A STUDY ON HIFIKEPUNYE POHAMBA UNAM CAMPUS PRIMARY STUDENT TEACHERS' INFORMATION AND COMMUNICATION TECHNOLOGY USE AND INTEGRATION PRACTICES DURING SCHOOL BASED STUDIES

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ABSTRACT

The use and integration of ICTs in the classroom practice of pre-service student is very important for student teachers to become more proficient in integrating technology in their teaching. The main purpose of this study was to investigate primary student teachers' field experience of information and communication technology use and integration during school based studies. The exploratory sequential mixed methods design targeted pre-service student teachers that were majoring in the lower and upper primary phases at Hifikepunye Pohamba Campus and had registered for School Based Studies in the Oshana Educational Region. The number of students targeted for this study was about 135 male and female 3rd year student teachers at Hifikepunye Pohamba Campus.

A proportional stratified sampling method was used in order for all specific subject specialisation groups to be represented equally. The focus was aimed at investigating and identifying the gaps in the skills and competencies that student teachers may incorporate the use and integration of ICTs into their pedagogical practices. The findings revealed that student teachers mostly used 2- and 3-dimensional ICT materials during school based studies because they were commonly available and easy to prepare. The study also revealed that student teachers lacked understanding of the difference between (1) ICT use and (2) ICT integration in the classroom. Using the TPACK framework and information collected through various instruments, the study showed that the student teachers were more Pedagogical Content Knowledge (PCK) oriented and had lesser abilities in the other components of the framework. Furthermore, the findings also revealed the challenges student teachers faced during school based studies, such as lack of accessibility of available ICT tools, lack of self-confidence when using ICT tools,

time constraints when preparing for ICT-oriented lessons, and the school culture that used no ICTs in lessons.

The researcher recommends that student teachers get the necessary support, exposure and practical training to gain the confidence and competence to use and integrate ICTs in teaching. The researcher also recommends that stringent assessment be done to determine how best to produce quality work in using the identified commonly used ICTs, such as posters, flip charts, models and transparencies during teaching. Finally, the researcher recommends that teaching pedagogies be expanded to accommodate the use of ICTs to allow student teachers to make their lessons more exploratory for learners and not just basically covering the subject content. Therefore, mentor teachers and university tutors should encourage and regularly control the use of relevant ICTs for lessons and encourage student teachers to prepare in advance for such lessons.

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List of abbreviations and acronyms

BEd	Bachelor of Education
IT	Information Technology
ICT	Information and Communication Technology
ICTED	Information and Communication Technology in Education
MOE	Ministry of Education
TPACK	Technology Pedagogical and Content Knowledge
IMTE	Integrated Media and Technology Education
UNESCO	United Nations Educational, Scientific and Cultural Organization
NDP4	National Development Plan 4
CAI	Computer Aided Instruction
CAT	Computer Aided Teaching
CAL	Computer Aided Learning
LMS	Learning Management Systems
WBI	Web Based Instruction
VCR	Video Cassette Recorder
DVD	Digital Versatile Player
SBS	School Based Studies
TK	Technological Knowledge

PCK Pedagogical Content Knowledge

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Last, but not least, I would like to thank my family, parents and friends for their definitive support during the study.

Dedication

This thesis is dedicated to my late foster mother Angela Maria Henoch who brought me up to be humble at all times and encouraged me to work hard towards all future endeavours that I am envisaging (your words of encouragement and push for tenacity still ring in my ears), and to my wonderful daughter Maleni Tulonga Henoch for being my best cheer leader.

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Lastly, I dedicate this thesis to my colleagues and friends who encouraged, supported and guided me during the study; I will always be indebted to you.

Declaration

I, Tulonga Tikikus Henoch, hereby declare 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 other institution of higher education.

……..…… Date……

Tulonga Tikikus Henoch

CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter discusses the background to the study, the statement of the problem, significance of the study, research questions, definition of terms, and limitations of the study.

1.2 Background of the study

The rapid developments in technology have made a tremendous change in the way people live as well as in the demands of society. Grant (2002) emphasises that by recognising the trends of new technologies at the workplace and in everyday life, today's higher education institutions are trying to restructure their education programs and classroom facilities in order to prepare their students to meet the technological literacy requirements of the future. These restructuring processes require effective integration of technologies into existing contexts in order to provide students with knowledge of specific subject areas, to promote meaningful learning and to enhance professional productivity (Grant, 2002).

Research studies have indicated that the quality of teaching and learning can be significantly enhanced when ICT is integrated into teaching. For example, Roblyer (2004) points out that ICT can enhance critical thinking, information handling skills, the level of conceptualisation and problem solving capacity. This means that technology is supposed to add value to education and support more effective methods of providing knowledge and improving communication that promotes

learning. Moreover, it creates a process of what is also known as collaborative learning.

Furthermore, the Namibian Government has made some innovative attempts to increase the use of information and communication technologies (ICTs) by teachers in schools as well as teacher educators. Through the Tech/NA! ICT Implementation Plan (Ministry of Education, 2006a) and the ICT policy for Education (Ministry of Education, 2005), the Ministry of Education introduced various programmes, such as International Computer Driver's License (ICDL) workshops, to enhance the skills and expertise of teacher educators so that they could effectively use and model ICTs in teaching and learning activities. The Namibian Government has also acknowledged the fact that ICTs can play a significant role in driving the country's aspirations towards becoming a knowledge-based society by 2030.

The Ministry of Education released the ICT Policy for Education in 2005 and outlined five key distinct developmental areas for the use of ICT, which are:

1. Investigation and development of appropriate ICT solutions;
2. Deployment of ICT;
3. Maintenance and support of ICT;
4. ICT literacy; and
5. ICT integration.

This study focused primarily on the fifth area, which is ICT integration. The ICT policy also emphasises that "ICT integration is a complex process and all educational stakeholders require clear guidance as to what is expected of them throughout the process" (Ministry of Education, 2005, p. i).

ICT integration is definitely a complex method that requires technological skills and the ability to use pedagogical knowledge as a base of integrating technology into teaching and learning. This means that various competencies need to be developed for ICT integration to be possible. This is supported in the ICT Policy in Education, which highlights that pre- and in-service training for teachers should provide the necessary knowledge and skills on how to use technology as a tool to support learner-centred teaching, continuous assessment and other forms of interactive learning.

The University of Namibia as a stakeholder of education in training of pre-service teachers has a module called Integrated Media and Technology Education (IMTE), which was introduced into the new Bachelor of Education programme in 2011. IMTE is a module that was designed to equip student teachers with knowledge, skills and attitudes required for the integration of media and information and communication technologies in teaching and learning situations.

ICT in education is often used interchangeably with instructional technology, which refers to the theory and practice of using technology for design, development, utilisation, management and evaluation of process for learning (Moller, Huett & Harvey, 2009). This means that there are multiple aspects and challenges that need to be understood first before teachers can be regarded as competent enough to integrate various ICTs into teaching and learning.

It is in this regard that Mishra and Koehler (2009) call for an approach that treats teaching as an interaction between what teachers know and how they apply what they know in the unique circumstances or contexts within their classroom.

"It is important for teachers to realize that at the heart of good teaching there are three components: Content, Pedagogy, and Technology, plus the relationship among and between them" (Mishra & Koehler, 2009, p.62).

These three components formulate the central point of the Technological, Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006, 2009), which this study will be based on. These are all skills that pre-service student teachers need to acquire to ensure an appropriate and effective integration process of ICTs during their teaching process. In the United States of America, it was found out that some teachers may have sufficient skills, but they often still do not integrate technology consistently both as a teaching tool and a learning tool for their learners (Bauer, 2005). Correspondingly in Namibia, it was observed that the integration of ICT into teaching and learning was either limited or not taking place at all (Iipinge, 2010; Ngololo, 2010).

1.3 Statement of the problem

As a teacher educator of the subject (module) Integrated Media and Technology Education, this researcher observed that pre-service student teachers are exposed to a variety of ICT equipment, learning tools and management systems as well as methodologies on how to use and integrate them in their lessons through some of the modules they take as part of their course work. A study done in the United States of America by Grant (2002) showed that despite the rapid advancement of ICT, it is not always used effectively in the classroom. Grant found that those who do not have ubiquitous access to the internet and other technologies in their own personal lives do not know how to use various ICT devices effectively, and also do not see the value of integrating ICT and the associated devices into the curriculum or using

it daily in the classroom. In addition, studies on technology usage and its integration into lessons at school level and higher education institutions found that there is often great failure in the usage and integration process (Bauer & Kenton, 2005). Bauer and Kenton (2005) further indicate that although some teachers may have sufficient skills and innovation, they do not integrate technology efficiently and consistently as both a teaching tool and a learning tool for learners. This could be due to lack of training in the use of particular equipment, unavailability of various ICTs at school level, and poor selection of the equipment.

The purpose of this study was to investigate the challenges faced by pre-service student teachers on the usage and integration of ICTs during School Based Studies (SBS), also known as teaching practice, at selected schools in Oshana Educational Region. The study was also aimed at investigating and filling gaps regarding the skills and competences that student teachers may not have in the use and integration of ICTs into their pedagogical practices. The study will add value to the limited research base of ICT use and integration in Namibia and provide a more holistic understanding of the subject matter through providing necessary adjustments on how student teachers needs to be trained on how to use and integrate ICT's during teaching.

1.4 Research questions

The main question for this study was: "How can the use of ICT by pre-service student teachers be enhanced during School Based Studies?"

The following sub-questions assisted in providing answers to the main research question:

(1) What type of ICT tools are mostly used by student teachers during teaching practice?

(2) What are the student teachers' perceptions on the ICTs use to improve their teaching during teaching practice?

(3) What teaching strategies do student teachers use when integrating ICTs into their lessons based on competencies?

(4) What challenges do the student teachers face and experience in using and integrating ICTs in teaching activities during School Based Studies?

1.5 Significance of the study

The researcher found the study to be important for various reasons. Firstly, it helps to identify ways of integrating ICT into classroom instruction. Secondly, it highlights and improves the way in which student teachers are being trained to select, design and use ICT tools for teaching and learning. This may lead to the examination of pre-service teachers' understanding of the concept of Technological Pedagogical Content Knowledge, which will in turn help to improve the acquisition and development of technological, pedagogical and content knowledge. Thirdly, students will become aware of new trends and good practices of technology in their teaching and learning process, as well as knowing what appropriate technologies are required to achieve the necessary learning objectives in a lesson. Lastly, the recommendations may be help to make easier the integration of ICT, as highlighted in the ICT Policy for Education, which emphasises the importance of having a relevant, effective and responsible ICT integration process in order to meet the challenges of the 21st century. These recommendations would also assist the

education program at the University of Namibia to strengthen the use and integration of ICT's by students.

1.6 Limitations of the study

Firstly, the researcher did not have any control over the placement of pre-service student teachers in schools that might be regarded as technologically well-equipped or ill-equipped. This made it difficult for the researcher to select an appropriate sample. Secondly, there was the possibility that the mentor teacher in charge of guiding the pre-service student teacher during the school based studies would not be prepared for the researcher to observe his/her lessons. In order to minimise this, the researcher explained fully the purpose of the study and significance thereof in order to motivate prospective of the study. Thirdly, because this study only investigated student teachers in one region, the results cannot be generalised to the rest of Namibia. The findings do present, however, a better overall understanding of what challenges pre-service student teachers face during school based studies and such knowledge can be used for further studies.

1.7 Definition of terms

In this study, the following terms are defined as follows:

Information and Communication Technologies (ICTs): This refers to technologies that provide access to information through telecommunications. The term is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums (Millea, Green & Putland, 2005).

ICT tools and devices: A collection of tools and devices used for a particular task, for example interactive whiteboards, mobile phones, laptops, tablets, Televisions, cameras and scanners (Millea et al, 2005).

ICT integration: The process of teaching by demonstrating the outcomes off innovation, pedagogical goals (student-centred, authentic), collaborative learning, robust reliable hardware and showing expertise skills (Milton, 2003).

Integrated Media Technology Education (IMTE): This is a module that 1st and 2nd year BEd students at the University of Namibia (UNAM) take in order to learn various available ICTs that could be used to conduct lessons as well as to gain technology-literacy skills.

Learning tools and management systems: This is Internet based software that deploys, manages, tracks and reports interaction between learners and instructors. They enable student registration, track learner progress, and record test scores and course completion. It also allows the instructors to assess student performance and contributions (Millea, Green & Putland, 2005).

School Based Studies (SBS): SBS is a term used to describe the time when student teachers are out in schools to observe or practice teaching. This can also be described as teaching practice (UNAM B.ED syllabus).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents the conceptual framework on which this study was based, followed by a discussion on ICT integration into education, factors hindering effective use and integration of ICT, and the current ICT uses and practices by teachers in Namibia. The chapter ends with a description of the general trends of ICT use and integration in teacher training programs.

2.2 Conceptual framework

This study was informed by the Technological, Pedagogical Content Knowledge (TPACK) conceptual framework developed by Mishra and Koehler (2006). The framework is based on Schulman's (1986) original idea of pedagogical and content knowledge (PCK). In principle, technology integration during teaching requires teachers to have an understanding of the content they want to teach and the pedagogy that is synchronised with the content of the subject to be taught, and that includes the technology that will support learners' learning process in a classroom situation. According to Mishra and Koehler (2009), the TPACK framework involves the interplay of six components: technological knowledge (TK); pedagogical knowledge (PK); content knowledge (CK); technological content knowledge (TCK); technological pedagogical knowledge (TPK); and pedagogical content knowledge (PCK).

Component 1: Technological knowledge (TK)

Technological knowledge is related to the ability of the teacher to use hardware and software to solve learning problems (Mishra & Koehler, 2009). This means that teachers should have knowledge of various technologies, starting from lower technologies, such as Overhead projectors, audio recorders, cassette players, etc, to more complex digital technology, such as digital video, interactive white board, laptops, mobile devices and smart phones, iPods, tablets, etc. Nonetheless, Mishra and Koehler (2009) acknowledge that technology is changing, much faster than the content and pedagogical processes. This means that teachers need to have the ability to make use of available technology.

Component 2: Content knowledge (CK)

This is the knowledge of the actual subject matter that is to be learned or taught (Mishra & Koehler, 2009). Content knowledge includes knowledge that teachers possess on the primary subject content they teach, which may include concepts, theories and conceptual framework.

Component 3: Pedagogical knowledge (PK)

This knowledge describes the knowledge of the teachers on the processes and practices of teaching. This may include how teachers plan their lesson and conduct assessment. Mishra and Koehler (2009) emphasise that teachers should demonstrate knowledge about techniques or methods in the classroom, determine the nature of learners' needs, and understand strategies on how to assess learners' performance. It must be pointed out that pedagogical knowledge is not sufficient on its own. Pedagogical knowledge is mainly based on the constructivist theories which include

the student teachers capabilities to have knowledge on the learners' ability and their learning strategies when planning for lessons, their age, attitudes towards learning, developmental levels, assessment and prior knowledge of what is going to be taught in class. Pedagogical knowledge may also include teaching methods during lessons and therefore student teacher with a strong pedagogical knowledge understands how learners will construct knowledge and acquire skills during a lesson. Pedagogical knowledge essentially requires student teachers to understand the cognitive, social, developmental theories of learning as well as the political, cultural and physical environments in which learners' are asked to learn.

Component 4: Pedagogical content knowledge (PCK)

This knowledge is about how to make subject content understandable to learners. By having this knowledge, teachers can determine what makes subject content difficult or easy to learn. This may include common misconceptions and preconceptions that learners bring with them to the classroom. Mishra and Koehler (2009) describe PCK as the transformation of subject matter, which occurs when a teacher interprets the subject matter, finding various ways of presenting the content and adapting and altering the instructional material to alternative ideas and learners' previous knowledge.

Component 5: Technological pedagogical knowledge (TPK)

This knowledge is about the teachers' cognisance that teaching and learning can change when particular technologies are used in a specific way. A teacher should know where and how a particular technology can be used to change teaching in a given subject matter (Mishra & Koehler, 2006). An example of TPK may include the use of digital or cell phone cameras to involve learners in the process of

interacting with pictures during learning, or online collaboration tools to facilitate social learning for geographically separated learners. TPK requires teachers to reject the use of the ICT tools in a fix way all the time, but wants teachers to develop skills that look beyond most common use of the available technology and to reconfigure such technologies to create creative lesson plans and instructional methods in the classroom.

Component 6: Technological content knowledge (TCK)

This is the knowledge of how technology can create some new representations for specific content. Niess, Ronau , Shafer, Driskell, Harper, Johnston Browning, Özgün-Koca, and Kersaint, G (2009) states that TCK is the type of knowledge that refers to how technology may be used to provide new ways of teaching content. An example of TCK is using digital animation to enable learners to conceptualise how events are taking place, such as osmosis, diffusion, soil erosion, transpiration, etc.

The combination of all these components forms the TPACK framework, which can be viewed as the interaction of CK, PK and TK when using technology for teaching and learning as shown in Figure 1 below:

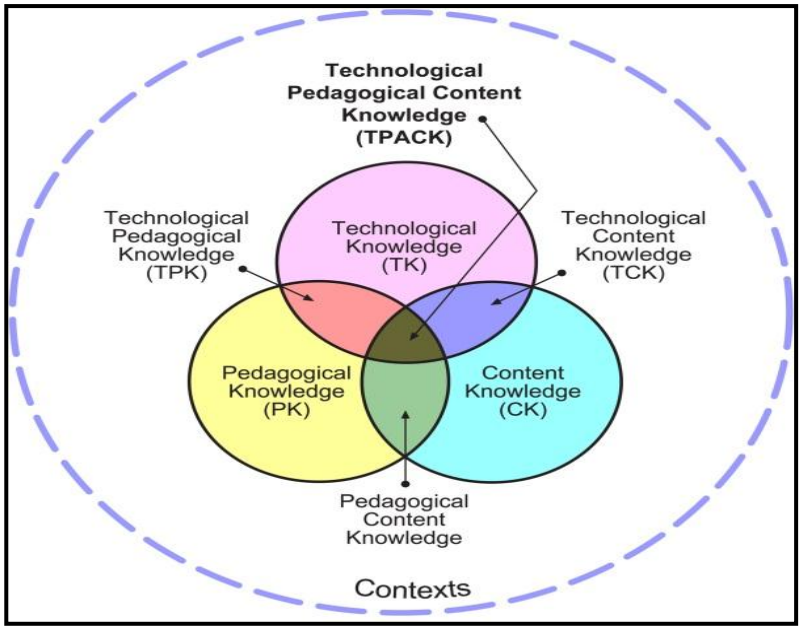

Figure 1: TPACK framework (Mishra & Koehler, 2009)

TPACK is a useful framework when considering the knowledge that teachers must possess to be able to integrate ICTs into teaching and learning. Mishra and Koehler (2009) claim that measuring teaching knowledge could potentially have an impact on the type of training and professional development exposure designed for pre and in-service teachers. TPACK does not necessarily mean that new technologies must be introduced, but instead focuses on creativeness to use the already available technologies.

Components 4, 5 and 6 allowed the researcher to establish the level and needs of the pre-service student teachers' knowledge of teaching methods with respect to subject matter content, knowledge of using technology to implement different teaching methods and knowledge of subject matter representation with technology in their respective subjects.

2.3 Emerging TPACK in teaching

The progression of integrating technology from content and pedagogy only to the formation of pedagogical content knowledge is not an easy process as indicated in the ICT Policy for Education (MOE, 2005). Niess et al (2009) stress that the development of teachers towards TPACK depicts various levels for them to develop sufficient knowledge on how to merge using technology, content and pedagogy. Figure 2 below illustrates these stages.

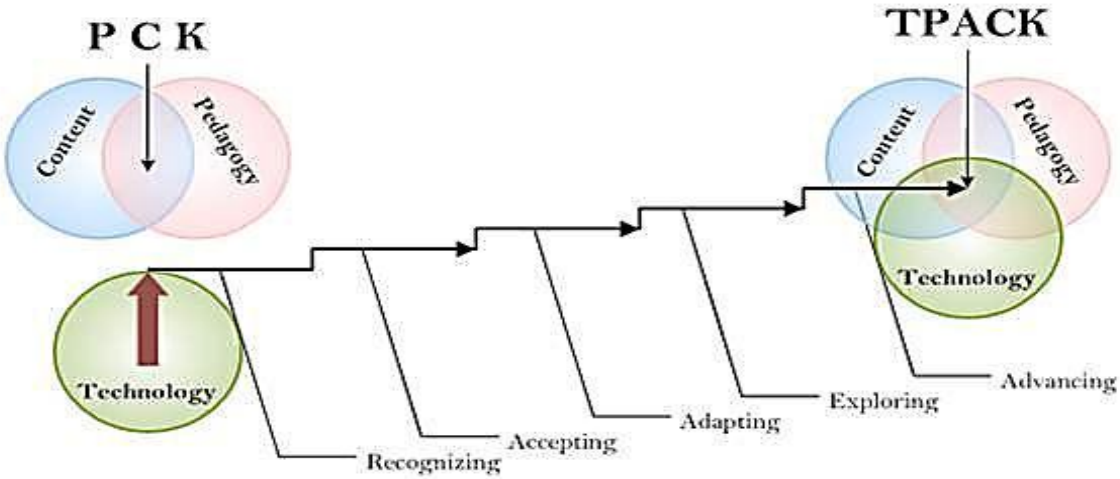

Figure 2: Stages in teachers' TPACK development (Adapted from Niess et al, 2009)

Stage 1: **Recognising** - this stage includes knowledge that teachers have of using the technology and recognising the alignment of technology with the subject matter, yet they do not integrate the technology into teaching and learning of the content.

Stage 2: **Accepting** - this stage involves persuasion, whereby the teacher forms a favourable or unfavourable attitude towards teaching and learning specific topics with an appropriate technology.

Stage 3: **Adapting** - this stage includes decision making, by which the teacher engages in activities that lead to a choice to adapt or reject teaching and learning specific content topics with an appropriate technology.

Stage 4: **Exploring** - this stage involves the process of implementation, by which the teacher actively integrates teaching and learning of specific content topics with an appropriate technology.

Stage 5: **Advancing** - the final stage includes confirmation, of which the teacher evaluates the results of the decision to integrate teaching and learning with the appropriate technology.

TPACK focuses on learner-centred approach. All knowledge and skills of teachers are focussed towards that purpose. In order to make these stages possible during teaching and learning, teachers need the knowledge, skills and experience as well as support to integrate technology successfully. This, therefore, may suggest that pre-service students should have basic technology skills and use technology regularly.

2.4 Essential TPACK competencies for teachers

UNESCO (2008) stresses that teachers should have the ability to make use of network resources to help learners collaborate, access information, and communicate with other teachers and subject experts to analyse and solve problems relating to their subjects. Further, teachers need to be ICT literate in using various ICTs to create lessons, plan learning projects for learners, and collaborate with respective fellow subject teachers to improve professional subject development. Kafyulilo (2010) summarises these competencies by indicating that besides technological, pedagogical and content knowledge, there is professional

development, whereby pre-service student teachers are urged to engage in continuous learning to transfer them towards deepening their understanding about teaching and technology to advance their personal careers.

Teachers are expected to develop their own competencies on how to make use of ICT and integrate it into teaching to enhance learning, rather than focusing on how learners must learn ICT. Cox, Preston and Cox (1999) state that the more competent the teacher is, the more interested they become in using ICT confidently during teaching. Therefore, a better understanding of TPACK among pre-service student teachers may lead to the interest in more confident usage and integration of ICTs and enhance learners' learning outcomes.

Cox et al (1999) also specify that ICT uptake by teachers during teaching is highly impaired by the worry of self-esteem, fear of damaging the equipment, and possibilities that the technology can go wrong while busy teaching. Therefore, based on the components developed by Niess et al (2009), Stage 5, which focuses on advancing or confirmation, pre-service student teachers should adopt the culture of assessing the type of technology they will use and its impact on the outcomes of the lesson.

2.5 ICT integration

2.5.1 What does ICT and integration mean?

ICT stands for "Information and Communication Technology." These technologies are used for communication, data processing and data storage. Jones (2001) states that with the emergence of new technologies such as interactive telecommunication systems, curriculum software and assistive technologies, the primary focus of using these technologies only for communication, data processing, storage and retrieval

has shifted enormously and made huge impacts on education. Iipinge (2010) states that the concept of ICT integration is not a new one and that it dates back to the ages when ICTs such as television, telephones, newspapers and films played a crucial role in teaching and learning. It should also be noted that devices such as calculators, video images/clips, broadcastings, still and slide images and projections are all regarded as ICTs.

UNESCO describes ICT integration as the way in which ICT becomes an integral part in the background of the classroom learning or learning process. This means that teachers should not only use ICTs as an instructional tool, but it should go beyond that by integrating it in order to achieve specific learning outcomes (UNESCO, 2008). For example, a teacher uses a video clip on soil erosion or ground pollution in a classroom to make learners aware of the dangers, but also instantly allows learners to come up with possible solutions to the identified problem. Therefore, a teacher needs to make a well-considered decision on which instructional strategy to use for that specific group of learners and that (sub) topic.

2.5.2 ICT in education

Since the core purpose of the ICT Policy for Education (MOE, 2005) is to prepare all Namibia's learners, students, teachers and communities for the world economy, the realisation is that education will be the key input in this regard. The Policy outlined some of the following key benefits of ICT use and integration in education:

- Offering an opportunity for more student-centred teaching;
- Giving at-risk students greater opportunities; e.g., students who have problems with authority figures perceive computers as neutral;
- Greater exposure to vocational and workforce skills for students;

- Greater opportunity for teacher-to-teacher and student-to-student communication and collaboration;
- Greater opportunities for multiple technologies delivered by teachers;
- Creating greater enthusiasm for learning among students;
- Access to a wider range of courses (by subject, level and lifestyle choice);
- Providing teachers with new sources of information and knowledge;
- Preparing learners and students for the real world;
- Providing distance learners country-wide with online educational material; and
- Providing learners with additional resources to assist resource-based learning.
- Providing technology integration standard for teachers (ICTED) and basic ICT literacy competencies.

Judging from the benefits listed above, it is demonstrated that ICT in education offers numerous beneficial opportunities for education. Subsequently, pedagogy and content form the baseline in teaching and the introduction of technology changes the way pedagogical practices are taking place in the classroom. This means that teachers need access to infrastructure and the opportunity to develop the expertise to use the technology and available software tools. Okojie, Olinzock and Okojie-Boulder (2005) argue that technology in education is not a mere object to be introduced into teaching and learning or activities at will without considering basic principles of learning and sound teaching methodology.

Modern technologies such as that of assistive technologies, mobile and smartphone technology, smart board technology, and online media have a greater potential to

improve the benefits outlined in the ICT Policy for Education. Morrison (2007) indicated that once ICTs are used and integrated in the best practices, it can improve and facilitate literacy acquisition, flexibility and differentiated learning. Morrison (2007) further indicated that student engagement and independent thinking are created.

A major concern related to ICT integration in education is that most teachers do not fully comprehend the pedagogical principles that will guide them in using technology for teaching and learning. This is why this study primarily focused on the TPACK framework to identify the gaps that might exist in student teacher's perceptions of ICT integration.

Therefore, improving the quality of education and training is a critical issue, particularly at a time of educational expansion as is the case in Namibia. To make that possible, teacher training needs to be enhanced to improve and effectively implement ICTs in education. UNESCO (2008) recommends that teacher training should be based on the use of ICT so that teachers develop their own teaching support materials. This ensures ownership by teachers and enhances usability of these products as many projects still focus on using materials that have been develop externally, making such materials often fall short in providing appropriate or relevant content for local use. This disregard for local context contributes to poor or no use of these materials by teachers.

2.5.3 The meaning of ICT integration

ICT integration is not about providing student teachers with ICT tools to enhance their teacher teaching, but it is the process of providing and allowing learners to make use of the ICTs to enhance their own learning. Roblyer (2004) clearly

describes that ICT integration requires five phases to plan and implement. This phases are (1) determine the advantage of the ICTs that will be use, (2) decide on the objectives of the lesson and what will be assessed, (3) design how integration process will take place, (4) prepare of the instructional environment, (5) evaluate and revising the integration strategies. Therefore, the process of integrating ICTs during lessons requires planning and a great deal of analysis of what will be the outcomes. Hence it can be stated that ICT integration is not merely the availability and use of ICT tools at an institution to provide instructions in a classroom, but it should provide innovation, collaboration, communication, critical thinking, problem solving, decision making, and provide digital citizenship awareness to the learners.

ICT integration would then allow teachers in this case to become facilitators to inspire active learning, designing, develop, and evaluate the learning experiences of learners as well as promote appropriate digital citizenship awareness and professional growth.

2.6 Factors hindering effective use and integration of ICT

Various researchers have identified several factors that continuously influence the use of ICT and the integration process. Balanskat, Blamire and Kefala (2007) have identified factors such as teacher level, time, experience, school level and system level as having an influence on how ICTs will be used and integrated. Sherry and Gibson (2002) also support the fact that individual characteristics, technological skills, organisational situations, as well as content characteristics often influence or impede the effective use of ICTs. A study done by Iipinge (2010) on former educational colleges in Namibia revealed that about 72,8% of educators lacked training in ICT pedagogy, 64% lacked technical “know how” of ICT applications,

while 54.3% indicated that workload made it impossible to use and integrate ICT tools. Similarly, another study conducted by Chainda (2011) on pre-service student teachers' perception of integrating ICT into their respective subjects found that 60% of the participants agreed that integrating ICT into subjects enhanced the quality of their learning.

The next section now focuses on some notable factors hindering the effective use and integration of ICTs in teaching and learning.

2.6.1 Personal characteristics

According to Jones (2001), personal characteristics such as background knowledge, age, gender, educational experience, and experience with various technologies can all influence the use and integration of ICTs. Generally, characteristics such as anxiety, lack of confidence and fear often hinder the use and integration of ICTs in teaching and learning. Moore, Lemon, Cox, & Servis (2002) stated that educational theory should form the basis for teaching. When student teachers are teaching, philosophy is deeply embedded into, for example, the behaviourist learning theory student teachers would find it difficult to use and integrate ICTs due to the fact that the behaviourist focuses more on aspects such change in behaviour as a form of learning. The environment in which teaching takes places is what shapes the behaviour and, in this case, the observable measurable behaviour is the prime focus. Moore et al. (2002) further added that behaviourist learning philosophy would only develop lesson goals and objectives for teaching that include knowledge, skills and attitudes that the learners should master by the end of the teaching session.

Constructivism learning theory beliefs and assumptions play a critical role in the use and integration of ICTs in the classroom as it involves the selection and organisation

of classroom activities. Higgins and Moseley (2001) found that teachers who adopt the constructivist educational beliefs seem to be more willing to adopt the learner centred approach and other innovative instructional approach in the classroom which makes them active ICT users. Therefore, student teachers need to adopt and have an in-depth understanding of the constructivism learning theory in order for them to be able to integrate ICTs much more efficiently in the classroom.

The Namibian teachers in general are required to use and integrate ICTs during teaching and learning activities, but teachers' preparedness to do so determine the effectiveness of the technology in the classroom (Jones, 2001).

2.6.2 Student teachers' attitude towards ICT integration

Attitude towards ICT use and integration will determine effective implementation of such integration in teaching and learning. Also, the more pre-service student teachers are exposed to the different technologies available and their possible usage and importance in education, the more likely they will use them during their teaching. According to Woodrow (1992), for successful transformation of technology in educational practice to take place, users need to develop a positive attitude towards innovation.

Ajzen (2005) described an attitude as a predisposition to respond favourably or unfavourably to an object, person, or event. Therefore, attitudes towards ICT use and integration influences student teachers' acceptance of the usefulness of technology, and also influences whether student teachers will integrate ICT into their classroom. In a study conducted by Buabeng-Andoh (2012) on factors that influence teachers adopting and integrating ICTs, it is stated that if teachers perceived technology programs as neither fulfilling their needs nor that of their

student needs, it is likely that they will not integrate the technology into teaching and learning.

In a similar study conducted by Drent & Meelissen (2008) found that teachers with student orientated pedagogical approach, possessing a positive attitude towards computers, having computer experience and personal entrepreneurship of the teacher, have a direct positive influence on the innovative use of ICT in the classroom.

2.6.3 ICT competence

UNESCO (2008) emphasises the importance of specific skills that teachers should possess, such as using various hardware and software to reach a specific level of knowledge in the use of technology. In the Namibian teachers ICT competency context, teachers are required to have ICT literacy competence which is obtained through computer literacy, as well as ICT integration competency standards which are stipulated under the ICTED guidelines.

Basic software, such as word processing, presentation software, graphics software, the Internet and the World Wide Web are regarded as the entry level skills for teachers. According to Peralta and Costa (2007), teachers with greater capability in basic computer operations tend to be more confident in using any other available technology. Therefore, it can be fairly concluded that competence on the use of ICTs can determine confidence in the use of ICTs.

2.6.4 Institutional characteristics

Institutional characteristics contribute to the development of student teachers' positive attitude towards the use and integration of ICTs. Vannatta and Fordham (2004) indicate that the amount of time that institutions such as universities or

schools spend on training and guiding teachers on how to use technology increases the possibility of them use it in future. This is also supported by Norris, Poirot and Soloway (2003), who comment that there should be sufficient accessibility and exposure to various technologies at these institutions to encourage students to make use of them. This implies that educators at these institutions should conduct primary progress assessment, through which students can realise how various technologies are used to teach specific content in a classroom situation.

2.6.5 Technological characteristics

Technological characteristics include the aspects of innovation and creativity in using specific ICT tools. This may include determining the advantage of using a specific tool, compatibility to the content being taught, complexity and time in creating learning materials for a lesson. Rogers (2003) stresses the need to understand how teachers accept innovation as this can have a strong influence on teachers in using and integrating specific ICTs. This implies that the creativity to produce teaching materials for a lesson depends on the teacher's technological characteristics.

Teachers in general tend to use and integrate technologies that are easier and compatible with their respective subjects. This is probably due to the time spent on preparing specific lessons and the number of learners to be taught. This is reinforced by Yildirim (2007), who reports that the major concerns for most teachers are the repetitive process of preparing lessons, teaching, giving summaries and assessment to learners, resulting in little time spent on innovation in creating fresh ideas to improve content by using technology such as digital devices, and searching for more information on the Internet to improve learners' performance and participation in class. Yildirim (2007) further comments that issues such as class congestion,

inadequate technical and pedagogical knowledge and insufficient training on using specific ICTs reduce the chances of teachers implementing ICT. Matters such as lack of access, insufficient time to complete lessons and syllabi, and lack of mentors cannot be overlooked as factors that contribute to lack of use of ICTs during teaching and learning.

2.6.6 School culture

School structures are an important factor in determining the use and integration of ICTs by teachers. In principle, the use and integration of ICTs during teaching and learning depends on the acceptance of new technologies by a particular school culture. Maslowski (2001) defines school culture as basic assumptions, norms, values and cultural artefacts that are shared by school members. These assumptions and perceptions can indirectly create certain behaviours and attitudes in a school as to how things should be done. Therefore, if the use and integration of technology is not perceived positively in a school, not much of it will be used in the teaching and learning process. Teachers who have a positive attitude in accepting various ICTs in their schools tend to apply it more in education. The mentor teacher who is then assigned to assist and guide the pre-service student during the SBS practicum plays a major role in guiding and motivating the student teacher to use and integrate ICTs in their subject lessons.

Maslowski (2001) described that school culture to encompass the vision, plans, norms and values that are shared by school members. It, therefore, means that for a school to successfully use an integrate ICT's, as a norm, it will depend on the perception and vision of the school leaders rather than the teachers ICT skills. Chai, Hong, & Teo (2009) found that that school culture has a mediating role that influences teachers' action, beliefs and attitudes.

This indicates that to achieve positive results in terms of using and integrating ICTs at school level effectively more professional development is required with the focus on increasing teachers' skills and confidence in order to overcome the hesitations associated with using technology. Ngololo (2010) recommends that schools must be encouraged to develop ICT user policies, goals and specific implementation plans for the school in each academic year.

2.7 Current ICT uses and practices in Namibia

Namibia's ICT infrastructure ranks among the best in Southern Africa. However, most of the technological infrastructure is urban based, except radio broadcasting and television, which seem to have covered the majority of the country. This has been echoed in Namibia's fourth National Development Plan document (NDP4, 2012-2017) which states that:

> *The problems associated with the education system are extensive, and range from a lack of quality to a lack of infrastructure and information and communication technology (ICT). While some advances have been seen over the past 21 years, these have been limited. Many regard them as inadequate, in that they have not given the system the reform it has sought. Since education, as with any training, is a direct skills transfer, it is critical that those with the immense responsibility of educating the nation, and of ensuring that skills are efficiently transferred, are in fact equipped to do so* (Republic of Namibia, p.46).

2.7.1 Ministry of Education ICT platform

ICT infrastructure and its accessibility play a major role in achieving such developmental goals as indicated in the NDP4 document. Since the Tech/NA!

document was established in 2006, it has been regarded as the main driving force behind all the ICT strategies and implementation process. The implementation plan of Tech/NA! (Ministry of Education, 2006a) clearly specifies the ICT platform that needs to be implemented at educational institutions such as schools. Figure 3 below shows the seven main choices for the ICT platform implementation to be rolled out to various educational institutions around the country.

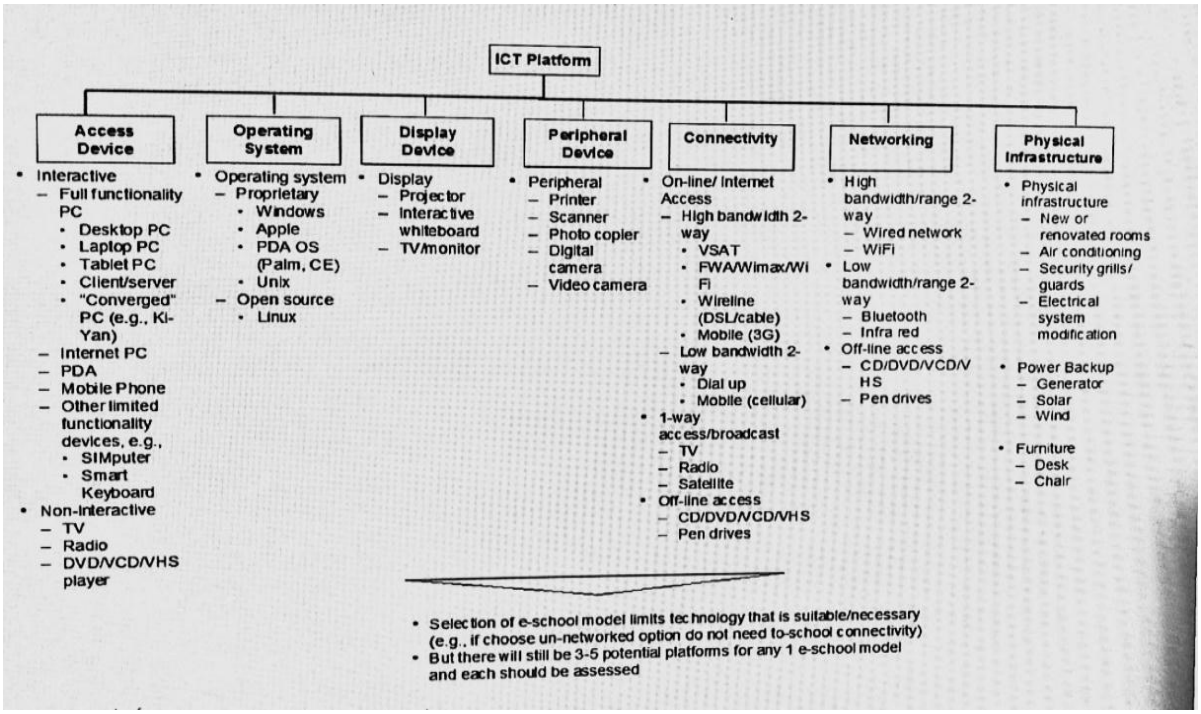

Figure 3: ICT platform envisioned for educational institutions (Ministry of Education, 2006a)

From an analysis of the above ICT platform, educational institutions such as schools may possess three to five potential platforms that suit the existing environment. This means that a school without any connectivity to internet or wireless network may lose out on the options of having platforms such as networking and connectivity, but may still have the possibility of possessing platforms such as display devices, peripheral devices and some of the non-interactive access devices such as TV, radio

and DVD/VHS. This shows that rural schools may possess only a few of these platforms.

As indicated in the literature, educational institutions may possess all or some of these platforms, but the ultimate goal is their use and integration for educational purposes.

2.7.2 Infrastructure readiness and usage in schools

According to the implementation plan, guide and deployment of the indicated platforms, each school is supposed to have at least computers and a data projector to be regarded as being on level one (Ministry of Education, 2006a). On this level, schools should at least possess a room with the deployed ICT equipment, of which at least one or two teachers at the school must have a foundational level of ICT literacy. At this stage, learners will be introduced to ICT skills during one class period for one month. At this level, the Internet would not be required. This serves as an indication that the Government of the Republic of Namibia has provided the minimum basic infrastructure to most schools in the country under Tech/NA!.

An evaluation study done by Ngololo (2010) on the implementation of ICT policy for education in rural Namibian schools indicated that the ICT implementation is not yet widespread in the country and, where implementation has taken place, it is not common. Also, most rural schools only partially met the requirements for level one. In support, Matengu (2006) emphasises that various schools were provided with computers and other ICT devices on the basis that they required these materials. Matengu (2006) further cautions against assumptions that schools will make use of such materials for the envisaged purposes.

In the same study, Matengu (2006) suggests that a critical review of the ICT policy goals and how its current implementation process takes place needs to be done. Ngololo (2010) also emphasises the following: 1) a proper systematic approach needs to be conducted in terms of infrastructure and implementation of ICT in schools; 2) such plans should consider storage space and a maintenance plan to sustain the ICT infrastructure; 3) a proper analysis needs to be done with regard to the suitability of equipment; 4) lessons of ICT for learners need to be increased; and 5) teacher training on the pedagogical issues relating to ICT use and integration should be improved as a method to instil confidence in the teachers using ICTs.

In this study, the researcher focused mainly on the pedagogical issues linked to ICT use during teaching. ICT use and pedagogical skills change the attitudes with which pre-service student teachers will make use of ICT during their practicum.

2.8 General trends of ICT use and integration in teacher training programmes

Information and communication technologies (ICTs) are becoming increasingly prevalent in societies and around the world. With the frequent world expansion in ICT, it is important that educators and students have a thorough working knowledge of these various media and their influence on the performance and engagement of their learners (Dey, 2011).

To effectively and efficiently use ICT tools, student teachers need to understand the potential of technology, be given opportunities (where and when) to apply them, be given training and support, as well as have ample time to experiment (Bowes, 2003). Only then can student teachers be confident in using and integrating any technology that will be available to them.

The University of Namibia is tasked with the training of teachers in Namibia; therefore, institutional training programme should be guided by the Tech/NA! implementation guide (Ministry of Education, 2006a). Student teachers are expected to be educated on how to capture the full benefit of ICTs in schools. These phases are:

1. Basic Concepts of Information Technology;
2. Introduction to the Internet for teaching and Learning;
3. Introduction to Tele-collaborative Learning projects;
4. Curriculum and Technology Integration; and
5. Innovations: Pedagogy, Technology and Professional Development.

Based on this training framework, it would be expected that the student teachers at the University of Namibia when conducting their School Based Studies (teaching practice) should be at phases 4 and 5 which allow the student teachers to have the ability to have developed skills and understanding of how to create, incorporate and facilitate innovative classroom practices which integrate networked technology and curricula as well as evaluate and diffuse innovative classroom practices while addressing social and ethical concerns.

Since teaching has become one of the most challenging professions, teachers are expected to facilitate learning and make this more purposeful for their learners, instead of just providing knowledge and skills. This indeed serves as a challenge to teachers who need constant reorientation to acquire the necessary ICT use and integration skills.

Jung (2005) maintains that ICT can facilitate not only the delivery of instruction, but also the learning process itself. Therefore, initial teacher training programs are

undergoing a rapid change in the structure and content of how students are trained and how courses are delivered, even though ICT integration pedagogy is still a daunting task.

Dey (2011) emphasises that for pre-service student teachers to understand the use and integration process of ICT fully, they have to undergo the following three phases: awareness, guided integration, and integration.

Phase 1: Awareness

During this phase, students should be made aware of various available technologies and their potential usage in teaching. Foremost, students should be able to acquire basic skills in applications such as Word-processing, Excel, PowerPoint and ability to browse the Internet.

Phase 2: Guided integration

During this phase, students are expected to experiment with some of these applications to produce meaningful material that they would use during their teaching and learning. Dey (2011) points out that during this phase, expectations are high from the students that they should master specific skills that enable them to produce relevant content material. Therefore, students should understand the impact of using ICT for learning and teaching.

Phase 3: Realisation

In this phase, student teachers should become aware that ICT can be used in high level thinking, decision making and problem solving. This is also the phase in which student teachers need to make an informed decision on what type of ICT materials they will select and use for a specific subject content to meet the learning outcomes

of the lesson. Dey (2011) urges that by the time students reach this stage, they should understand that it is not about just using technology during lessons, but it is to assess whether such selected technology is enhancing the learning process.

A pragmatic approach of ICT integration into the teacher training program was adopted by UNESCO. In 2005, Bangkok (Figure 4) approached the teacher training program for ICT integration in four practical stages.

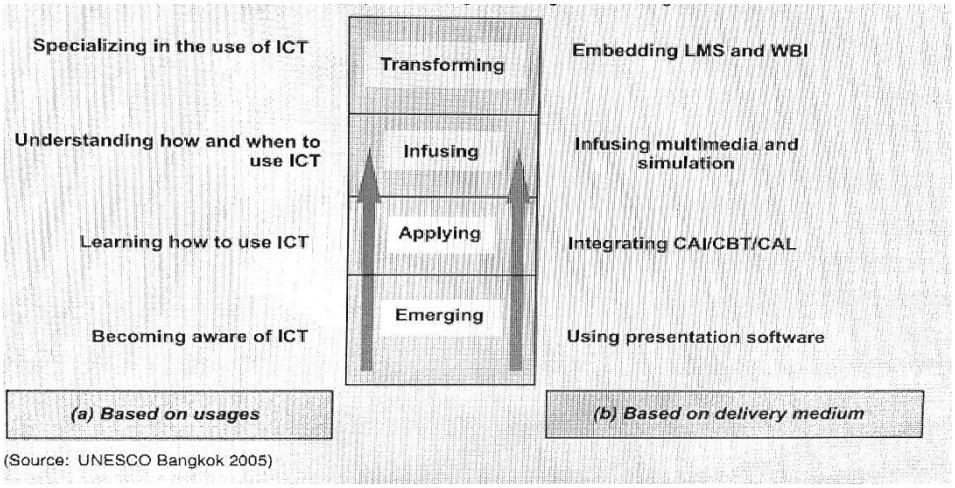

Figure 4: Mapping teaching and learning to the stages of ICT integration in a teaching program

These approaches and stages are refined and merged as follows:

Approach 1: Emerging

Student teachers discover ICT tools and their general functions as well as their uses in teaching. In this approach, emphasis would mostly be on literacy and basic skills, mainly by acquiring knowledge about available hardware and software as well as their use in education. Based on a delivery medium, students are required to be able to use this software appropriately. In principle, this can also be regarded as a skills development approach.

Approach 2: Applying

This approach involves using the ICT tools and creating awareness of their use in different disciplines relating to their subjects. This is when pedagogy influences the process of using ICT in teaching. Students would be required to design lessons and activities that are centred on the use of ICT to enhance the learning outcomes. This could be done by using Computer Aided Instruction (CAI), Computer Based Teaching (CAT) and Computer Aided Learning (CAL). This involves both the general and particular use of ICT to improve their ICT skills, and pedagogy to maintain such skills to design better classroom activities.

Approach 3: Infusing

Student teachers should now understand how and when to use ICT tools to achieve a particular purpose. This approach is similar to Dey's (2011) realisation phase, whereby a student teacher should make an informed decision on the use of a particular ICT tool. Ngololo (2010) informs that the infusing approach implies the ability to recognise situations where ICT would be helpful, choosing the most appropriate tool for a particular task, and using these tools to solve real problems and for authentic learning to happen. This approach can also be regarded as subject specific, as ICT should be integrated into the subject area to create innovative ways of using ICT; this could be creating and using multimedia as well as simulations.

Approach 4: Transforming

This is the exposure of a student teacher to new ways of teaching and learning to indicate that teaching has different approaches, of which specialised ICT tools can

be used to improve learning. The focus during transforming is to allow student teachers to develop lessons, activities and assignments by using ICT to implement what they would have acquired in the first three approaches. These approaches also indicate that student teachers can use ICTs to do assessment and manage teaching activities, such as the Learning Management System (LMS) and the Web Based Instruction (WBI) tool.

Ngololo (2010) warns that progression through all these stages takes time and the emphasising pedagogical practice is more important than training students to obtain ICT skills only. This clarifies the fact that pedagogical training on how to use ICTs is of more significance than only training student teachers on what type of ICTs are available, as this will motivate them to use and integrate ICTs in their respective subjects.

With these outcomes in the literature, Namibia's current situation with regard to pre-service student teachers integrating ICTs during their practicum could be attributed to acquiring the necessary skills and knowledge, pedagogical usage, infrastructure and availability of ICTs, personal characteristics, technical support, attitudes towards the use of ICT, institutional characteristics, as well as school culture.

When pre-service student teachers face challenges as revealed in the literature, then the success of integrating ICTs into teaching and learning would be placed in doubt as to whether the implementation of ICT integration would be successful in schools, as the pre-service student teacher will resort to the already existing teaching styles.

2.9 Summary

This chapter presented the conceptual framework on which the study was based by underlining what ICT integration in education accentuates on, the role ICT use and integration may play in education, the TPACK framework, what levels student teachers need to acquire to meet the requirements of successfully integrating technology, and factors that may hinder effective use and integration of ICT. The chapter concluded with an overview of the current ICT issues and practices in Namibia as well as the general trends of teacher training with regard to ICTs.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter presents the research design of this study and a brief explanation of the population sample and sampling procedures. This will be followed by an explanation on the instruments used to collect data and the piloting process of the instruments. The data collection procedure, data analysis, and ethical considerations will also be described in detail.

3.2 Research design

The aim of this study was to investigate how primary student teachers use and integrate ICTs during their School Based Studies. In order to answer the research questions, a mixed method study was chosen which is based on the QUAL-Quan mode (De Vos, Strydom, Fouch and Delport, 2005), with the qualitative method being dominant.

For this research, an exploratory sequential design was found to be the most suitable method. Creswell and Clark (2012) explain that an exploratory sequential design allows a researcher to start exploring the qualitative part of the topic first and then building on to the second part, which is the quantitative phase. The primary purpose of the exploratory sequential design is to generalise qualitative findings from few individuals and then to the larger sample during the second phase (Creswell & Clark, 2012). The first phase, i.e., qualitative, helped the researcher to develop variables for the quantitative phase. Since the researcher was investigating how primary student teachers use and integrate ICTs during their practicum, this research was anchored more on the TPACK framework.

3.3 Population

The targeted population for this study included student teachers that are majoring in the lower and upper primary phases at Hifikepunye Pohamba Campus and have registered for School Based Studies in the Oshana Educational Region.

3.4 Sample and sampling procedure

The sample throughout this study was 135 male and female 3rd year student teachers at Hifikepunye Pohamba Campus. Given the fact that the pre-service students are majoring in various specialisations (e.g. Languages, Social Studies, Mathematics and Science), a proportional, stratified sampling method was used in order for all specific groups to be represented equally. As such, the lower primary pre-service students had a smaller representation compared to the upper primary students, as students tend to be enrolled more for the upper primary phase. Using the proportional stratified sampling, 135 students were selected for the study. This number was sub-divided into 40% for lower primary, which represented about 28 students, and 60% for upper primary, which represented about 107 students.

3.5 Research instruments

There were two phases as follows:

PHASE 1: Qualitative

3.5.1 Classroom observations

In order to investigate how primary student teachers use and integrate ICTs in their teaching, the researcher conducted nonparticipant observation during lessons in the classrooms. According to Gay, Mills and Airasian (2009), nonparticipant

observation allows the researcher to observe and record behaviours, but does not interact or participate in the life or the settings of the event.

During the classroom observation, field notes were taken and recorded to compile information during the course of the study. Although observation alone did not answer the research questions sufficiently, it served as a useful method to gather data on how primary student teachers use their selected ICT tools for the lessons and how they integrate them. Therefore, during the classroom observation process, the researcher observed the classroom physical setting, types of ICT used, how the student teacher made use of them and for what purpose, the timeframe they used the selected ICTs and the process of interaction between teacher and learner while using and integrating ICTs based on the TPACK framework. The questionnaire instruments were developed from the TPACK survey method of Schmidt, Baran, Thompson, Koehler, Mishra & Shin (2009).

3.5.2 Semi-structured interviews

The researcher selected semi-structured interviews because of its flexibility to probe participants for more information for better understanding. De Vos et al (2005) is of the view that the researcher can use semi-structured interviews in order to get a detailed picture of participants' beliefs, perceptions and accounts of a particular topic. The researcher had focus group interviews that consisted of 14 members each, of which 7 sessions were conducted for approximately 40 minutes.

PHASE 2: Quantitative

3.5.3 Questionnaires

In the second quantitative phase of collecting data, a questionnaire was used. The questionnaire consisted of a 4-point Likert rating scale to measure aspects such as

the level of (1) ICT skills, (2) types of ICT tools used and (3) frequency of usage, and (4) level of pedagogy and (5) content knowledge on selecting ICTs. These were all close-ended type of questions.

The open-ended questions in the questionnaire covered issues related to (1) perceptions, (2) teaching strategies of ICT integration and (3) factors hindering the effective use and integration of ICTs.

3.6 Pilot study

A pilot study was done on 2nd year pre-service student teachers who had done their School Based Studies earlier than the 3rd year students in 2013. The main study was conducted on the 3rd year pre-service student teachers only. According to Neuman (2001), a pilot study can reveal deficiencies in the design of a proposed experiment or procedure and these can be addressed before the actual study. The pilot study helped to determine what needed to be adjusted and to further test the reliability and validity of the research instruments. Data from the pilot study assisted in correcting the deficiencies in the questionnaire and improving the interview questions.

3.7 Data collection procedure

During phase 1, the researcher first observed some lessons, based on the observation checklist and took notes on how the student teachers used and integrated ICTs. Data collected during classroom observation were transcribed daily to avoid loss of valuable interpretation and information. Phase 2 was followed by the dissemination of the questionnaires to the participants to complete. The semi-structured focus group interviews were conducted in the 1st and 2nd week upon the return of the student teachers to the University campus from their teaching practicum and this was done with prior arrangement with the selected participants for this study.

The estimated time allocated for each focus group interview was 40 minutes and the interviews were audio recorded. Data collected during interviews were transcribed immediately after the interview of each focus group.

3.8 Data analysis

The qualitative data methods help to describe facts, detect patterns, and develop explanations and test hypothesis (Gay et al, 2009). Since the researcher envisioned exploring the use and integration process of ICTs by primary student teachers, the approach of data interpretation was inductive - this is the process of moving from specific observation to broader generalisation. Data analysis was done as the data were collected.

Data from classroom observations were analysed by observing the frequencies in which the student teacher used a specific ICT device and the level of interaction between teacher and learners when using ICTs. The data from interviews were read through and transcribed several times by looking for patterns and themes that were similar. The researcher looked at the significance of these themes by observing how the data was classified into specific categories. Data from the closed responses in the questionnaire were analysed by using the method of central tendency to determine the frequencies of the pedagogical and content knowledge, ICT usage, level of skills and type of ICT tools used often, while the closed responses were transcribed using the same method as that of the interviews.

3.9 Ethical considerations

"Research ethics" refers to the values of right and wrong that suggest what humans ought to do. This can be in terms of rights, obligations, fairness, confidentiality or specific righteousness (Neuman, 2001). All participants for this study were informed verbally and through letters, which provided a clear description of the study, and this allowed the participants to indicate whether they agreed or disagreed to take part in the study. The researcher also emphasised to the participants that their participation would be voluntary and that they were free to withdraw at any time if they felt uncomfortable. All information collected was kept confidential and used for the purpose of this study only and no real names were used during the data collection process. The researcher also applied for permission from the Ministry of Education and the relevant school authorities as well as from the University of Namibia to conduct this study.

3.10 Summary

This chapter described the methodology used to collect and interpret data for this study. The research design, population, sample and sampling procedure, research instruments that were used to conduct the study, pilot study, data collection procedure, data analysis and ethical considerations were discussed.

CHAPTER 4: PRESENTATION OF STUDY RESULTS

4.1. Introduction

The purpose of this study was to investigate primary student teachers' field experiences of information and communication technology use and integration during School Based Studies (SBS). This chapter reports the results of this investigation. In order to facilitate the reading of this chapter, the biographical information of participants in terms of gender, age, phase of specialisation and areas of specialisation are presented first. Second, school profiles where the study was conducted are presented. Results collected through observations, questionnaires and responses from the interviews are presented in accordance with the following headings, which initially formed the sub-questions of this study: (a) type of ICT tools most often used by student teachers during SBS; (b) student teachers' training and preparation in the use of ICT; (c) student teachers' perceptions on ICT use and integration; (d) teaching strategies used by student teachers using and integrating ICT; and (e) challenges student teachers faced and experienced when using and integrating ICT.

4.2. Biographical data of participating student teachers

Biographical data about the participants collected as part of the questionnaire are presented below.

4.2.1. Age range and gender of student teachers

Student teachers' age range and gender are presented in Table 1:

Table 1: Student teachers' age ranges

	Frequency					
Age range	**Male**	**%**	**Female**	**%**	**N**	**%**
18 - 22	11	58.0	46	55.4	57	55.9
23 - 26	4	21.0	28	33.8	32	31.4
27 - 32	0	0	7	8.4	7	6.9
32+	4	21.0	2	2.4	6	5.8
Total	**19**	**100%**	**83**	**100%**	***102**	**100%**

**Note: N = actual number of students that had returned the completed questionnaires.*

The results in Table 1 shows that 57(55.9%) of the student teachers were between the ages of 18 and 22, of which 11(58.0%) were male and 46(55.4%) were female. 32(31.4%) were between 23 and 26 years of age, of which 4(21.0%) were male and 28(33.8%) were female, 7(6.9%) were between the ages 27 and 32, which represents only 7(8.4%) the female student teachers. Finally, 6(5.8%) were from the age of 32 and above, which included 4(21.0%) males and 2(2.4%) females.

4.2.3. Phase of specialisation

The student teachers were asked to indicate their area of specialisation in the questionnaire. The responses are presented in Table 2.

Table 2: Phase of specialisation of student teachers

	Frequency	
Specialisation	**N**	**%**
Lower Primary	26	25.5
Upper Primary	76	74.5
Total	102	100%

The majority of students 76(74.5%) were specialising in the upper primary phase (grades 5 to 7). One quarter (26) of the participants belonged to the category of lower primary (grades 0-4). Obtaining this data was essential as the study used a proportional stratified sampling method to represent phases of specialisation equally. This was significant because the enrolment for the lower primary has always been lower than that of the upper primary phase.

4.2.4. Area of subject specialisation

To determine the area of subject specialisation, student teachers were asked to indicate which subject they were specialising in. The results are shown in Table 3.

Table 3: Area of subject specialisation of student teachers

Area of specialisation	*Total
Class teaching	26
English	48
Oshindonga	29
Oshikwanyama	13
Mathematics	22
Integrated Natural Science	16
Social Sciences	24

**Note: Total = Actual number of student teachers who indicated their specialisation. Student teachers in upper primary had double majors.*

Student teachers specialising in the upper primary phase to have two major subjects to teach. Table 3 shows that the majority (48) of the student teachers were taking English as a major subject, followed by 29 who were taking Oshindonga. Oshikwanyama had the least number of student teachers (13). Mathematics, Integrated Natural Sciences and Social Sciences had 22, 16 and 24 student teachers respectively. About 26 student teachers from the lower primary phase indicated that their major area of specialisation was class teaching.

4.3. School profiles

The study was conducted in ten schools, both rural and urban. Five of the schools were located outside Oshakati and Ongwediva; thereby regarded to be under the rural sector. The remaining five urban schools were located within Oshakati and Ongwediva.

In terms of ICT infrastructure, the urban schools were better than the rural schools. They had more and better equipped ICT facilities than the rural schools, such as computer labs, mainline telephone, wireless connectivity, various digital media such as television sets, VCRs and DVD players, scheduled computer literacy lessons, availability of educational software such as the Genius software for teachers to use during lessons. While many of the rural schools visited did have electricity, many lacked the basic infrastructural equipment that would make it possible for teachers to use and integrate ICTs.

4.4. Types of ICT tools most often used by student teachers during SBS

Student teachers were asked what type of ICT tools they used in their teaching. The student teachers, especially those specialising in lower primary, indicated that they mainly used the conventional tools available in the classrooms, such as the chalkboard, posters, textbooks, software for simulation (Figure 5) and other teaching aids such as flip charts. Further, the student teachers indicated that the use of PowerPoint was their most preferred form of an ICT tool to use.

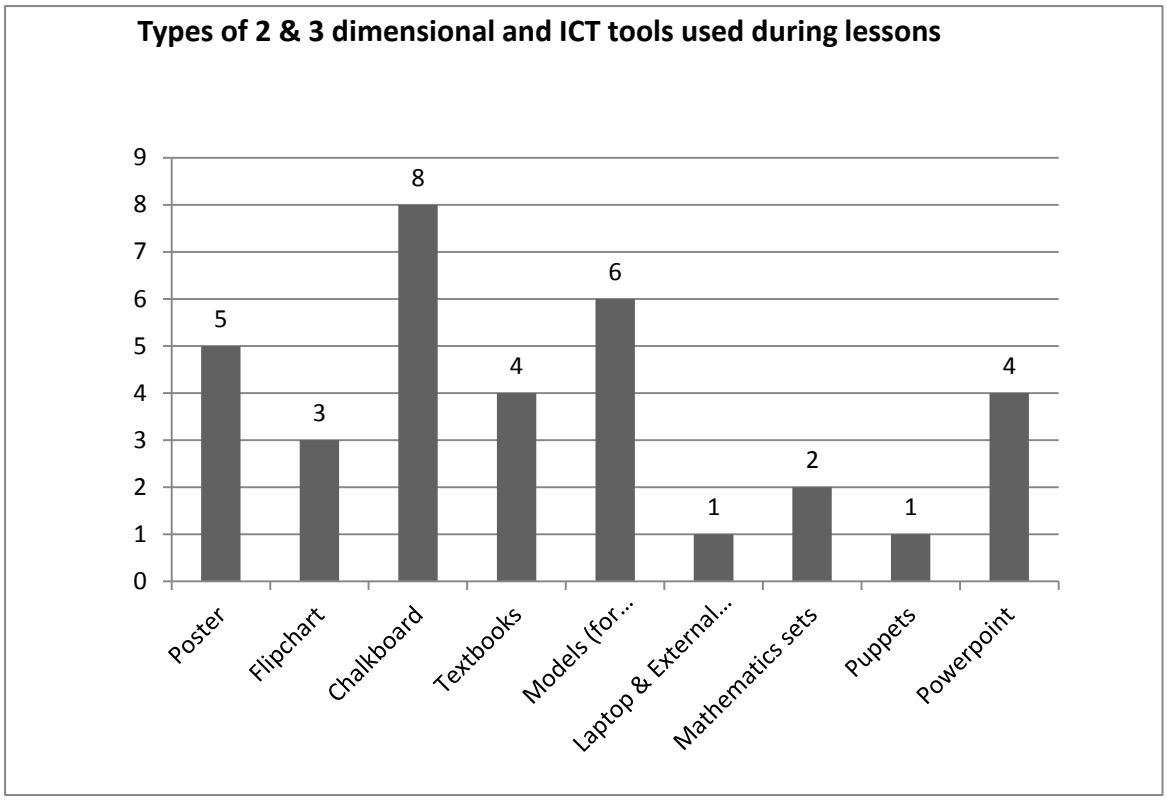

Figure 5: Types of 2 & 3 dimensional teaching aids and ICT tools used by student teachers during lessons

Figure 5 below shows the different types of ICT tools and other teaching aids student teachers used most during their school based studies.

4.5 Purpose of ICT use in the class

During observations, checklist data were also collected to establish what these tools were being used for. Figure 6 below shows the purpose for which the student teachers used the selected tools during lessons.

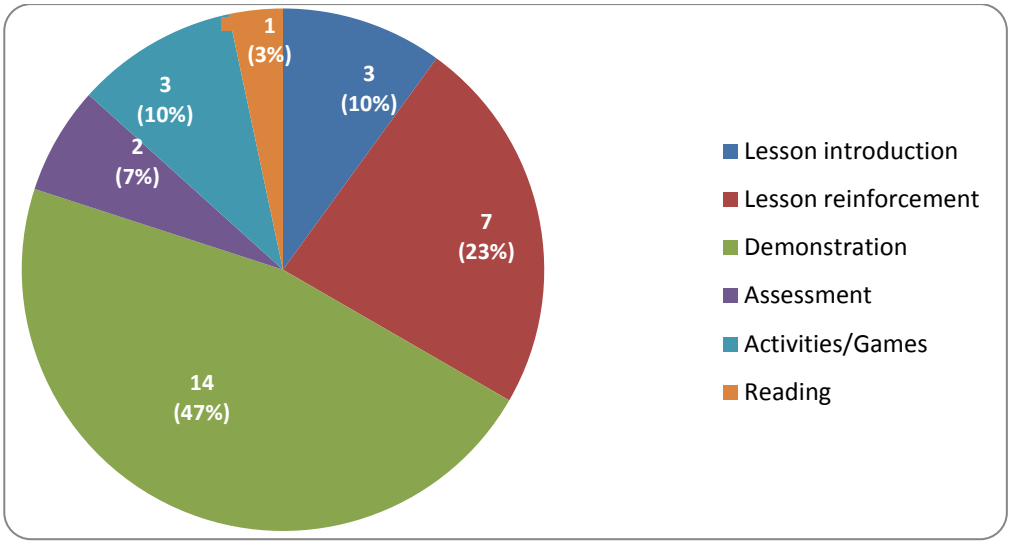

Figure 6: Purpose for which tools were used by the student teachers during lessons

The main purpose for which the participating student teachers used any selected ICT tools was to demonstrate the lesson objectives 14(46.7%) in line with their lesson plan. Some students, about 7(23.3%), wanted to use the selected tools only for lesson reinforcement towards the end of their lessons. Only 2(6.7%) of the student teachers used the tools for assessment, while 3(10%) used the selected tools for lesson introduction and teaching activities.

4.6 Level of interaction during ICT use or integration

As indicated in Table 4 below, a total of 30 student teachers were observed (N=30). From the observation checklist, 28(93.4%) of the student teachers exhibited the interaction process that was mostly focused on teacher-led instructional processes. In this case, the student teachers were mainly asking questions and the learners were responding. Only 1(3.3%) student teacher had activities or lessons that related to learners interacting among themselves. Similarly, only 1(3.3%) student teacher used the ICT tool without involving learners during the lesson.

Table 4: Observed interaction between student teacher and learners during ICT use and integration

	Frequency	
	N=30	**%**
Teacher centred only	1	3.3
Teacher to learner collaboration	28	93.4
Learner to learner collaboration	1	3.3

4.7 Student training time and preparation in the use of ICTs

Student teachers were asked through a questionnaire to indicate if they had received adequate ICT training on how to use and integrate ICTs in their respective lessons. The respondents answered as follows:

Table 5: Training time on how to use ICTs during teaching

At the University, I received enough training time to become aware of all available ICTs in teaching

	Frequency	
	N=102	**%**
Strongly disagree	37	36.3
Disagree	35	34.3
Agree	26	25.5
Strongly agree	4	3.9

The majority 37(36.3% and 35(34.3%) of the participants, as shown in Table 5, indicated that they did not receive enough training on how to use various ICT tools, even though they were aware that these tools were available.

4.8. Practical training experience in using ICTs

When asked whether they had received enough practical experience in using various ICTs to assess and manage learners' performance, 45(44.1%) and 13(12.7)% of the participants (as shown in Table 6 below) indicated that they did not receive adequate practical time to learn how to use ICTs as a tool to assess and manage learners' performance.

Table 6: Practical experience of using ICT to assess and manage learners' performance

	Frequency	
	N=102	**%**
Strongly disagree	13	12.7
Disagree	45	44.1
Agree	33	32.4
Strongly agree	11	10.8

The majority of the student teachers, 13(12.7%) strongly agreed and 45(44.1%) agreed that too little time was available for them to practise using ICT as an assessment tool. 33(32.4%) of the participants agreed and 11(10.8%) strongly agreed that they had received enough practical time.

4.9. Student teachers' perception of ICT use and integration

Student teachers in both the lower and the upper primary phases were asked how the use of ICT tools enabled them to carry out tasks with ease and to the required standards. The key themes that emerged were (a) student teachers' confidence or fear in using the available ICT in schools, (b) student teachers found it easy to use such ICTs, (c) ICT teaching tools available in schools were irrelevant for subject content. The results are shown below:

4.9.1. Student teachers' confidence or fear in using the available ICT at school

Student teachers were asked whether they could use ICTs with ease and confidence.

Table 7: Ease and confident usage of ICTs by student teachers

Student can easily and confidently use ICTs

	Frequency	
	N=102	**%**
Strongly disagree	2	2.0
Disagree	9	8.8
Agree	71	69.6
Strongly agree	20	19.6

As shown in Table 7, the majority of the student teachers, 71(69.6%) and 20(19.6%) strongly agreed and agreed respectively that they felt confident and found it easy when using ICT during lessons. When further asked if they had any hesitation or fear that contributed to low confidence in using and integrating ICTs during their lessons, only 9(8.8%) and 2(2.0%) disagreed.

Figure 7 below shows the findings with regard to fear when using ICTs.

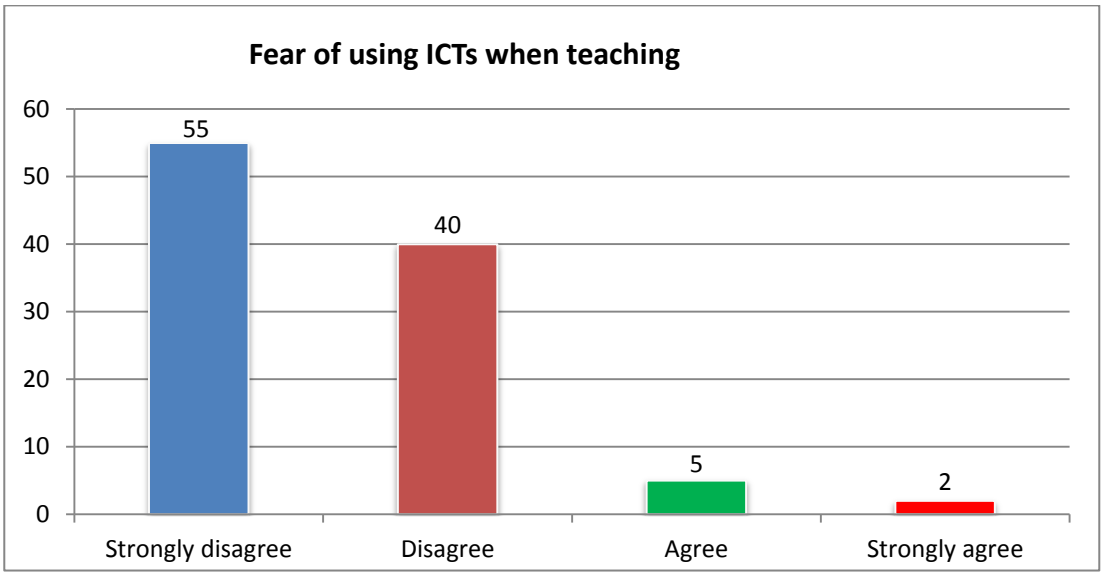

Figure 7: Number of student teachers reporting fear of ICT use during teaching

The chart shows that 55(53.9%) and 40(39.2%) of the student teachers reported no fear in using ICT during teaching. The majority of these student teachers who had no fear in using ICTs were mostly from the upper primary category. The remaining 5(4.9%) and 2(2.0%) indicated that they had some fear when using ICTs during teaching. Most of the student teachers who reported some fear were from the lower primary category.

During the interviews, the issue of having fear when using ICTs was also mentioned. For example, a student teacher from School H, located in a rural area, said,

> *"I fear when using ICTs during my lessons as they take time to prepare and sometimes if the machine breaks you might be requested to pay for it as it belongs to the school."*

Another student from School C in an urban area specialising in upper primary said:

> *"Lack of [technological] exposure, Sir, makes one to have great fear of using or even touch[ing] ICT equipment. Some of us just came to hear and see the different types of technologies at university. It took me time to print or make copies on the library photocopying machine because I did not know how to use it, and therefore I would prefer to be shown first how it [technology] operates, and then I will feel better."*

A student teacher from School B in an urban school said,

> *"Sir, technology is nice to use, especially when you become used to it. You get more convinced that you can do better in the next class. Like, for me, all my lessons should preferably have a video clip inserted into it all the time."*

Another student teacher from School G in a rural area said,

> *"If all technologies were made available to me as of tomorrow, I will surprise my mentor teacher with what I can do. Learners will forever remember me for using ICT in the classroom."*

4.9.2. ICT teaching tools available at schools are irrelevant for subject content.

In terms of usefulness of available ICTs, the majority of student teachers, 45(44.1%), agreed and 13(12.7%) strongly agreed respectively that the available ICTs at their schools were not always relevant to the subject content being taught (see Table 8 below).

Table 8: ICT irrelevant to subject content that is being taught

ICT teaching tools available at schools are irrelevant for subject content		
	Frequency	
	N=102	**%**
Strongly disagree	12	11.8
Disagree	32	31.4
Agree	45	44.1
Strongly agree	13	12.7

These perceptions were exemplified by one of the student teachers who specialised in Languages, who said during the interviews,

> *"When textbooks to be used for reading and audio cassettes to be used for listening are out-dated, it is better not to use such tools as they will end up not achieving your lesson objectives."*

Furthermore, student teachers also specified that lack of ICT awareness and skills by learners hindered their willingness to use ICTs during lessons, as they believed that it would distract learners' attention during lessons. One of the participants specialising in Integrated Natural Sciences indicated in the questionnaire that,

> *"When using ICT tools such as PowerPoint with a data projector in class, learners tend not to concentrate well anymore in class as they just look at the machines [equipment] you are using and how you operate them instead of following what is being taught. This means that learners have little*

know-how [awareness] of ICT, and this will make it difficult to integrate it with them."

This phenomenon may occur when learners are not exposed regularly to ICTs in the classrooms. Therefore, when they see it for the first time, it may understandably distract their attention during the lesson. However, the student teachers perceived that when teachers and learners are exposed, aware and frequently make use of the ICT in their subjects at school, learners tend to achieve a better retention rate of the subject content. This is evidenced in the responses during interviews from a student teacher who conducted SBS at School I (rural school):

"Basic ICT tools such as overhead projectors and white display boards must at least be installed in each classroom, because this will cover the syllabi much more efficiently".

In addition, another student teacher from School E (urban school) said:

"Since we live in a visual world, these projectors may allow teachers to make illustrations on a subject matter, of which learners may be able to learn and at the same time see what the teacher is explaining, especially in the rural areas."

Surprisingly, as shown in Table 9 below, 41(40.2%) of the student teachers agreed and 33(32.4%) strongly agreed that they would only be interested if learners were motivated to use ICT as a learning tool. Similarly, a student teacher who conducted SBS at School A (urban school) responded as follows during interviews:

"It is difficult for a teacher to make use of ICT material and integrate it if learners do not know how to use it. For example, Sir, taking my Grade 6 to

the computer lab to do an activity while they cannot use a computer will demoralise you as a teacher to use such ICT."

Table 9: The use of ICT by student teachers only when learners are motivated

Student teachers who are only motivated to use ICT if learners are motivated to use it as well	**Frequency**	
	N=102	**%**
Strongly Disagree	13	12.7
Disagree	15	14.7
Agree	41	40.2
Strongly agree	33	32.4

The learners' use of ICTs appeared to motivate the student teachers to integrate ICTs more during their lessons, and student teachers admitted that the use of ICTs during lessons could play a major role in the following identified aspects:

- Making lessons interesting and arousing learners' interest in the subject;
- Allowing learners to understand subject content better;
- Changing the way a teacher teaches a specific topic;
- Improving participation of learners in class, and exposing learners to available ICT tools in a subject; and
- Engaging learners actively in class.

4.10. Teaching strategies

Student teachers should be able to apply some of their technological skills during content teaching by using appropriate pedagogies. Therefore, student teachers were asked if they were able to combine technology, pedagogy, and content knowledge.

4.10.1. Technological knowledge

Figure 8 shows the results from the questionnaire with regard to student teachers' self-assessment of their general knowledge of technology.

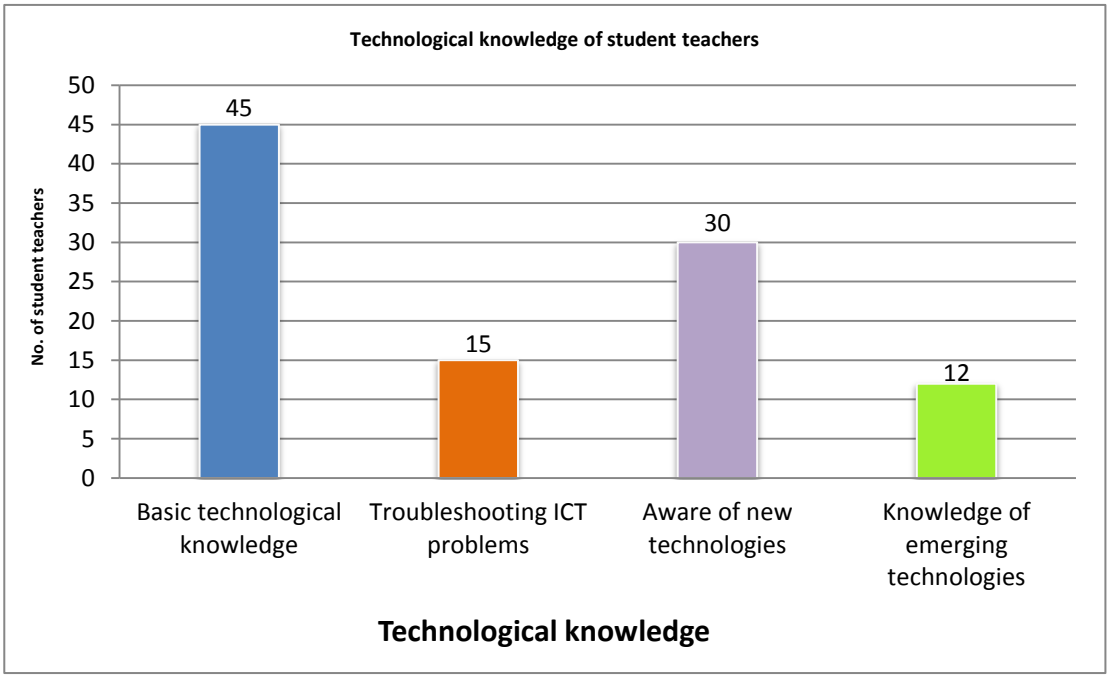

Figure 8: Student teachers' self-reported general technology knowledge

Figure 8 shows that 45(44.1%) of the student teachers reported that they 45 (44.1%) had the ability to choose and apply basic technical skills and demonstrate fluency in using the selected ICT tool to present a lesson. 15(14.7%) reported that they could troubleshoot ICT problems on their own without technical assistance. Figure 8 also shows that 30(29.4%) mentioned that student teachers were aware of new

technologies used in education and wanted to learn about them, and 12(11.8%) revealed that they had an updated knowledge of emerging technologies.

During interviews, one student teacher (School B in an urban area) said,

> *"Sir, some teachers use smart boards, educational software, touch screens, wireless keyboards, etc. these days for Maths, Science, Geography and English in some schools, and such equipment should also come to our areas as it will encourage me to use it more often."*

Table 10: Number of student teachers wanting training on new technologies

Number of student teachers that wanted training on all new technologies

	Frequency	
	N=102	**%**
Strongly disagree	2	2.0
Disagree	8	7.8
Agree	47	46.1
Strongly agree	44	43.1

Table 11 shows that 47(46.1%) agreed and 44(43.1%) strongly agreed that from the technologies available at university and at school, they still needed to be trained to be able to integrate them into their teaching.

4.10.2. Technological content knowledge

Student teachers were asked in the questionnaire to state if they could select an ICT tool and use it to enhance the knowledge of learners when teaching.

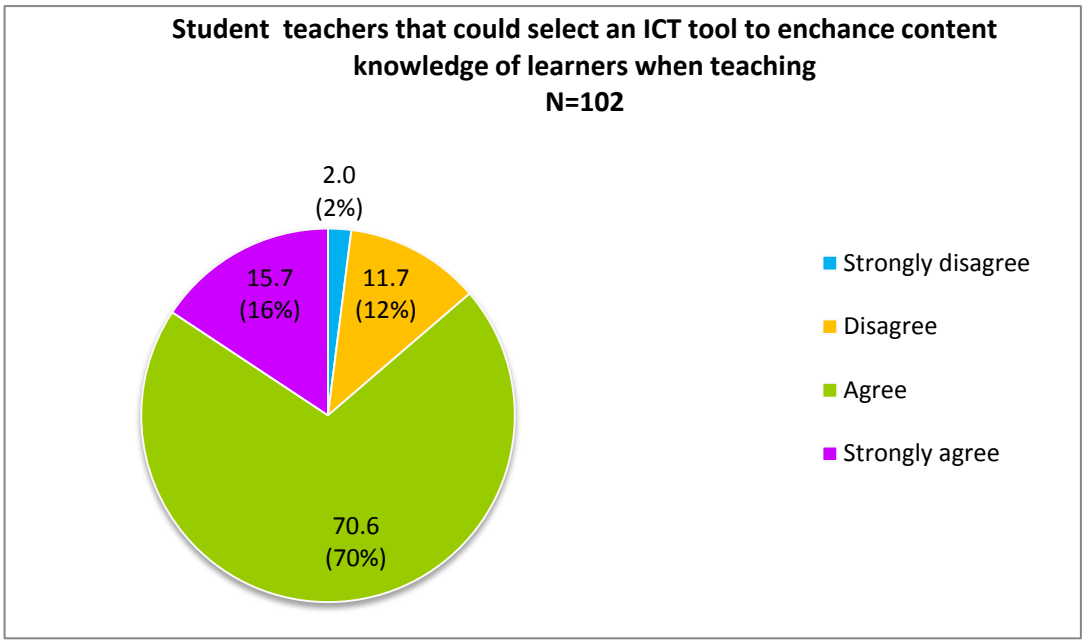

Figure 9: Student teachers able to select an ICT tool to enhance content knowledge of learners

Most student teachers felt confident in using a specific selected technology during teaching, as shown in Figure 9 above, with 72(70.6%) agreeing and 16(15.7%) strongly agreeing that they could use a chosen technology during their lessons. However, data collected during observations showed that most student teachers relied on posters, chalkboard and use of models as the only form of ICT tools to enhance learners' content knowledge. This was also emphasised during the interviews where one student teacher (from School J in a rural area) said:

> *"I only use the available teaching aids such as a poster or flipchart, as that is what is available at school. They [posters and flipcharts] make my work much easier to prepare, but I would prefer to use the chalkboard as the last tool."*

Figure 9 also shows that 12(11.7 %) and 2(2%) of the student teachers reported that they did not know how to select ICT tools that could enhance teaching. This was emphasised by one student teacher (from School D in an urban area) who said during the interviews:

> *"I am not always so sure which ICT tool will suit my lesson as some can confuse learners and myself as to what to do with it, I will go [opt] for something different from ICT, such as simple group work or class activity".*

Another student teacher (from School F in a rural area) said:

> *"I personally feel ICT is just there to demonstrate or show them [learners] something they have not seen before, I cannot use that [ICT] the whole lesson to teach a specific objective".*

4.10.3. Pedagogical content knowledge

Pedagogical content knowledge (PCK) requires that student teachers have the ability to implement pedagogies that are applicable to the teaching of specific content in their specialisation, either with or without technologies. As the results in Table 11 below show, 17(56.7%) of the student teachers demonstrated the ability to use appropriate teaching methods. This is consistent with the data obtained through the questionnaires (see Table 12). The remaining 13(43.3%) indicated that they lacked the necessary teaching methods when using ICTs.

Table 11: Observation data on PCK of student teachers

Pedagogical content knowledge from observations

	Frequency	
	N=30	**%**
YES	17	56.7
NO	13	43.3

Table 12 below shows that the majority of the student teachers 60(58.8%) agreed and 33(32.4%) strongly agreed that they could apply different teaching methods during teaching when using a specific ICT tool. The remaining 6(5.9%) disagreed and 3(2.9%) strongly disagreed with the statement.

Table 12: TPCK of student teachers

Technological Pedagogical Content Knowledge from questionnaires

	Frequency	
	N=102	**%**
Strongly disagree	3	2.9
Disagree	6	5.9
Agree	60	58.8
Strongly agree	33	32.4

Table 13: Demonstration of ability to integrate ICT into the lesson

Student teachers who demonstrated ability to integrate ICT into the lesson

	Frequency	
	N	**%**
YES	8	26.7
NO	22	73.3

Linking with Tables 11 and 12, results from the observations shown in Table 13 also show that despite 8(26.7%) of the student teachers having the ability to switch pedagogies and show skills when using ICT tools, the majority, 22(73.3%), struggled and lacked the ability to integrate such ICT tools into their lessons. Table 11 (which gives results to indicate if student teachers had the PCK abilities), and Table 13 (which indicates the interaction levels between the teacher and learners during teaching) can be linked to the interviews, where the teachers would use the selected ICT tool more for themselves rather than for involving learners. During interviews, student teachers were asked: "What issues do you take into consideration when using or integrating ICT in your teaching?" A student teacher (from School C in an urban area) said:

> *"When using ICT during your lessons, factors such as time and classroom size [number of learners] should be considered, otherwise it is impossible for me [student teacher] to allow each learner to interact with the ICT tool in use."*

Another student teacher (from School A in an urban area) also added the following:

> *"I consider the time and classroom environment, which includes the number of learners and arrangement of desks, when using a specific ICT tool for a lesson".*

However, from the 8(26.7%) student teachers who showed skills in the integration process (Table 13), one student teacher (from School F in a rural area) said:

> "*I will use ICT tools only when my learners do not understand something and I want them to see it visually; that is when I will then bring things like pictures or video [clips] to show them and that will probably help them to understand a concept better*."

4.10.4. Technological pedagogy knowledge (TPK)

The concept of technological pedagogy knowledge refers to the student teachers' understanding that teaching and learning can change when a particular ICT tool is used and integrated in the classroom during teaching. Data collected from the questionnaires, as represented in Table 14 show that the majority of the student teachers 64(62.7%) and 3(2.95%) responded that they did think critically when selecting and integrating a specific ICT tool for teaching. The remaining 32(31.5%) and 3(2.9%) of the student teachers believed that they had a problem regarding how they could cogently integrate a particular ICT into the lessons.

Table 14: No. of student teachers that critically think before using and integrating ICT in lessons

Technological pedagogy knowledge linked to critical thinking

	Frequency	
	N=102	**%**
Strongly disagree	3	2.9
Disagree	32	31.5
Agree	64	62.7
Strongly agree	3	2.9

Also linked to technological pedagogy knowledge (TPK) is the ability to create activities for learners using the available ICTs. The results in Table 15 show a slight difference in percentages of students who believed they could create learning activities by using available ICT tools to enhance understanding of the subject content.

Table 15: Number of students with the ability to create activities using available ICT tools

Using available ICT tools to create activities for learners to enhance understanding of the content	**Frequency**	
	N=102	**%**
Strongly disagree	1	1.0
Disagree	45	44.1
Agree	49	48.0
Strongly agree	7	6.9

As reflected in Table 15 above, 49(48.0%) and 7(6.9%) of the student teachers specified that they could create activities with the ICT tool of their choice to enhance learners' understanding of the subject content, in contrast to 45(44.1%) and 1(1%) who reported that they did not use the ICT tools to create lesson activities.

4.11. Challenges student teachers faced and experienced in using and integrating ICT

Participants were asked to list the challenges they faced when using and integrating ICT in their lessons. The challenges identified can be classified as either extrinsic or intrinsic barriers.

4.11.1. Extrinsic barriers

Extrinsic barriers refer to limiting factors such as access, time, support, availability of resources, proper exposure and training regarding the available ICT tools. Data

collected from the questionnaires and interviews showed that students faced numerous challenges such as lack of infrastructure, which included lack of electricity, lack of computers at schools for learners to use, and the classroom size (the classrooms were often too small and overcrowded). Lack of skills in setting up technical ICT tools that were available at schools was also identified as a big challenge.

Other challenges identified were the unavailability of ICT tools and resources at schools, conduciveness of classroom in terms of set-up and arrangement of desks, and lack of student teachers' practical training on the use of specific ICT tools.

4.11.1.1. Lack of infrastructure

During the interviews, a student teacher (from School C in an urban area) said:

> *"Some schools do not have a single computer, Sir, even though electricity is available. I manage to bring along my laptop (notebook), but cannot display it in class because there is no data projector available. Hence I could also not show them the different states of matter on my laptop."*

Similarly, another student teacher (from School H in a rural area) also said:

> *"Sometimes I want to show learners objects [images], but to find the ICT tools and bring them to class is difficult because the environment simply has nothing to offer in terms of teaching material, and the nearest town is far from the school. This always demotivates me to use ICT and therefore I stick to the traditional way as my mentor teacher(s) do."*

4.11.1.2. Time constraints

Student teachers also mentioned in the questionnaires that there were always time constraints in preparing a lesson involving ICT tools, as well as lack of appropriate knowledge as to when and how to introduce the selected ICT tool into the lesson. Other major factors emphasised were the misunderstanding of the difference between ICT use and ICT integration during lessons, and that the available ICT tools at schools were often irrelevant to the subject matter. During one interview, a student teacher (from School F in a rural area) said:

> *"It is very difficult to plan a lesson when you are not familiar with a specific ICT tool, as you have to practise for a long time on how to use it on how to use it first. And there is also no practical guide book as to which ICT must be used for a specific topic in my subject. This takes a lot of time. Integration is also another tough [complex] process I do not understand yet".*

In addition, another student teacher (from the same school) commented:

> *"I personally only like to use ICT for my own personal benefit, but I find it confusing, time consuming and difficult when we are asked to integrate it, the process of using is similar to that of integrating to me, unless we are trained more or shown what the difference is".*

4.11.1.3. Lack of guidance from mentor teacher

One student teacher stated in the questionnaire that lack of guidance from their mentor support teacher on the use and integration of ICT was another challenge, and that they did not experience enough practise in ICT use and integration during micro-teaching sessions at the university.

As quoted:

> *"During our micro-teaching, we are asked to present lessons of our choice, and so we opt for lessons that require less preparation or using no ICTs as we want to pass the module and not make mistakes and obtain less marks. If our tutors can make it a requirement that ICT should be used when we present our lessons during micro-teaching, then probably we will prepare more and see the need to use and integrate ICTs in our lessons."*

4.11.1.4. Lack of unavailability of ICT tools

From the student teachers' responses, the lack of infrastructure and unavailability of ICT tools were also identified as challenges, specifically at the schools where they conducted their SBS. This served as a demotivating factor for student teachers to use and integrate it more often.

A student teacher (from School D in an urban area) said the following during interviews:

> *"There is time one is looking for ICT tools at a school but the school does not possess such tools. This forces one to teaching the traditional way because the ICT tools are not available and the ones that are available are not in a working order or completely broken".*

Table 16: Number student teachers that indicated that the availability ICTs would motivate them to use them in classroom

The availability of ICT will motivate student teachers to use it in class

	Frequency	
	N	**%**
Strongly disagree	5	4.9
Disagree	5	4.9
Agree	39	38.2
Strongly agree	54	52.0

Table 16 shows that the majority of student teachers, 54(52.0%), strongly agreed and 39(38.2%) agreed that the availability of ICT tools would motivate them to use and integrate them in their teaching and learning activities. However, 5(4.9%) each of the student teachers respectively strongly disagreed and disagreed with the statement.

4.11.2. Intrinsic barriers

There are also intrinsic factors that can influence behaviour, attitude, belief, level of confidence and resistance in using ICT during teaching. However, data collected from the interviews and questionnaires indicated that students did not see these as barriers.

4.11.2.1 School culture

In the open-ended questions in the questionnaire, student teachers were asked if they would continue using ICTs, whether their mentor teacher at the school was using ICT tools or not.

One student teacher explained:

> *"When my mentor (support) teacher does not use ICTs during lessons this does not discourage me from using it during lessons. It is just a matter of having ICT materials available in class or for the subject at school"*.

In relation to the results in Figure 10 below, a student teacher during the interviews (from School A in an urban area) stated thus:

> *"It would be best if we are given more practical activities or practice time on our own on how to use certain available ICT tools so that we can become more motivated and boost our personal skills, as sometimes we lack exposure, which makes us feel less motivated to use ICT. Even if the mentor teacher is not using it, I will still use it, as I know what to do"*.

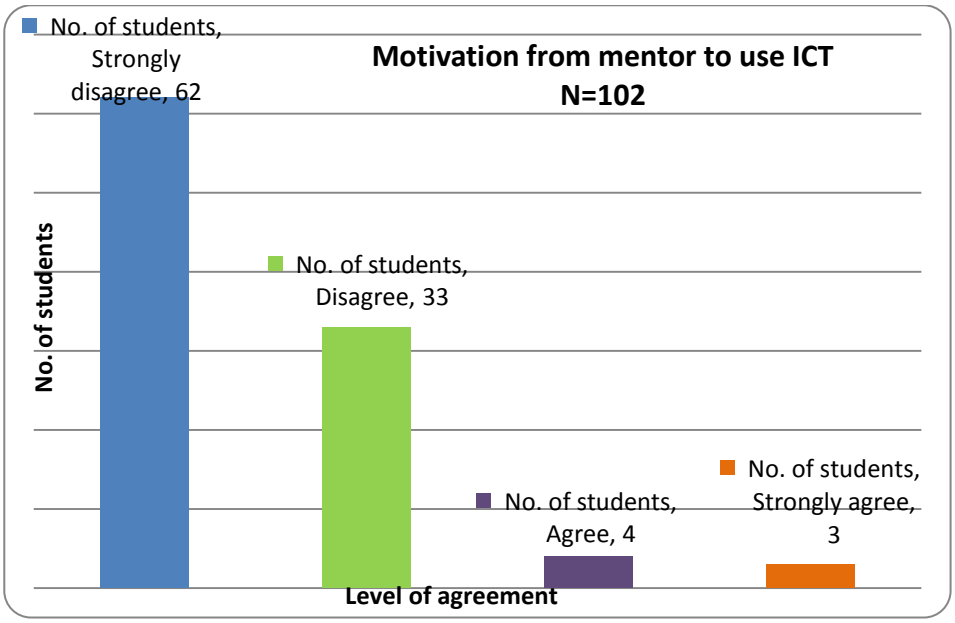

Figure 10: Number of student teachers needing motivation from mentor teacher

Figure 10 above shows that 62(60.2%) and 33(32.4%) student teachers strongly disagreed and disagreed, respectively, to the statement that if their support teacher at school did not use ICT, they too would be discouraged to use it.

Only 4(3.9%) and 3(2.9%) strongly agreed and agreed, respectively, that their mentor teacher needed to encourage them to use ICT.

4.11.2.2 Student teachers' perceptions regarding ICT use during teaching

In response to the open-ended questions in the questionnaire, student teachers were asked to indicate what their perceptions were regarding using ICTs during teaching. One student teacher stated the following:

> *"ICTs can generally attract learners' attention when I am teaching. Today's learners like seeing and touching things. So I think ICT use during teaching is the best method in today's world as learners are very fast in doing things".*

Another student teacher also stated:

> *"ICT use during teaching arouses learners' interest and creates an atmosphere of participating, and also changes the teacher's style [method] of teaching. This makes teaching interesting and exciting, if you are well prepared and know what you are doing"*

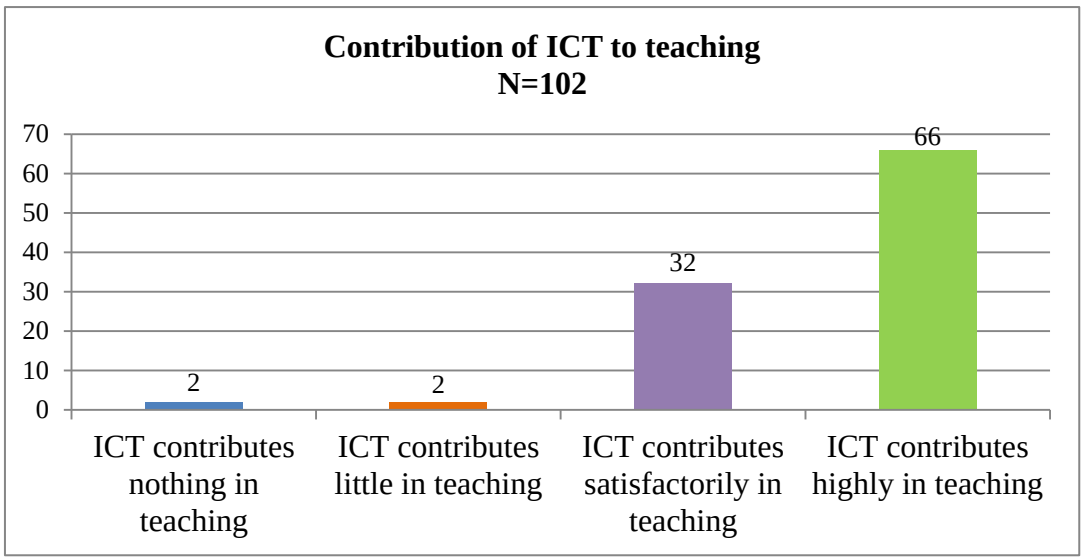

Figure 11: Number of student that showed the level of contribution of ICT into teaching

Figure 11 shows the results on student teachers' perception of the contribution of ICT to teaching, with 66(64.7) reporting that ICT contributed highly to teaching and 32(31.4%) reporting that ICT had satisfactory contribution to teaching; while 2(2.0%) each indicated that ICT contributed little and nothing, respectively, to teaching.

4.12 Summary

This chapter presented data gathered from respondents through observations, questionnaire and interviews. The results indicate that the student teachers only used ICTs when they were available at their respective SBS schools and that they used such ICTs to mostly demonstrate lesson concepts. The results also show that the student teachers had a positive perception of ICT use in teaching and that they were motivated to use ICTs at any given time once they were thoroughly exposed, and trained to use such ICTs.

Although the student teachers showed positive admiration of ICT use during teaching, there seemed to be a misconception between ICT use and ICT integration, and some student teachers indicated that they required more training on the process of integration. On the conceptual framework of TPACK, student teachers clearly showed that they were aware of new emerging technologies and were willing to use them once they were made available, and that this would affect their pedagogical teaching strategies, which they were commonly being trained on. They were also aware that this would change when using and integrating ICTs during teaching, which remained a challenge for the student teachers to apply. Extrinsic and intrinsic factors such as time constraints, lack of guidance from mentors, and school culture were also identified as challenges they faced when using or integrating ICTs during SBS.

In the next chapter, the researcher presents a discussion on the findings in relation to the research question of the study. Therefore, in the next chapter, four themes will be discussed: ICT use and integration; the link to the TPACK conceptual framework; student training on ICT use and integration; and challenges student teachers face in the use and integration of ICT during school based studies.

CHAPTER 5: DISCUSSION OF FINDINGS

5.1. Introduction

The discussion in this chapter focuses on aspects related to the research questions on four themes, i.e., ICT use and integration; the link of ICT use and integration to the TPACK framework; student training on ICT use and integration; and challenges student teachers face during school based studies in the use of ICT and integration.

5.2 ICT use and integration

The use of ICT is changing teaching pedagogies in several ways. Student teachers are able to create their own materials and thus have more control over the material used in the classroom. It seems that technology is requiring student teachers to be more creative in modifying their own materials. In this study, the researcher identified two main factors that lead to ICT use and integration by student teachers: 1) types of ICT used and its integration, as well as methods of preparation; 2) purpose of ICT use in the classroom.

5.2.1. Types of ICT used and its integration, as well as methods of preparation

The leading matter that was identified as to what type of ICTs the participating student teachers used during school based studies was that the majority opted for 2- and 3-dimensional materials; understandably probably due to the fact that they were available and easy to prepare. Student teachers felt that the use of posters, flip charts, textbooks, models and the chalkboards were more convenient for teaching, based on the environment they found themselves. The students' teachers claimed that sophisticated ICTs were not always available. This was supported by data, which revealed that 2- and 3-dimensional materials enabled student teachers to use

them more often in their lessons than any other ICTs due to their availability. During the same data collection process, student teachers who were specialising in the lower primary phase demonstrated superior ability to prepare these 2- and 3-dimensional materials more effectively than their upper primary counterparts. The reason could be that the lower primary student teachers practised making their own teaching materials more often during their practical classroom training at the university, and this was supplemented by attending IMTE lessons. Although a small number of student teachers used audio equipment, mathematical sets and puppets, these were used more to illustrate the subject matter based on the topic that was being taught, rather than reinforcement.

Drawing from the literature review and the TPACK conceptual framework, it can be stated that student teachers had difficulties in using the various available 2 and 3 dimensional teaching materials, as well as other ICT tools in terms of integrating them effectively during lessons. As indicated, these 2 and 3 dimensional teaching materials as well as other ICT tools are mostly used for illustrating subject concepts which learners hardly made use of such materials to be included as part of learner centred activities.

Therefore, it can be concluded that student teachers did not use ICT tools and the 2 & 3 dimensional teaching materials to radically change their pedagogical practices, but instead, in most cases, the ICT tools and the 2 & 3 dimensional teaching materials were used to maintain the student teacher's traditional pedagogical practices.

Cox & Abbott (2004) indicated that teachers who use ICTs in the classroom create their own new pedagogical knowledge for both the subject and also of how learners

will understand and learn the subject, therefore, they maximise the effects of using ICTs to increase learner's attainment. This learner attainment is best achieved when learners are challenged to think and to question their own understanding.

Above all, the ICT integration process was the main confusing concept that student teachers identified. The student teachers assumed that the use of any of the 2- and 3-dimensional tools automatically meant that the integration process had taken place as well. Data collected intensely show that student teachers used these ICT tools more for teaching (demonstration), rather than engaging learners actively in aspects such as activities, games, reading and assessment. Yildirim (2007) reports that the major unease for most teachers is a result of the repetitive process of preparing teaching materials simply for teaching; giving summaries and assessing learners afterwards, which results in little time being spent on creative thinking and innovation by improving content; and the search for more information using other relevant sources to improve learners' performance and participation in class.

Preparation of any teaching material requires time, critical thinking and innovation. Looking at how the student teachers prepared their 2- and 3-dimensional teaching material, a lot still needs to be done. Quality teaching material better attracts learners' attention and, when integrated properly, allows better participation of learners too. The student teachers observed during the study generally had poor quality self-made teaching materials, such as posters and flash cards. Better quality teaching materials could have been created if ICT devices such as computers had been used. Peralta and Costa (2007) state that teachers with greater capability in basic computer skills tend to be more confident in using any other technology that is available and produce materials easily for use in their classrooms. Thus, student teachers tend to use the poor quality materials merely for instructional purposes

rather than integrating such materials to enhance learners' cognitive skills. It should also be noted that the knowledge that student teachers have about using ICT to create self-made teaching materials highly depends on their own ICT competence, for example, many student teachers would attempt to draw specific diagrams themselves which ended up not being clearly visible for learners to determine what exactly is being displayed on the teaching material. Student teachers could have instead searched for these diagrams on the internet to create a possibility of a more attractive and neat diagram for the learners. Authentic learning happens when ICT is integrated correctly.

UNESCO (2008) describes ICT integration as the way in which ICT becomes an integral part in the background of the classroom learning or learning process. Significantly, this means that teachers should not only use ICT as an instructional tool, but it should go beyond that by integrating it in order to achieve specific learning outcomes. This means that teacher training is still traditional and not learner-centred. Authentic learning can only happen when ICT is used in a pedagogical approach that supports inquiry based or project based learning.

Innovation and adapting the use of different ICT tools during teaching is a timeous exercise, as it involves the change of interpersonal skills and pedagogical skills of student teachers. This makes the integration process of ICT more complex for the student teachers, as various factors serve as limiting factors. Sherry and Gibson (2002) point out those factors such as individual characteristics, technological skills, organisational situations, as well as content characteristics often influence or impede the effective use of ICTs. This was supported by the research participants, who indicated that time, reliability of the ICT tools and the ICT tool not being suitable for the subject content made the integration process more complex.

School environment also played a major role in the ability of student teachers to implement acquired skills on which they had to integrate ICTs into their lessons. Other factors that were also represented in the data are: lack of electricity; lack of access to the relevant materials at schools; where ICTs were available, not much support was provided to student teachers to use them during their lessons as schools did not have a program or policy on how and when they should be used. Ngololo (2010) emphasises that schools must develop ICT policies, goals and specific implementation plans for the school in each academic year to allow and encourage the use of ICTs around the school and to integrate such tools during teaching. This will serve as a motivational factor to students.

5.3 ICT use and integration linked to TPACK framework

Teaching with technology is a requirement based on the National Professional Standards for Teachers in Namibia (2006b) to increase the pedagogical skills of teachers. The TPACK framework provides an interlink process, which allows all skills of a student teacher to be used at the same time when using and integrating ICTs during teaching. This framework requires student teachers to possess a strong understanding based in areas such as subject knowledge and matter, pedagogical approach, content, and knowledge of learners' needs. This study primarily focused on student ability to use and integrate ICTs by way of linking them to technological knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogy knowledge (TPK). As pointed out by Kafyulilo (2010), student teachers need to develop abilities that indicate that in addition to technological, pedagogical and content knowledge, there is some sort of professional development that student teachers need undertake continuously, so as to

transfer them towards deepening their understanding about teaching using technology and integrating it into teaching. During this study, pedagogical content knowledge (PCK) dominated the role in which student teachers planned and conducted their teaching. As described in the literature, PCK is the knowledge about how to make subject content understandable to learners.

The participating student teachers mostly planned and designed their lessons to explain and instruct subject content to the learners and clarify common misconceptions and preconceptions that learners brought to the classroom. Mishra and Koehler (2009) describe PCK as the transformation of subject matter, which occurs when a teacher interprets the subject matter by finding various ways of presenting it, by adapting and altering the instructional material to alternative ideas and learners' prior knowledge. As such, when student teachers establish themselves more on PCK, this often results in very little or no ICT being used or integrated in the classroom.

The phenomenon of excessive PCK use was evident in the upper primary student teachers as PCK could be linked to the process of becoming more of a subject expert in relation to content rather than holistically understanding the needs of learners. Student teachers specialising in Mathematics and Sciences as well as Languages need to know their subject content extensively. Many of the participants observed implemented the PCK method during teaching and, by so doing; they created a link between subject matter knowledge and pedagogical content knowledge, with no reference to ICT use and integration. High use of PCK use indicates that no learner-centred approach is being implemented in the classroom. This means that the University as a training institution should not focus heavily on traditional method which can be regarded as "teacher as fountain of all knowledge" approach.

For student teachers to effectively use and integrate ICTs, they should be able to confidently identify and switch between pedagogies, integrate them, and display the knowledge by demonstrating these skills. Even though during this study the student teachers demonstrated skills in selecting the ICT tools to use during teaching, many still found it challenging to use appropriate pedagogies when using the selected ICT tools during lessons. The level and use of technological pedagogical knowledge (TPK) still needs to be improved. This knowledge is about the student teachers' cognisance that teaching and learning can change when particular technologies are used in a specific way. A teacher should know where and how a particular technology can be used to enhance teaching in a given subject matter (Mishra & Koehler, 2006).

To understand why TPK is unclear for many student teachers, a deeper analysis of the constraints and the ability to afford the needed technologies and their disciplinary contexts within which they function should be considered. As student teachers use only the available technology at the University during training, as well as the possibilities of not much infrastructure such as computer labs and various other ICT devices, available at schools, students do not gain much skill to implement sufficient technological pedagogical knowledge (TPK) in teaching. This is supported by Mishra and Koehler (2009), who comment that teachers tend to focus much on a specific teaching style and the available ICT tool, with the belief that it cannot be used differently. Mishra and Koehler (2009) further state that when a technology is used in the classroom, the teacher becomes the sole user of such equipment and does not integrate it at all.

To address TPACK amongst student teachers pedagogy appropriately, student teachers will need to show off relevant ICT capabilities. This means that during the

student training program it will be necessary to ensure that all student teachers' have the necessary background in technology, content and pedagogy. Therefore the aim of ICT during teaching is for specific teaching style to change and the aim of integration is for the learner to use the tools to learn.

This is comparable to the observation done during the study that the student teachers used a specific ICT tool in class but did not necessarily allow learners to make use of it. In this case, the most commonly used ICTs, such as the chalkboard, posters and flipcharts can be used for learners to complete sentences, calculations, identify items, etc., as a form of integration. This left other aspects out during teaching, such as group discussions, classroom debates, brainstorming, etc. Therefore, it became evident that there was little difference in student teachers integrating ICTs during teaching as their teaching methods served as a preventive factor to integrate ICTs effectively.

Student teachers adapt these preventative factors easily due to the fact that teachers training programme often focuses on basic literacy and less on the integrated use of ICTs in teaching. According to Schaffer and Richardson (2004), when technology is introduced into teacher education programmes the emphasis is often more on teaching about technology instead of teaching with technology. Student teachers are more likely to integrate ICT in their subjects when they are provided with guidance and assistance as well as time to practise with the technology and to learn, share and collaborate with colleagues.

5.4 Student training on ICT use and integration and challenges student teachers faced during school based studies

Bowes (2003) highlights that teacher training should emphasise the potential that technology has in teaching and teaching methods, where and when to apply such technologies, extensive training and support, as well as ample time to experiment on how best to use and integrate these technologies.

Several questions in this study were used to determine if student teachers had acquired the necessary training on how to use and integrate ICTs in their teaching. The first question sought to determine if student teachers received enough time to become aware of all available ICTs in teaching. The findings revealed that 36.3% of student teachers indicated that they were not given enough time to become aware of the various types of ICTs in teaching, while only 25.5% indicated that they had been given enough time. Bingimlas study (2009) suggests that when lack of time exists during the training on using various ICTs, student teachers may find it difficult to complete their practice on exploring different aspects of their lessons on the internet, search for various educational software, explore and practise using the available technology, and deal with certain technical problems. In this regard, student teachers need plenty of practical time during the period of lessons, practical's, micro-teaching, as well as on their own time.

Although the student teachers that took part in the study revealed that they had received sufficient subject knowledge on how to use ICT in their respective subject specialisation, the results showed that the student teachers possessed the subject knowledge but lacked technological pedagogy knowledge. Bingimlas (2009) alludes to this fact as he emphasises that providing pedagogical training for teachers, rather

than simply training to use ICT tools, is an important issue as student teachers need to be convinced on the value of using ICTs in their teaching. With this understanding, student training should allow more access to ICT tools at the University for students to gain sufficient practical experience, as about 44.1% revealed that they received no practical experience in assessing and managing learners' performance.

Stronger emphasis should be placed on the use and integration of available technology in lessons during micro-teaching and any other presentations and on student teachers' conduct during their teacher training, as only 39.2% of the participants indicated that their lecturers emphasised the use and integration of ICTs during their micro-teaching. Tinzmann, Jones, Fennimore, Bakker, Fine, and Pierce (1990) underlines that student teachers can use micro-teaching as an opportunity to interact and collaborate more with each other, thus allowing them to become creative and innovative, improve knowledge and gain problem-solving skills.

During this study, student teachers were requested to identify the challenges they faced during school based studies, which hindered them from using and integrating ICTs during their lessons. The following were the challenges that student teachers listed: lack of accessibility of available ICT tools, lack of confidence in using ICT tools, and lack of student teacher competence in using ICT tools.

Lack of accessibility of available ICT tools: When ICT tools are not accessible at university, school or home, it serves as a discouragement to student teachers to search and make use of such ICTs. As a result, student teachers always feel left behind when newer technologies emerge. According to Bingimlas (2009), the inaccessibility of ICT resources is not always merely due to the non-availability of

hardware and software or other ICT materials within the school, but it may be a result of other factors, such as poor organisation of resources, poor quality hardware and software, inappropriate software and lack of personal access for the teacher. The participating student teachers highlighted that at some schools where they had conducted their teaching practice, there was not a single computer available and, even though they possessed personal notebooks, they did not have the facilities to print their materials. This made it unnecessary for them to prepare materials using ICT or use such materials in class.

The researcher observed that in schools that had the necessary infrastructure, the ICT tools were not used for teaching in most cases and remained idle. This emphasises the fact that many schools that possess such ICT infrastructure and tools do not necessarily use them for the benefit of integrating ICT into lessons for the learners, but only for the teachers' use. Balanskat et al (2007) specify that the accessibility of ICT resources in schools does not always guarantee successful implementation in terms of usage in the classroom during teaching.

Lack of confidence in using ICT tools: When student teachers are confident in using ICTs during teaching, it increases the chances of them adopting newer pedagogies and ways of integrating the available ICTs to their best ability. During this study, participants indicated that as much as they had the knowledge to select an ICT tool, they lacked the confidence, especially if such ICT tool stopped functioning during the lesson or when they were being observed by their respective tutors. Bingimlas (2009) suggests that lack of confidence serves as a barrier that can cause teachers to hesitate bringing to class an ICT tool they have limited knowledge about, especially if the learners are aware of it.

Lack of student teacher competence in using ICT tools: This challenge can be linked to lack of confidence in student teachers using ICTs during their teaching. This, in fact, is interrelated to the TPACK framework where student teachers have more of the ability to teach only content and find it difficult to integrate ICT into their teaching. Even though some of the observed students used and integrated ICTs during teaching, the standard at which it was done needs to be improved. Technological competence associated with pedagogical competence needs to be emphasised more often to allow students to improve their competencies. Balanskat et al (2007) state that technological competencies can serve as a limiting factor, especially when skills become a serious obstacle for teachers, which results in teachers not accepting and adopting ICTs during teaching, thereby shifting the blame to lack of training, skills, and exposure to ICTs. When student teachers lack the competence in using and integrating ICTs in their teaching, this may result in resistance in using them during teaching.

In general, other identified factors that hindered the use and integration of ICTs during teaching were lack of time, technical problems, resistance to accept new methods that included ICTs by the mentor teachers, poor fit of ICTs to subject content and curriculum, scheduling of time for learners to use the computer labs and other ICTs, as well as poor support from management and mentor teachers regarding which ICTs to use for a particular lesson.

Lack of time: The reason why some student teachers do not use and integrate ICT during lessons is insufficient time to plan and to use it. Bingimlas (2009) found that lack of time affects teachers in their ability to complete tasks such as searching for relevant materials online, preparing lessons, exploring and practising to use the relevant technology. During interviews, the upper primary student teachers

specifically indicated that scheduled times for lessons in schools was insufficient, as they could hardly complete their prepared lessons on time. Therefore, this can all be attributed to the curriculum, in line with Bingimlas (2009) observation that the curriculum structure and assessment system are mostly designed in a way that teachers do not spend much time on implementing the use and integration of technology, as their prime focus is centred on covering the content.

School culture: The culture of the school plays a major role in providing a suitable environment for teachers and pre-service student teachers to be encouraged to use and integrate ICTs in the classroom. Martinez (1999) found that one of the major challenges facing developing countries is to make technology an essential part of each school culture.

School culture can be defined as the basic assumptions, norms, and values and cultural artefacts that are shared by school members (Maslowski, 2001). In this case, school culture means that the school embraces a culture of using and integrating various technologies within their own organisation. During interviews, student teachers specified that they opted to use ICTs during lessons only if the support teachers encouraged them to do so, indicating that ICT as a teaching aid was not a priority for many. Albirini (2006) indicated that, if technology is not received well by teachers, there will be a mismatch between the culture of the school and the use of technology.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This study tried to provide insight into how primary student teachers experienced the use and integration of Information and Communication Technology (ICT) in their teaching during their school based studies.

The study also investigated student teachers' ability to use and integrate ICTs during teaching SBS practice by looking at the frequencies and identifying the pedagogical methods that were displayed more often and factors that hindered the appropriate use and integration of ICTs.

6.2 Summary of findings

During the process of investigation on what common ICTs student teachers used during teaching practice, the study found 2- and 3-dimensional teaching aids. The reasons for this trend indicated that these types of tools were readily available at schools and were easy to prepare and to use in the classroom. However, the 2- and 3-dimensional teaching aids identified were mostly used for instruction and demonstration on certain topic themes and concepts. Student teachers were the main users of ICT tools and the findings of this study showed that the student teachers lacked skills in the integration of ICTs during teaching. This resulted in student teachers implementing more teachers to learner collaboration, and less learner to learner collaboration in the classroom.

Although students were made aware of the available ICTs for teaching during training, only very few student teachers appeared to have gained the practical experience and knowledge on how and when to use such ICTs during teaching. The study also identified that insufficient time, as well as limited number of ICTs available at the university, which could be used for practical's, also reduced their chances of gaining enough confidence in using various ICT tools during lessons. The study also established that the student teachers had a positive attitude towards the use of ICTs in their studies; this despite the fact that confidence and competence seemed to be a limiting factor for students as they lacked the practical experience on using these ICTs.

The study also revealed that the TPACK framework components were hardly met as a set standard for student teachers training and during school based studies. The TPACK set standards serve as a guiding tool for student teachers to implement various pedagogical skills when using ICTs in the classroom. The study found that generally, student teachers focused more on the component of pedagogical content knowledge (PCK) during school based studies. The component of PCK designates that student teachers master the content of their subject specialisations and essentially instruct learners to remember and understand such concepts in class. It was also observed that even if student teachers used any form of ICTs, the PCK approach remained dominant.

During the time of collecting data from interviews, the study identified that student teachers were opting for the (PCK) method of instruction and illustrating more as it is positively linked to time, completion of number of lessons, class size, learners' poor background knowledge on subject topics and inappropriate ICTs available to stimulate lessons.

The study therefore established that the technological pedagogical knowledge (TPK) of the student teachers had not improved to an extent that they possessed the ability and skills to use ICTs effectively as a form of integration during teaching.

Therefore, identifying and describing various ICTs to student teachers during training is not adequate, and should rather be enhanced through practice on ICT use and integration.

The study also focused on possible factors that could prevent student teachers from using and integrating ICTs during their teaching practice. The findings from the observations, interviews and questionnaire showed student teachers experiencing multiple challenges that served as preventative dynamics for students not to successfully use and integrate ICTs in their lessons. The extrinsic limiting factors that were identified linked to lack of infrastructure such as electricity, computers and classroom size, lack of skills on setting up technical ICT tools, unavailability of ICT tools and resources at schools, and conduciveness of classroom.

Other extrinsic limiting factors identified were; lack of practical training on the use of specific ICT tools, time constraints in preparing lessons involving ICT tools, lack of appropriate skills on when to introduce the selected ICT tool during a lesson, lack of access to ICT tools at schools when available, misconception of the ICT integration process in lessons, available ICT tools at schools often irrelevant to the subject matter, school culture, lack of mentor/support teacher's advice, and not much exposure in ICT use and integration during micro-teaching. These factors caused student teachers to adapt to the traditional practices at a particular school.

The study also sought to find out what personal factors would have served as a challenge for students to integrate ICTs effectively. The intrinsic factors identified

were personal confidence, lack of exposure and competence, which resulted in student teachers not making use of any ICTs during teaching. This can also be interlinked with training and practice during presentations and micro-teaching.

6.3 Summary

The use and integration of ICTs in teaching is a complex process and not always seen as being effective and successful. As a result, it still requires strong motivation and indulgence by the student teachers to recognise how ICTs can play a positive role in their subject specialisation. The study revealed several issues pertaining to the type of ICTs being used, the nature of student training, challenges student teachers experienced and the link to the TPACK framework. The 2- and 3-dimensional teaching aids were regarded as the most used tools due to reasons explained earlier in the study. The study also identified and concluded that student teachers need more extensive practical time at the university to use various available ICTs in order to gain the necessary exposure, confidence and competence to be able to use and integrate them during lessons. Since the extrinsic challenges that student teachers faced during school based studies are mostly beyond the control of the university, student teachers can still be guided on how best to make use of the available ICTs at their schools by being trained in using the suitable pedagogical skills and how to integrate them. A conclusion can also be made that students need to be exposed and trained on various methods of using ICTs. The use of ICTs allows learners to become active learners, as student teachers can make their lessons exploratory.

6.4 Recommendations

Based on the findings of this study, the researcher makes the following recommendations:

- It emerged clearly that student teachers are willing to use and integrate ICTs during their school based studies. However, support, exposure, and more practical training needs to be provided to student teachers to gain the confidence and competence to use and integrate ICTs in teaching. Therefore, student teacher training should be integrated when students are doing presentations and micro-teaching in their respective specialisations for more emphasis to be placed on the use and integration of ICTs, rather than only looking at the methodology and content the students display. This means that ICT use should be infused into the entire teacher training programme and not have separate ICT topics for one subject such as IMTE only.
- Stronger emphasis should be put on the use and integration of ICTs during student teachers' classroom presentations and micro-teaching demonstrations. Student teachers should demonstrate that they have the relevant skills to use as well as integrate ICTs and suitable assessment standards should be put in place either during teaching practice or micro-teaching demonstrations. Therefore, the teacher training programme should model an interactive and participatory teaching pedagogy rather than a transmission based pedagogy.
- Training and stringent assessment on how best to produce quality work using the identified commonly used ICTs during teaching, such as posters, flip charts, models, transparencies, etc. should take place.

- Teaching pedagogies should be expanded to accommodate that of using ICTs to allow student teachers to make their lessons more exploratory for learners and not just basically covering the subject content.
- Student teachers should be guided and trained on the difference between the usage of ICTs and the integration thereof. This could result in the migration from teacher to learner collaboration to a more active learner to learner collaboration.
- Student teachers should be exposed and allowed to prepare teaching materials using ICTs more frequently before they conduct their school based studies, by storing such media in a file or media room to enable them to borrow such material when conducting their teaching practice.
- Mentor teachers and university tutors should put in place regular control measures and encourage the use of ICTs in lessons more frequently, thus allowing the student teachers to prepare in advance for such lessons.

6.5 Recommendations for future research

The researcher recommends the following for future research:

- A study that would determine the extent to which student teachers' confidence and attitude makes a difference in the use of ICTs during their teacher training. As determined earlier that student teachers need to have the necessary confidence, skill and exposure to make use of ICTs during teaching, such a study would assist in gaining in-depth guidance on the training of student teachers.
- A study on the application of ICTs to the student teacher's subject area: a pedagogical view. At this stage, student teachers have some knowledge in a

number of commonly available ICT tools that can be applied to teaching, but the opportunity to apply ICTs in all of their specialisation is often limited by the lack of access to ICT facilities and resources; hence it is not fully integrated into all lessons for student teachers to gain different pedagogical skills.

- A study on ICT in teacher training institutions such as the University of Namibia, which can examine the needs, expectations and attitudes of student teachers. Such a study could provide information on pre-service student teachers' needs, expectations and attitudes towards the learning and integration of information and communication technologies (ICTs) into their teaching, given the diverse demographic backgrounds and social conditions of the student teacher candidates, such as age, gender, English language proficiency, and educational background, etc. Such a study would determine the level at which the enrolled students understand the significance of ICT in teaching and learning.
- A study on evaluating the B.Ed. programmes to train and assist student teachers in appropriate ICT integration practices and pedagogies in the classroom.

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Appendix A: Questionnaire for students

Student Questionnaire

Thank you very much for participating in this study. It is important for us in the education sector to understand the various challenges we face in teaching, especially when it involves ICT use and its integration. This questionnaire was prepared to collect data concerning student teachers' abilities in ICT use and integration during teaching, as well as knowledge and pedagogical matters linked to the Technological Pedagogical and Content Knowledge (TPACK) framework. All the information provided on this questionnaire will only be used for the purpose of this study and all the information collected will be treated with strict confidentiality.

Please answer each question to the best of your knowledge. Your responses will be greatly appreciated. Please do not write your name anywhere on this questionnaire.

DEMOGRAPHIC INFORMATION

A. Personal information

Please use a cross (✗) in the appropriate boxes

1. Gender

Female ☐ Male ☐

2. Age range

18-22 ☐ 23-28 ☐

29-32 33+

3. Phase specialisation

a. Lower Primary ☐ b. Upper Primary ☐

4. Area of specialisation: *Please cross (✗) only subjects you major in.*

Lower Primary class teaching

English

Oshikwanyama

Oshindonga

Mathematics

Integrated Natural Science

B. Perceptions and challenges towards ICT use and integration

Please indicate the extent to which you agree or disagree with each of the statements in this section. Please cross (✗) in the relevant box only.

Perceptions	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
5. I can easily and confidently use ICTs.				
6. I find it time wasting to use and integrate ICT during teaching.				

7. The process of using and integrating ICTs is just too complicated.

8. I have ICT fear; therefore I do not use it at all.

9. If I was not trained to use a specific ICT, I will not use it at all in class.

10. If the school mentor teacher is not using ICT during teaching, I will also not use it.

11. The available ICT is sometimes irrelevant for the content that I will be teaching.

12. I can be motivated to use ICT if my learners are motivated as well.

Challenges

13. I am very unsure of my abilities to use ICT on a daily basis and in teaching.

14. I seem to have difficulties in selecting the correct ICT equipment/tools for teaching.

15. I find the use of ICT during

my teaching confusing.

16. The fear of damaging the ICT equipment is my greatest fear.

17. I am able to plan activities that engage learners with ICT.

18. Availability of ICT will motivate me to use it in class.

19. I struggle to select the appropriate ICT for my lessons.

C. ICT Pedagogical and Content Knowledge measurements of teaching strategies

Please indicate the extent to which you agree or disagree with each of the statements in this section. Please cross (✗) in the relevant box only.

	Strongly disagree	**Disagree**	**Agree**	**Strongly agree**
20. ICT Knowledge competency (TK)				
A. I can do troubleshooting by myself when problems arise while using a specific ICT tool.				
B. I can learn new ICT easily.				
C. I keep up to date with all new technologies available relating education.				
D. I know a lot about different modern				

technologies.

E. I need to be shown and trained on all new technologies.

	Strongly disagree	Disagree	Agree	Strongly Agree
21. Pedagogical & Content competency (PCK)				
A. I have the ability to select different teaching approaches to help learners understand the subject content.				
B. I have the ability to use different teaching approaches for learners to think and learn independently in my class.				
C. I have the ability to approach learners to acquire necessary skills to solve problems they face in subject content.				
D. I can apply the best approach for a given subject topic to attract learners' attention while teaching.				

	Strongly disagree	Disagree	Agree	Strongly agree
22. ICT & Content competency (TCK)				
A. I know the right ICT tools for each lesson I am going to teach.				

B. I can choose the ICT that enhances content knowledge of learners when teaching.

C. I know various available technologies that can be used to enhance learner's content knowledge.

	Strongly disagree	**Disagree**	**Agree**	**Strongly agree**
23. ICT & Pedagogy competency (TPK)				
A. I think critically before selecting an ICT tool for a lesson.				
B. I think critically about how I will use and integrate a particular ICT in the classroom.				
C. I can use the available ICT to suit a lesson effectively.				
D. I can use available ICT to create activities for learners to enhance their understanding of the content.				
E. I consider the types of learners I am teaching before selecting and while using a specific ICT in class.				

F. My teacher training program had influence and made me think differently on how ICT can change the way I will teach by using different approaches.

D. Student teacher training overview

Please indicate the extent to which you agree or disagree with each of the statements in this section. Please cross (✗) in the relevant box only.

24. At the University, I received enough training time to become aware of all available ICTs in teaching.	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**

25. At the University, I obtained sufficient subject knowledge on how to use ICT in my subjects.	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**

26. At the University, I was exposed to the relevant available ICT to get an understanding on how and when to use ICT in teaching.	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**

27. At the University, I got the practical experience of using ICT to assess and manage learners' performance.	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**	

E. Overall student training and perception

Please indicate the extent to which you agree or disagree with each of the statements in this section. Please cross (✗) in the relevant box only.

28. How would you rate your specific subject lecturers' confidence on using and integrating ICT during lectures?	**1** **Low**	**2** **Little**	**3** **Good**	**4** **Very Good**
29. Do lecturers emphasise the use and integration of ICTs in lessons during micro teaching?	**1** **No emphasis**	**2** **Some emphasis**	**3** **Much emphasis**	**4** **Great emphasis**
30. Based on your experience, what can you conclude about using ICTs in teaching?	**1** **ICT does not contribute anything in teaching**	**2** **ICT has little contribution in teaching**	**3** **ICT has satisfactory contribution in teaching**	**4** **ICT has very high contribution in teaching**

F. Open response Questions

Please feel free to respond to the questions below in the box provided.

31. What other challenges do you face when trying to use or integrate ICT in your lessons?

32. What are your general perceptions on the use of ICTs in your teaching?

Thank you very much for your participation.

Appendix B: Observation checklist

Observation Check list **TPACK observation**

Name…….……... **School…….…….**

Date observed……..

Technological Knowledge	**YES**	**NO**
1. Appropriate choice of ICT tool selected connecting to the content and pedagogy		
2. Student teacher shows technical skills to use the ICT		
3. Student teacher demonstrates fluency in the available ICT to present subject knowledge		
4. Student teacher shows knowledge of using available ICT tools for presentation in the classroom.		
ICT Pedagogical Knowledge		
5. Student teacher shows ability to engage learners by using the available ICT tool as a form of learning activity.		
6. Student teacher shows ability to use the ICT tool, for learners to collaborate on the subject content.		
7. Student teacher uses appropriate pedagogies and knowledge to incorporate the ICT tool as a learning material.		
Pedagogical Content Knowledge		
8. Student teacher has the ability to integrate the selected ICT tool into teaching to create an environment of learning and creativity.		

9. Student teacher can apply methods that will create a situation of understanding of subject content by using available ICT tool.

10. Student teacher addressed the diverse needs of all learners by accommodating all learners with special needs.

Appendix C: Interview questions to students

Interview Questions

ICT, Pedagogy, Content and Challenges

1. What type of ICT tools do you think are important for your teaching and why?
2. When do you think is the best time to use or integrate ICT when teaching a lesson and why?
3. Briefly tell me what you think is the role of ICT in teaching.
4. What are the differences between ICT use and ICT integration?
5. What issues do you take into consideration when using or integrating ICT into your teaching?
6. What specific example can you tell in which you have used ICT into your lessons?
7. Do you think you are successfully integrating ICT or is there need for improvement? Explain.

Challenges when using ICT during teaching

1. What factors do you know (personal experience at your school) that may prevent you from using or integrating ICTs effectively during your teaching?

Appendix D: Information letter and consent form for invitation to take part in a study

Dear Student

This letter is an invitation to consider participating in a study I am conducting as part of my Master of Education degree in the Department of **Curriculum Instruction and Assessment Studies (CIAS)** at the **University of Namibia** under the supervision of **Dr. S.M. Iipinge.**

The purpose of this study is to collect data concerning primary student teachers' abilities at Hifikepunye Pohamba Campus on the use and integration of ICT during teaching practice as well as on knowledge and matters linked to the Technological Pedagogical and Content Knowledge (TPACK) framework. The study will try to answer the following questions:

(1) What type of ICT tools are mostly used by student teachers during teaching practice?

(2) What are the student teachers' perceptions on use of ICTs to improve their teaching during teaching practice?

(3) What teaching strategies do student teachers use when integrating ICTs into their lessons?

(4) What challenges do the student teachers face and experience in using and integrating ICTs into teaching activities during School Based Studies?

Participation in this study is **voluntary**. It will involve a classroom observation during your lessons, an interview of approximately 40 minutes in length, to take place in a mutually agreed upon location at the campus, and a questionnaire that will be provided to you for completion. With your permission, the interview will be tape-recorded to facilitate collection of information, and later transcribed for analysis. All information you provide is considered completely confidential. Your name will not appear in any thesis or report resulting from this study. There are no anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at 0812433691 or by e-mail at thenoch35@gmail.com.

Therefore, please complete and return the consent form for record keeping purposes.

I very much look forward to working with you on this study and thank you in advance for your assistance in this study.

Sincerely,

T.T Henoch

Appendix E: Consent form

I have read the information presented in the information letter about a study being conducted by **T.T Henoch** of the Department of **Curriculum Instruction and Assessment Studies (CIAS)** at the University of Namibia.

I am aware that I have the option of allowing a classroom observation, completion of a questionnaire and an interview to be tape recorded to ensure an accurate recording of my responses.

I was informed that participation is voluntarily and that any data collected is strictly confidential and no names will appear in any thesis or report of this study. I may withdraw my consent at any time without penalty by the researcher.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES ☐ NO ☐

Participant's Name (please print) _____

Participant's Signature _____ Date _____

Researcher's Signature _____ Date _____

Research Title: ***INVESTIGATING PRIMARY STUDENT TEACHERS' FIELD EXPERIENCE OF ICT USE AND INTEGRATION DURING SCHOOL BASED STUDIES***

Department: **Curriculum Instruction and Assessment Studies (CIAS)**