realize the full integration of ICT in teacher education, This will require a well-coordinated approach to the ICT integration within the framework of the BETD curriculum subjects.

6.4.1.6 ICT equipment such as television sets, videotapes, video cameras and tape recorders should be used to the maximum by both student teachers and teacher educators to support teaching and learning at the Colleges of Education. This ICT equipment is still useful and relevant in supporting teaching and learning activities.

6.4.1.7 Teacher educators should give assignments, projects and presentations to the student teachers that require them to integrate various ICT skills, for example, submission of assignments electronically. It is recommended that the teaching practicum forms and the lesson evaluation forms be redesigned in order to reflect ICT integration requirements.

6.4.1.8 Teacher educators should model the use and integration of ICT in order for student teachers to learn and see examples of good practice.

6.4.1.9 Teacher educators should be given an in service training on how to upload and update their subject materials into web based e-learning platforms, for example KEWLNextGen, in order to make content materials accessible to the student teachers.

6.4.2 Recommendations for the College Management

The recommendations discussed here are directed at the management of the Colleges of Education in order to enable them take appropriate decisions that might improve the use and integration of ICT at the Colleges of Education.

6.4.2.1 The positions of computer technician, analyst programmer, student computer caretakers that exist within the Colleges of Education should be maintained and strengthened. These positions positively contribute to the implementation and adoption of ICT integration by providing the much needed technical support and expertise in the use of ICTs within the Colleges of Education.

6.4.2.2 The management at the Colleges of Education, in collaboration with the Ministry of Education, should seriously consider starting a mentoring system whereby knowledgeable teacher educators in the area of ICT integration would have a lighter teaching load in order to have more time to direct and offer continuing advice and support to the less knowledgeable and inexperienced teacher educators counterparts.

6.4.2.3 The management at the Colleges of Education, in consultation with the Directorate of IT in the Ministry of Education, should revise the budget allocated to ICT equipment and training. The budget allocated to ICT equipment in the Teacher Training Fund at colleges should be considerably increased to enable colleges to purchase ICT equipment, software and subscribe to the Internet. ICT

equipment gets outdated quickly, therefore, a larger ICT budget should be provided to replace and update outdated equipment.

6.4.2.4 The management should place some computers in classrooms instead of putting all computers in labs because labs were often locked and were not easily accessible to student teachers and teacher educators as they were also timetabled for IMTE classes. Placing a certain number of computers in the classroom would ensure maximum use of computers on a daily basis.

6.4.2.5 The procurement of software for specific subjects should be made by the management, for example Adobe Illustrator and Art Dabbler for Art, Google Earth for Geography, StyleWriter and WriteWell for English and other subjects. This would encourage teacher educators and student teachers to integrate ICT within their subjects as these software packages address specific skills in the different subjects.

6.4.2.6 The management at the Colleges of Education should adopt strategies that require electronic communication between the teacher educators, student teachers and the administrative staff. This will not only cut cost on paper but it will force the teacher educators and the student teachers to make ICT part of their daily practice.

6.4.2.7 The management of the Colleges of Education should regularly inform and update teacher educators and student teachers on the availability of ICT equipment, and upgrade the e-learning infrastructure in order to effectively support e-learning activities. This will result in the use and integration of ICT by both student teachers and teacher educators.

6.4.2.8 The management should improve the accessibility to the ICTs by looking into practical aspects such as opening the computer lab for longer hours and increasing the support structures.

6.4.3 Recommendations for further research

Recommendations for further research are given below.

6.4.3.1 Future research should be carried out to evaluate and examine the quality of staff development programmes currently offered at the Colleges of Education in terms of content depth, level and mode of training, duration of the training, provisions of ICT resources, facilitators and support during and after the training. This would help support and strengthen existing and upcoming professional development programmes and initiatives to contribute to the acceleration in the rate and acceptance of ICT adoption at the Colleges of Education.

6.4.3.2 A similar study on attitudes should be conducted to investigate various roles the early adopters of innovations can play at the Colleges of Education specifically with regard to offering motivation and support to the late adopters and laggards.

6.4.3.3 Another study should investigate the qualifications in the ICT and pedagogical skills of IMTE teacher educators. This would help pinpoint the necessary skills and support the IMTE teacher educators' need to teach this course effectively.

6.4.3.4 Future research should investigate how best ICTs can be infused into the entire curriculum of the Basic Education Teacher Diploma.

6.4.3.5 A study should be conducted to investigate how best the constraints that prevent the use and integration of ICT in teaching and learning situations at the Colleges of Education can be addressed in a more sustainable manner.

6.4.3.6 Another study should be conducted to assess the impact of ICT integration in the Colleges of Education.

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APPENDICES

APPENDIX A: Regions of Namibia



(S. Abraham, 2006. Graphics Services Unit, Rhodes University, Grahamstown)

**APPENDIX B: Letter to the Ministry of Education requesting permission to
conduct research at the Colleges of Education**

Private Bag 13317
Windhoek Namibia
Tel 061-2703270 (w)
Cell 0811296939
10 May 2007

The Permanent Secretary
Ministry of Education
Windhoek

Dear Sir,

Subject: Permission to conduct research studies at Colleges of Education

My Name is Sakaria M. Iipinge, a PhD student (student number 9712666) at the University of Namibia. I am requesting the Ministry's permission to conduct research at all four Colleges of Education in Namibia. The title of my research is: *The integration of information communications technologies (ICTs) and e-learning strategies in the preparation of teachers at the Colleges of Education in Namibia*. Professor F.A. Phiri, Professor C.D. Kasanda and Dr. C. B. Villet will be supervising the study.

Information collected through either the interview or questionnaire will be held in strictest confidence and will only be used for the purpose of this research. There will be no physical risks involved for those who will be participating in this study.

Please, Sir, be rest assured that no class lessons will be interrupted during data collection process. Further, I want to promise that one final copies of the research study will be given to the Ministry.

Thank you very much and I look forward for your positive answer.

Sincerely,

Sakaria M. Iipinge

**APPENDIX C: Letter of approval from the Permanent Secretary of Education to
conduct research at the Colleges of Education**



REPUBLIC OF NAMIBIA
MINISTRY OF EDUCATION

Tel (061) 2706132
Fax (061) 2706143

Private Bag 13391
WINDHOEK
30 May 2007

The Rectors: Colleges of Education

**PERMISSION TO CONDUCT RESEARCH STUDIES AT COLLEGES OF
EDUCATION: MR SAKARIA M. IIPINGE**

Permission is hereby granted to Mr Sakaria M. Iipinge to visit the colleges of education with the purpose of collecting data for his research studies for a PhD.

Rectors of colleges of education are hereby requested to support and facilitate that Mr Iipinge visits their colleges and have an access to staff members, students and any other person on the campus who may be able to provide information or whatever assistance Mr Iipinge may require for his studies.

Your assistance to Mr Iipinge is appreciated in advance.



APPENDIX D: Interview questions for the teacher educators

1. To what extent do teacher educators, including yourself, integrate ICT and e-learning in your teaching and why?
2. What are teacher educators' perceptions regarding the integration of ICT in their teaching and learning?
3. What are the perceptions of teacher educators regarding the constraints that hinder the integration of ICT and e-learning in teaching and learning at the college?
4. How do teacher educators overcome the barriers affecting the integration of ICT in teaching and learning?
5. Describe the classroom environment when ICT and e-learning are integrated in teaching and learning?
6. What support do teacher educators receive when they integrate ICT in their teaching?
7. What ICT strategies do you think may be employed that could enhance the integration of ICT in teaching and learning in the Colleges of Education?
8. What ICT practices do you think may be employed that could enhance the integration of ICT in teaching and learning in the Colleges of Education?
9. How do teacher educators use e-learning and ICT integration to respond to the needs of adult learners?
10. How do the integration of e-learning and ICT promote concepts of the constructivist approach to teaching and learning?
11. How do the integration of e-learning and ICT affect the empowerment of learners as professional educators?
12. How do the integration of e-learning and ICT affect the emancipation of learners as professional educators?
13. How do the integration of e-learning and ICT affect the emancipation of learners as professional educators?
14. How do ICT and e-learning change your approach to the curriculum of your subject?

APPENDIX E: Interview questions for the student teachers

1. What are your perceptions regarding the use of e-learning and integration of ICT in the lessons at the college?
2. What are you saying as a student teacher about the constraints (problems) that hinder the use of e-learning and integration of ICT in teaching and learning at the college?
3. Describe the classroom environment when ICT is integrated for teaching and learning purposes at the college.
4. Do you think you are likely to use of e-learning and integration of ICT in your teaching? Explain.
5. Do you think the use of e-learning and the integration of ICT respond to your needs as an adult learner? Explain.
6. How do the integration of e-learning and ICT promote concepts of constructivist approach to teaching and learning? Refer your experience to your Education, Theory and Practice classes?
7. How do the integration of e-learning and ICT affect the empowerment and emancipation of your learning process?
8. How do the integration of e-learning and ICT affect the emancipation of your learning process?

APPENDIX F: Questionnaire for the teacher educators

Purpose: The purpose of this study is to investigate the perceptions of the teacher educators and student teachers regarding the integration of ICTs in teaching and learning at the Colleges of Education.

Directions: Please answer all the questions. Information provided and all research materials collected will be held in strictest confidence and will only be used for research purposes. Your response to this questionnaire is highly appreciated.

Definition of e-learning: The Mode of instruction and learning delivery which is supported through the use of ICT.

A. BIOGRAPHICAL INFORMATION - Please tick (✓) item 1-3

1. Sex: Male Female
2. Age: <30 30-39 40-49 >50
3. College: WCE OCE RCE CCE
4. Department:-----
5. Years of teaching experience at the college: -----
6. What subject fields do you teach at the college? (please tick (✓) all that apply)

Lower Primary Education		Science Education	
Mathematics Education		Agriculture and Life Science	
Social Studies/Science		Other (please specify _____)	
Languages			
Practical skills			
Education Theory and Practice			
Commerce			
Integrated Media and Technology (IMTE)			

7. How do you classify your employment status at the college? Please tick (✓)

Full-time teacher educator

Contract teacher educator

Volunteer

Other (please specify _____)

8. Have you received any professional training in the integration of ICT and e-learning strategies during the past four years (2004-2007)? (Please tick (✓) one)

<input type="checkbox"/> Yes	<input type="checkbox"/> NO
------------------------------	-----------------------------

If, no why? *If yes, specify?*

B. INFORMATION ON THE INTEGRATION OF ICT AND E- LEARNING IN TEACHING AND LEARNING

9. How many hours do your student teachers on average spend on integrating ICT at the college in a week working on your class work? _____

10. How many hours do your student teachers on average spend integrating e-learning at the college in a week working on your class work? _____

11. Approximately how often do you integrate each of these ICT applications/tools with your student teachers? Please tick (✓)

	<i>Daily</i>	<i>Weekly</i>	<i>Monthly</i>	<i>Once or twice a year</i>	<i>Never</i>	<i>Not Available</i>
Computers in general						
Word processing packages						
Spreadsheets						
Databases						
Graphical applications						
Presentation software (e.g., Power Point)						
Desktop publishing						
Any Internet activity						
Search engines for the Internet (e.g., Google, Yahoo)						
Drill/Practice Programmes, Tutorials						
Others specify						

12. How do student teachers integrate ICTs in your classes? (Please tick (✓) all that apply)

a. to organize and store information	
b. to collect data and perform measurements	
c. to manipulate/analyze/interpret data	
d. to communicate information	
e. to create visual displays of data/information (e.g., graphs, charts, maps)	
f. to plan, draft, proofread, revise, written text	
g. to create graphics or visuals of non-data products (e.g., diagrams, pictures, figures)	
h. to create visual presentations	
i. to perform calculations	
j. to create models or simulations	
k. to support individualized learning	
l. to access information as part of lessons	
M. other (please specify)	

13. How do you use and integrate e-learning as one aspect of ICT in your classes? (Please tick (✓) all that apply)

a. to post course information and resources	
b. to communicate with others outside of the school	
c. to supplement face-to-face instruction	
d. to collaborate with others	
e. to deliver a course	
f. to support teaching and learning	
g. other (please specify)	

14. In a week, you may take on a variety of roles. What percentage of the time do you think you spend in each of the following roles:

Lecturing _____ %

Coaching _____ %

Mediating _____ %

Mentoring _____ %

Facilitating _____ %

15. Rate your experience and comfort level in each of the following ICT applications using a scale of 1-4

Experience

Comfort

where 4. = a lot of experience

4.= very comfortable

3. = some experience

3.= moderately comfortable

2. = little experience

2.= would need some help to feel comfortable

1. = no experience

1.=would need a lot of help to feel comfortable

	Experience	Comfort
Computers in general		
Word processing packages		
Spreadsheets		
Databases		
Graphical applications		
Presentation software (e.g., Power Point		
Desktop publishing		
Internet software (e.g., Netscape, Internet Explorer)		
Search engines for the Internet		
Simulation Programmes		
Drill/Practice Programmes/Tutorials		
e-learning initiatives		

16. What are the constraints that hinder the use and integration of ICT in teaching and learning at your college? (Please tick (√) all that apply)

a. lack of training in ICT pedagogy	
b. lack of technical know-how of ICT applications	
c. lack of computers	
d. lack of the basic equipment for the establishment of ICT i.e. network equipment	
e. limited Internet access	
f. limited support for the development of ICT skills of teacher educators	
g. lack of technical support provided at the college	
h. lack of adequate awareness about ICT by the management of the college	
i. insufficient budget allocation in place for use in procurement of ICT tools such as hardware and software	
j. lack of time to learn and incorporate ICT skills and tools into lessons	
k. fear of ICT tools	
l. lack of collaboration with other teacher educators to design lessons that accommodate ICT integration across subjects	
m. The workload makes it impossible to use and integrate ICT tools	
n. Unreliable power supply makes access to ICTs difficult	
o. the information technology bandwidth makes the downloading of information slow and difficult	
p. training budgets for ICTs are often not sufficient	

17. How much do you believe ICT has changed the way you deliver lessons (Please tick (✓) one)

<input type="checkbox"/> Greatly	<input type="checkbox"/> Somewhat	<input type="checkbox"/> Not at all
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18. Please indicate your perceptions regarding the integration of ICT and e-learning in teaching and learning at Namibian Colleges of Education.

Thank you for taking time to complete the questionnaire.

Appendix G: Questionnaire for the students

Purpose: The purpose of this study is to investigate the perceptions of the teacher educators and student teachers regarding the integration of ICTs in teaching and learning at the Colleges of Education.

Directions: Please answer all the questions. Information provided and all research materials collected will be held in strictest confidence and will only be used for research purposes. Your response is highly appreciated.

Definition of e-learning: The Mode of instruction and learning delivery which is supported through the use of ICT.

A. BIOGRAPHICAL INFORMATION - Please tick (✓) item 1-3

1. Sex: Male Female
2. Age: <18 18-25 26-33 >34
3. College: WCE OCE RCE CCE
4. Major:-----
5. Year Level: -----
6. In which subject do your teacher educators regularly integrate ICTs? (Please tick (✓) all that apply)

Lower Primary Education		Science Education	
Mathematics Education		Agriculture and Life Science	
Social Studies/Science		Other (please specify _____)	
Languages			
Practical skills			
Education Theory and Practice			
Commerce			
Integrated Media and Technology (IMTE)			

B. INFORMATION ON THE INTEGRATION OF ICT AND E-LEARNING IN TEACHING AND LEARNING

7. How many hours do you on average spend integrating ICT in your school work at college in a week? _____
8. How many hours do you on average spend integrating the Internet at the college in a week? _____
9. Approximately how often do you integrate each of these ICT applications/tools in your school activities (Please tick (√) one)

	<i>Daily</i>	<i>Weekly</i>	<i>Monthly</i>	<i>Once or twice a year</i>	<i>Never</i>	<i>Not Available</i>
Computers in general						
Word processing packages						
Spreadsheets						
Databases						
Graphical applications						
Presentation software (e.g., Power Point)						
Desktop publishing						
Any Internet activity						
Search engines for the Internet (e.g., Google, Yahoo)						
Drill/Practice Programmes, Tutorials						
Others specify						

10. What do you integrate ICT as an educational tool for in your schoolwork? (Please tick (✓) all that apply)

a. to organize and store information	
b. to collect data and perform measurements	
c. to manipulate/analyze/interpret data	
d. to communicate information	
e. to o create visual displays of data/ information (e.g. graphs, charts, maps)	
f. to plan, draft, proofread, revise, and publish written text	
g. to create graphics or visuals of non-data products (e.g., diagrams, pictures, figures)	
h. to create visual presentations	
i. to perform calculations	
j. to create models or simulations	
k. to support my individualized learning	
l. to access information as part of lessons/course	
m. other (please specify)	

15. Rate your experience and comfort level in each of the following ICT applications using a scale of 1-4

Experience

where 4 = a lot of experience
 3. = some experience
 2. = little experience
 1. = no experience

Comfort

4.= very comfortable
 3.= moderately comfortable
 2.= would need some help to feel comfortable
 1.= would need a lot of help to feel comfortable

	Experience	Comfort
Computers in general		
Word processing packages		
Spreadsheets		
Databases		
Graphical applications		
Presentation software (e.g., Power Point		
Desktop publishing		
Internet software (e.g., Netscape, Internet Explorer)		
Search engines for the Internet		
Simulation Programmes		
Drill/Practice Programmes/Tutorials		
e-learning initiatives		

11. What do you use the Internet for? (Please tick (✓) all that apply)

a. to gather information from a variety of sources	
b. to communicate with others outside of the school	
c. other (please specify	

12. How much do you believe that ICT integration has changed the way you do your school work (Please tick (✓) one)

_____ Greatly	___ Somewhat	___ Not at all
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13. What do you think are the constraints that hinder the integration of ICT and e-learning at your college? (Please tick (✓) all that apply)

a. lack of training in ICT pedagogy	
b. lack of technical know how of ICT tools	
c. lack of computers	
d. lack of the basic equipment for the establishment of ICT, that is, network equipment	
e. limited Internet access	
f. limited support for the development of ICT skills of teacher educators	
g. lack of technical support provided at the college	
h. lack of adequate awareness about ICT by the management of the college	
i. insufficient budget allocation in place for use in procurement of ICT tools such as hardware and software	
j. lack of time to learn and incorporate ICT skills and tools into learning activities	
k. fear of ICT tools	
l. lack of collaboration with other teacher educators to design lessons that accommodate ICT integration across subjects	
m. the learning load makes it impossible to use and integrate ICT tools	
n. unreliable power supply makes access to ICTs difficult	
o. the information technology bandwidth makes the downloading of information slow and difficult	
p. other (please specify)	

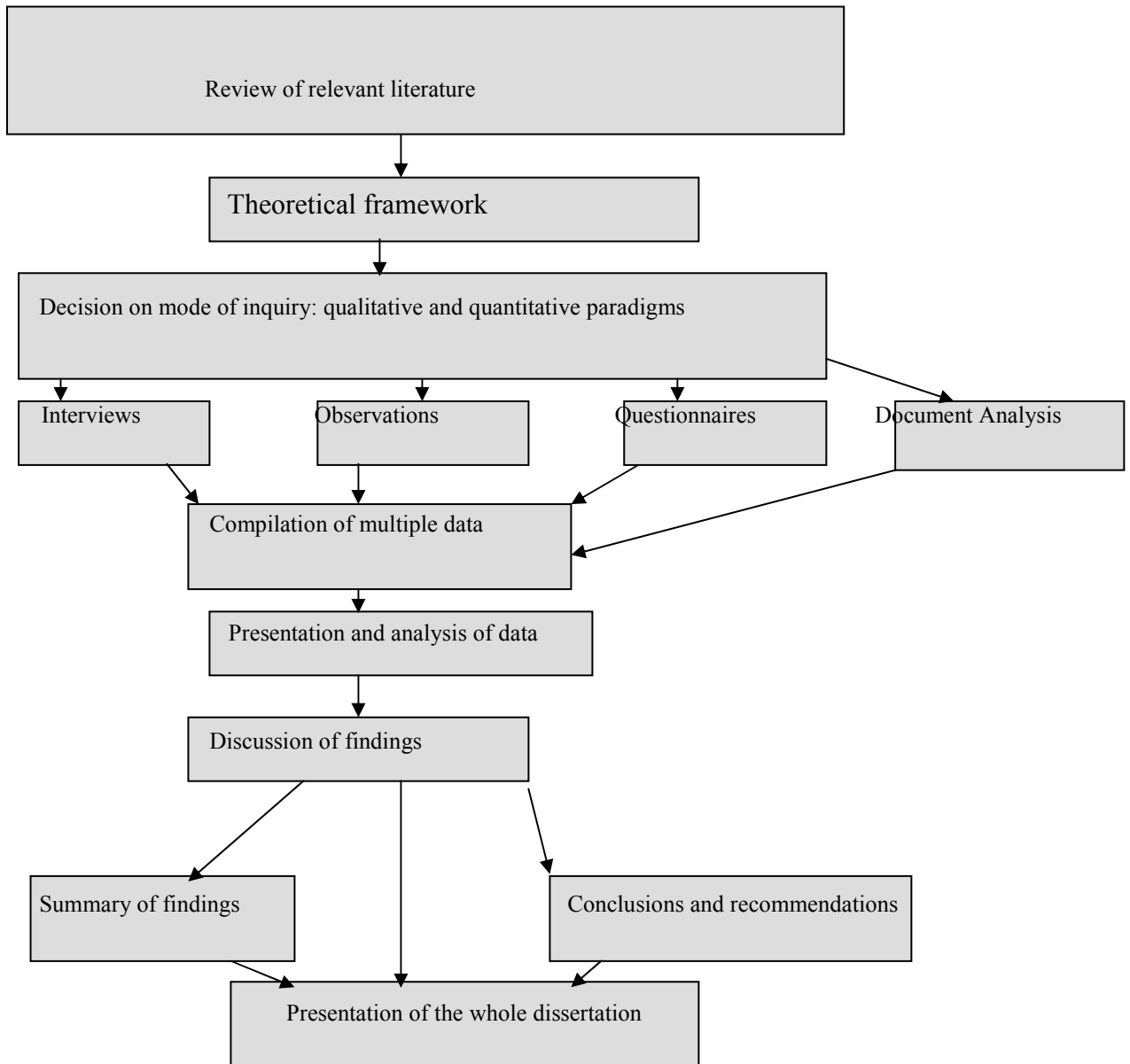
18. In general what are your perceptions regarding the integration of ICT and e-learning in teaching and learning?

Thank you for taking time to complete the questionnaire.

APPENDIX H: Observation schedule

<i>Date:Teacher Educator:College:..... Subject:.....</i>	
<p>A. Student groupings (single, small, large, etc.) and Roles: ----- ----- ----- -----</p>	<p>Notes on what to follow up (theories) ----- ----- -----</p>
<p>B. Brief description of classroom/lab setting Activity/Lesson: ----- ----- -----</p>	<p>----- ----- ----- -----</p>
<p>C. Students Groupings (single, small, large, etc.) and learning atmosphere (collaborative/individual): ----- ----- ----- -----</p>	<p>----- ----- ----- ----- -----</p>
<p>D. Relation of ICT to teacher educator's style: ----- ----- ----- -----</p>	<p>----- ----- ----- -----</p>
<p>E. Curriculum relationship of ICT and learning/content objectives: ----- ----- -----</p>	<p>----- ----- ----- -----</p>
<p>F. Description of any example of technological failure and how it was handled: ----- ----- -----</p>	<p>----- ----- ----- -----</p>

APPENDIX I: Chart presenting the flow of data collection procedures



APPENDIX J: Follow-up letter to the Colleges of Education

From: S.M. Iipinge
Windhoek College of Education, Windhoek

To: All Rectors
Colleges of Education

Dear Rectors,

Please receive herewith my explanation of the research study that I plan to do at your college in a near future. Attached is a letter from the Permanent Secretary of Education granting me a permission to conduct research. The title of my research study is: *The integration of information technologies (ICTs) and e-learning strategies in the preparation of teachers at the Colleges of Education in Namibia*

The overall purpose of this study is to investigate perceptions of teacher educators and student teachers regarding the integration of ICT and e-learning in teacher training institutions with special reference to the Colleges of Education. The procedure will be that participants (students and teacher educators) in this study will be asked to fill out a questionnaire at a place of their work/learning. This instrument contains two sections. Section A is biographical information of the participants and section B is the information on the integration of ICT and e-learning in teacher education. Participants will also be requested to participate in the interview. Documents collected and all information collected through either during the interview or questionnaire will be held in strictest confidence and will only be used for the purpose of this research.

There will be no physical risks involved in participating in this study. If a participant does not want to answer a specific question during the interview, he/she may choose to do so. Also, if the participant later on decides to withdraw from the study he/she may do so. Participants will not be paid to participate in this study.

Participants who agree to the above research conditions and willing to participate in the study will then be selected.

Should you have any further questions, please do not hesitate to call me at the telephone numbers: 061-2703270 (w); or 0811296939 (cell).

Thank you.

APPENDIX K: Sample of Notes taken during classroom observation of student teacher and teacher educator

Student teacher:

The lesson was Life Science, Grade 8. The topic for the lesson was plants and animal cells. The lesson was after the first break and 40 minutes long. Mr. Tangeni ((pseudonym) used his break time to set up the equipment. He invited the computer technician from the college to bring him the LCD projector, as the school did not have one. He looked enthusiastic towards using ICT in his lesson. Mr. Tangeni's personal laptop that he brought along for his presentation, could not work and the computer technician suggested to him that he should go to the principal to get a system box, which he got later. This one worked fine. I could see him smiling. The lesson was conducted in the classroom. There were about 34 learners in the class. As soon as the bell had rung, all the learners were in the class. Most of the students came five minutes before the class started. As they entered, they came to check what was happening. Some even asked if they could assist. The teacher greeted the learners and told them to sit at their allocated seats. Mr. Tangeni introduced the lesson: 'You remember that we were talking about the structure of plants and animal cells. "Today, as I have promised you, I will show you the structures of cells using the Power Point Presentation. I want you to learn, enjoy and participate as we go along." The first slide has two pictures, one for the plant and the other was for the animal cell. Mr. Tangeni's first question was to ask which picture was for a plant cell and which one the animal cell? Most of the learner's hands were up. When the answer was given, he continued to follow up with "why" type of questions. He encouraged learners to explain and look carefully at the details. He created opportunities for inquiry and discovery. Learners seemed to be actively involved in the lesson, following the teacher's instructions. I could hear learners saying, "Look at that," "That is nice", referring to some impressive animations and pictures. At the end of the lesson, Mr. Tangeni handed out supplementary notes for the same lesson. Then he thanked the

learners for their attention and active participation. His final words were, "I hope you have enjoyed the lesson!"

Mr Tangeni reflected on his lesson after the class session. He wrote: 'The basic competencies of the lesson were achieved. All learners took part in giving the correct answers. The best lesson ever! Maybe it is because of the Power Point Presentation that I used. The only problem was that I could not control learners to settle down before the presentation.'

Teacher educator

Observation: Ms. Van Dirkkie (pseudonym) 11 Sept 2009, IMTE class, Second year students majoring in Lower Primary. Venue: Computer lab Starting time: 9:00 Ending time: 10:20

21 PC computers in the lab, 37 students present, students seated in pairs, one student computer caretaker, who belonged to that class, was also facilitating the lesson. A computer technician assisted in setting up the equipment earlier before class started.

Theme: ICT integration

Topic: Use of Spreadsheets

A handout was distributed at the beginning of the lesson. A PowerPoint presentation was used to project the information onto the whiteboard that is mounted on the wall. She encouraged and motivated the students in her introductory remarks to think of how this program could be of help to them in their future teaching.

T: Under which program will you find spreadsheets?

S: Under Excel - (students replied)

T: Okay, good.

T: How many of you have worked with Excel before?

T: Okay, wonderful (seeing many hands being raised). So, we can help each other. Please help each other. Don't be shy as there are those who have never worked with Excel before.

She kept on saying constantly: "If you need help, please ask, don't be shy. "The students were very excited. At one point she said those who know the stuff should go ahead and those who have a problem should seek help from her or peers. "We are coming"- referring also to the caretaker. The lecturer was able to see that the students did not have the same ability and/or was at different levels on terms of computer skills.

The handout contained guidelines and the students were guided from step to step. Each step was demonstrated. As an example, the entering of marks of a pupil was used. The students also had to calculate the average mark of a learner in a specific subject. Other features such as writing notes, and drawing a graph for this particular learner were demonstrated and practiced.

The assignment, which the students have to choose, should be similar to the task, which was practiced in the class, and they were told that it should be relevant to their classroom situation. Here, I could see students being given a choice.

Interactions between lecturer and student and student and student were good. Despite the fact that students worked independently, Ms. Van Dirkkie moved around the lab helping students who were experiencing difficulties. Students were **active, collaborating** and really **involved** in the lesson. She clarified things by referring students to the handout and/or talked directly to the students. I could observe Ms. Van Dirkkie taking the position of being a **facilitator**- moving around the lab helping those who have problems.

Ms. Van Dirkkie, being sensitive to different levels of abilities, could be observed during the whole session. Note: Gardner Multiple Intelligence Theory! She displayed the necessary **guidance** that is important for a successful ICT integration.

APPENDIX L: Student answers of constructivist principles while integrating ICTs

Construction of Knowledge: As a teacher to promote learners building up on the knowledge I would use a video to build up on the learners' knowledge for example in grade 8 learners learnt about the solar system so to build up their prior knowledge in grade 9 I would use a video to make them understand on what they already know about the solar system. The video will build up knowledge of the different shapes of the planets and their distance apart as this would be visible to them. I will ask them to discuss the contents of the video.

Learners active engagement: After watching the video and discussing it in class, I will assign each learner to write down the new knowledge that they learnt from the video and how they learnt it in their books, through writing this, the learners are creating new understanding on their learning.

Reflective learning: Using the same video, I would ask the learners to analyze the aspects of the video that made them or helped them understand the lesson and how they were able to understand this would be at the end of the lesson and learners will reflect on the day's topic and learning.

Collaborative learning: To promote collaborative learning I will assign learners in groups and ask them to discuss the relevance of the video to the topic and why they believe the video was appropriate for the topic, this will engage learners in dialogue in their groups and with the teacher as well.

Inquiry based learning: I will use a video again to show how an earthquake happens but half way into the video I stop it and ask the learners to predict the ending of the video after all learners have given their answers then I play it and see how the video ends, when the video is stopped. Learners will ask questions in order to solve the mystery of the end of the video.