AN EXPLORATION OF SELECTED WINDHOEK SECONDARY SCHOOL TEACHERS INFORMATION COMMUNICATION AND TECHNOLOGY CLASSROOM INTEGRATION

A THESIS SUBMITTED IN PARTIAL FULFILMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF EDUCATION (EDUCATIONAL TECHNOLOGY)

OF

THE UNIVERSITY OF NAMIBIA

BY

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OCTOBER 2022

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ABSTRACT

The Namibian ICT in Education Policy and the TECH/NA! Implementation Plan have been in existence since 2006. Many studies have followed up on technology integration in various subjects at schools across the country since then. This study is focused on measuring the levels of integration in the Khomas Region and looks at the return of investment from the implementation of the Policy. This study explores the challenges still existing for teachers integrating technology into classroom practice and the strategies that are being employed. Theoretical frameworks supporting this study is Technology Acceptance Model (TAM) and the four levels of Kotrlik Pierson's model of technology integration (KPMTI). The theoretical framework focuses on the actual ICT classroom integration, perceived importance of ICT integration, teachers' confidence, and challenges in ICT integration. This exploratory case study research design uses a semi-structured interview protocol. Due to the COVID19 pandemic and interruption in education, the researcher was unable to carry out class observation that was originally planned. This study is dependent entirely on the self-efficacy of teachers reporting of their practice. The results indicate that, despite a few innovative strategies of ICT integration, the majority of ICT integration initiatives in the classroom are still not optimised to a desirable redefinition or transformational level according to SAMR ICT integration level. Attitudinal issues, lack of support, affordability and lack of skills were identified as constraints that affect effective implementation of ICT. The Ministry of Education, Arts and Culture appears to place more financial focus on the training of staff, including the principals. Furthermore, results show the need for making stakeholders aware of the need to refocus on re-implementing ICT integration efforts, encourage teachers to take their own initiative to develop skills in ICT integration and improve access to ICT resources and tools. The study concludes that despite many efforts, the return on financial and training investment from Ministry of Education, Arts and Culture (MoEAC) was insufficient to support the activities of sustaining the Namibian ICT in Education Policy as it pertains to teachers' ICT integration in classrooms.

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LIST OF ABBREVIATIONS/ACRONYMS

CPD- Continuing Professional Development

ETSIP- Education and Training Sector Improvement Program

ICDL- International Computer Driving Licence

ICT- Information Communication Technology.

ICTPDT- Information Communication Technology Professional Development for Teachers.

ICTsCIF- ICTs Classroom Integration Framework

IMTE- Integrated Media Technology in Education

KBE- Knowledge Based Economy

KoRTI- Kotrlik-Redmann Technology Integration model

MoE- Ministry of Education

NAMCOL- Namibia College of Open Learning

NETSS- Namibian Education Technology Services and Support

NIED- National Institution for Educational Development

OLPC- One Laptop Per Child

PiL- Microsoft partners in learning software

SAMR- Substitution, Augmentation, Modification and Redefinition model

ToT- Train of Trainers

TRC-Teacher Resource Centre

UbD- Understanding by Design

UNESCO- United Nations Educational, Scientific and Cultural Organization

ACKNOWLEDGEMENTS

I wish to thank the Almighty Father, God, for giving me the courage, strength and knowledge to work on this thesis. At times I experienced difficult situations, and indeed, I stood the on sure promises of God, I shall surely continue. I am sincerely gratified and indebted to my main supervisor Prof. P. Boer, she came at a time when I was at the verge of giving up and letting everything go, but her direction, guidance and most of all, her motivation, have brought me up to this stage.

My gratitude also extends to my colleague and a friend Severina Neingo for her unconditional support from the very beginning. I had to be given unpaid leave to attend a seminar and she had to come in with words of encouragement to urge me on. Furthermore, I also want to acknowledge the academic assistance from Dr. N. Lupahla and Mr. M. Nyangara for providing critical comments and asking questions that helped me focus on important issues in the study. Credit should be given to all the teachers who took part in the interviews, this study would not yield success without them, thank you for sacrificing their time. I would also like to thank the Ministry of Education, Arts and Culture for granting me the permission to access the Secondary schools in Windhoek Khomas Region and collect the data.

To my dear children, Rachel, Nico and Victoria: thank you for your patience and for understanding that "Mommy had to spend longer times in front of the computer", instead of reading you bedtime stories. Seeing you every single day gives me the courage to work even harder in my future endeavours. To my husband, thank you for all that you are and for your support. To all my friends, thank you for being there whenever I felt like talking to someone. I am grateful for your support and untiring moral encouragement.

DECLARATIONS

I, Ndapewemona Ndatalomwene Nghaamua, 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.

17 October 2022

Ndatalomwene N. Nghaamua Date

CHAPTER 1

1.1 Introduction

The focus of this study was to explore teachers' Information Communication Technologies (ICTs) integration levels in Windhoek. Therefore, this chapter will deliver a general overview and background of ICTs integration in the classroom. The historical account of ICTs in education in Namibia is also highlighted in this chapter.

1.2 Background of the study

Since the introduction of the ICT in Education Policy in the Namibian education system, which resulted in Namibian teachers integrating ICTs into their classroom teaching, many studies (Iipinge 2010, Nuuyoma 2012, Boer 2012, Simon & Ngololo 2015, Nendongo 2018) have been done to explore teachers' ICT integration in the regions. It has been alluded that some challenges that were faced by teachers as well as learners are: lack of appropriate skills and competencies, lack of continuous support, teachers unable to use ICT resources made available to them, lack of computers, limited access to internet and insufficient budget allocation to ICTs integration implementation. Nevertheless, teachers were seen recognizing and acknowledging the value and benefits of ICTs integration. The Namibia ICT Policy for Education, was developed in 2005, with a mandate of the integration and use of ICTs for a variety of goals, including the production of ICT literate citizens, leveraging ICT to assist and

facilitate teaching and learning, improving the efficiency of educational administration and management at every school level, and expanding access to quality educational services for learners at all levels of the education system (MoE, 2005).

In addition, the Namibian ICT policy established explicit targets and fundamental competencies for learners, students, and teachers to achieve critical ICT knowledge and abilities. At all levels of the educational system, more emphasis is placed on the pedagogical use of ICT as an integrative tool in the teaching-learning process. Teachers, students, and learners will build competences in the use of ICTs through a process of guided practice and investigation, according to the policy.

The ICT policy also specifies the infrastructure, hardware, and software requirements for successful ICT integration in order to meet the policy's objectives. These criteria range from guaranteeing that each school level has a computer room with a specific number of computers to ensuring that all learners, students, and teachers have good access to a computer. The ICT integration activities at each school level are articulated in the implementation plan, which is an annex to the policy. Figure 1 shows the descriptions of the required level as per the TECH/NA! implementation plan. These levels were partially met especially within the Khomas region where access to better ICTs tools are found.

	Level 1	Level 2	Level 3	Level 4	Level 5
Classroom facilities	1 room with ICTs	At least 1 room with ICTs	2 or more rooms with ICTs	Many rooms with ICTs	Significant number of rooms with ICTs
Display facilities	Audiovisual and/or broadcast facilities	Projector and/or ability to display audiovisual materials	Projector and/or ability to display audiovisual materials	Projector and/or ability to display audiovisual materials	Projector and/or ability to display audiovisual materials
Internet access	Not necessarily	Yes	Yes	Yes	Yes
Teacher skills: all teachers	Foundation Level ICT Literacy Certificate	Foundation Level ICT Literacy Certificate	Intermediate Level ICT Literacy Certificate	Intermediate Level ICT Literacy Certificate	Advanced Level ICT Literacy Certificate
Teacher skills: specialised staff	1-2 staff with Intermediate Level ICT Literacy Certificate	At least 2 staff with at least Intermediate Level ICT Literacy Certificate or higher ICT qualification	At least 30% of staff with Advanced Level ICT Literacy Certificate or higher ICT qualification	At least 50% of staff with Advanced Level ICT Literacy Certificate or higher ICT qualification	At least 50% of staff with ICT Diploma/Degree (or equivalent)
Learner or student skills	Introduction to ICTs	Foundation Level ICT Literacy Certificate	Intermediate Level ICT Literacy Certificate	Intermediate Level ICT Literacy Certificate	Advanced Level ICT Literacy Certificate
Student access	1 class period per month	1 class period per week	At least 3 class periods per week	At least 1 class period per day	At least 4 class periods per day
Timetabling of ICTs	No	Yes	Yes	Yes	Yes
Communication with parent Ministry via ICT	None	Over 20% done via email	Over 33% done via email	Over 50% done by email	Over 75% done through email and web

Figure 1: *The technological development levels at educational institutions from the TECH/NA! implementation* as adopted from Boer and Kacelo, 2015

Iipinge (2010) indicated that student teachers at the college of education in Namibia agreed that ICT integration has a positive impact in teaching in terms of making learning interesting, storage and retrieval of information is easier. Furthermore, ICTs integration will facilitate the improvement of writing skills and serves as a motivation for further studies. He recommended that teacher educators should use ICT in their teaching and learning to serve as a motivation to the student teachers to integrate ICT in their teaching when they are in the field. The teachers' program at the University of Namibia offers Integrated Media Technology in Education (IMTE) one and two in their second and third year, this is done by all students under the program and in fourth

year the students have Educational technology as one of their career specializations that they can chose to do.

The Namibian government has made a provision in terms of helping teachers to integrate ICT in their classroom effectively. Nuuyoma (2012) highlighted that a government-funded course has been rolled out to train teachers on how to utilize computers and access the internet to obtain relevant information that they can use across the curriculum. Through this course, teachers could obtain an International Computer Driver's License (ICDL). Al-Othman & Abdullah (2021) defined ICDL as One of the international programs discovered to close the IT skills literacy gap. The ICDL is a globally recognized certification that attests to a person's proficiency at using a computer and its most used programs (Microsoft Office Suite which includes: Concepts of ICT, Using the Computer and Managing Files, MS Word, MS Excel, MS PowerPoint, MS Databases, Presentation & Web Browsing and Communication) (Lubbe & Benson 2010, as cited in Kacelo, 2018). Teachers were expected to meet their need on access to ICT, training in ICT skills and on-going support. Similarly, Kacelo & Boer (2019), studied the Zambezi region to explore the impact of this initiative on how teachers are integrating the information and communication technologies in their classrooms. Teachers that completed four to seven modules indicated that the ICDL training has empowered themselves with necessary ICT integration skills such as use of Microsoft excel for keeping assessment records, MS PowerPoint for captivating lesson presentation and Internet for accessing and development of additional teaching resources (Kacelo, 2019). Sadly, it is reported that most teachers at most schools did not manage to complete minimum modules (4 modules) required for this course before it was terminated in 2011 (Kacelo, 2019).

1.3 The Historical Account of ICT in education in Namibia

Namibia, after gaining its independence on the 21st March 1990, the Ministry of Education (MoE) accepted the past history and embarked on the journey of identifying the purpose for a nation that needed to lay a foundation for sustainable supply of skills required for the country's transition to a knowledge-based economy (World Bank, 2008, Boer, 2012).

The efforts to bring ICTs in education in Namibia started with SchoolNet/Namibia. In the early 1990s SchoolNet/Namibia, a non-profit organization, donated refurbished computers to schools and provided a low-cost thin-client solution running Linux. SchoolNet/Namibia also provided internet connectivity, continued support and maintenance. It also provided training to out-of-school youth under the program called "Kids-on-the-block" and teachers (Boer, 2012). During this time there was no policy to guide teachers on how to integrate ICTs in their classrooms. The (MoE) has adopted several ICT training courses since 2005, with an objective of preparing teachers to effectively integrate ICTs in the classrooms across the curriculum. This was done to respond to the need of globalization and attainment of a Knowledge- Based Society that the country is aiming to achieve by 2030 in order to meet the challenges of the 21st century (MoE, 2006). ICT in education is a strategic objective under the Education and Training Sector Improvement Program (ETSIP) to strengthen quality education. With the assistance of the World Bank the Namibian government came up with a strategic plan to improve the education system. The World Bank offered the Namibian government a loan for the implementation of the first face of ETSIP as well as to align

the Namibian education reform plan to the World Bank philosophy of human capital development (Jones, 2004).

Boer (2012) mentioned that when the ICT policy was tabled in parliament, the ministry of education (MOE) came up with an implementation plan called TECH/NA! which means technology is "nice or good". It is under the TECH/NA! implementation plan where teachers guide and support are implemented to support and guide teachers in introducing ICT in their classrooms. These has been done through the "ICT literacy certification" in the form of ICDL training to improve the teachers' computer skills. The TECH/NA! Plan was to immediately deploy computers to schools according to the priority set lists through Namibian Education Technology Services and Support (NETSS) Centre which was tasked to provide ongoing support to schools (RON, GRN, 2006, as cited in Boer, 2012). According to Boer (2012), teachers and principals claimed that NETSS took too long to respond to their technical problems and NETSS took too long to deploy computers at schools. This was affecting the process of planning their technology integrated lesson. Despite this concern, some teachers were observed using ICTs in their lessons. Furthermore, teachers were not all aware of the implementation requirements and of the policy requirements. The awareness of policy shows lack of political will in that there was a lack of continual training in the requirement and expectations of the ICT in Education policy and Tech/Na! Implementation plan thus, principals and teachers were unable to demand technology infrastructure and training (Boer, 2012). These factors patricianly explain the technology integration level that remains at fundamental level (Boer, 2012). Thus, ICT integration in the classroom is still not optimised to a desirable redefinition or transformational level. It was also noted that insufficient technologies and devices denied teachers the opportunities to integrate ICTs in the classroom. Katjavivi (2016)

indicated that poor support for teachers and inadequate use of technology in the classroom remain obstacles to improving both primary and secondary education in Namibia.

Mirzajani et al., (2016), in a study on teachers' acceptance of ICT and its integration in the classroom in Malaysia, documented that PowerPoint was the most used ICT tool in the classroom and teachers have expressed that if such technology is carelessly used, learners can get disinterested. Lorenz et al., (2015) cited that ICT tools could be used in the classroom to support ICT integration could include calculators, computer games, spreadsheets, databases and online, interactive resources. How teachers in secondary schools integrate these ICT tools/digital tools in their classroom is of interest in this research study as it determines not only the progress of TECH/NA! implementation plan, but an evaluation of ICT integration and the intervention strategies. The main focus of this research thus was to explore how teachers in secondary schools in Namibia are integrating ICTs in the classroom and what challenges, if any, are experienced. The study also explored intervention strategies to ensure effective integration of ICTs in Namibian secondary schools.

1.4 Statement of the problem

ICT integration in the classroom is one of the driving forces for Namibia to become a Knowledge- Based Economy (KBE). In 2007, the Education and Training Sector Improvement Program (ETSIP) was approved to support the implementation of the ICT policy for education. ETSIP received an amount of U$7.5 million to assist the government to increase the supply of ICT skilled individuals relevant to the demands of the current labour market. The current COVID-19 pandemic has further revealed the digital divide and the inability for all schools in the country to launch an inclusive

e-learning system as spelt out in the ICT policy for education. The cited challenges vary from lack of e-learning infrastructure to lack of teachers' competencies in managing e-learning software and/or enablers like PowerPoint, spreadsheets, Zoom, Skype, WhatsApp, and so on (Aras, 2020). It is crucial to consider the return on the investment from the Ministry of Education, Arts and Culture.

It was therefore important to know the level of ICTs integration that the teachers are at in order to be able to identify further needs for professional training. This study further endeavoured to understand the challenges, if any, the teachers are experiencing when integrating the ICTs in the classroom and what possible intervention strategies could be employed to improve the situation.

1.5 Research questions

This study sought answers to the following questions:

a. What are the statuses or levels of selected Windhoek Secondary school teachers' ICT integration practices in their classroom?

b. What challenges, if any, are secondary school teachers in Windhoek, facing in integrating ICTs in the teaching of their subjects?

c. What intervention strategies do teachers indicate is needed to ensure effective integration of ICTs in their teaching?

1.6 Significance of the study

This study is aimed at providing the Ministry of Education, Arts and Culture with the necessary information on the state of teachers' ICTs classroom integration in secondary schools in Windhoek. It is hoped that the findings of this study will not only

highlight the state of the ICT integration by secondary school teachers but also allow for better professional development and infrastructure planning for the ministry of education and other stakeholders. The study findings may also be used in developing a framework, to act as a guide for teachers' ICTs integration in their specific subjects.

1.7 Limitations of the study

The study was limited to only 7 selected secondary schools in the Khomas region, and as such it cannot be generalised to the entire secondary schools in Windhoek. The schools were selected based on ICT infrastructures and the teachers' ICTs integration in the classroom. Initially, the study intended to collect data through face-to-face teacher interviews and through classroom observation. This was no longer possible due to the COVID-19 pandemic. The Corona virus pandemic forced the government to declare a state of emergency, resulting in measures being put in place to restrict face to face public meetings. The absence of class observations, threatens the reliability and validity of the participants responses to the interview questions, in that they may have indicated to integrate ICTs in their classrooms practice while in reality they were actually not.

1.8 Delimitation of the study

This study's scope was limited to the integration of ICTs in the classroom by secondary school teachers in Windhoek, Khomas educational region. Therefore, the scope of the views of the participants in this study cannot be generalised to other schools in Windhoek or the Khomas educational region

1.9 Conclusion

This thesis consists of five chapters. Chapter 1 focused on the orientation of the study which highlighted benefits of ICT integration in the classroom to both learners and the teachers. ICTs integration in the classroom will ensure that teachers produce individual learners who will be knowledge-based citizens and are fit to compete in the global economy when they leave school. The problems associated with integration of ICTs were specified. The research questions, the significance of the study, limitations and delimitations of the study were also stated. Chapter 2 presents literature related to ICTs integration in the classroom, its challenges and strategic interventions.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The focus of the study explored teachers' ICT integration levels in selected Windhoek secondary schools and therefore sought an aggregate level or status of ICT integration classroom practice. Additionally, the study wants to uncover what challenges these teachers were experiencing when integrating ICTs in teaching their subject and what intervention strategies teachers indicate are needed to ensure effective integration. Therefore, this chapter reviewed literature on the landscape of ICT integration in the classroom in Sub-Saharan Africa and Asia, due to these regions' developmental similarities to Namibia. The focus is on the overview of ICTs integration, how ICTs are being integrated in the classroom, challenges and suggested interventions. The conceptual framework to which the study is aligned is also outlined in this section. The literature is organized into subtopics, giving details on the status of ICTs integration in the classroom and how it is being done with examples of ICT tools being used across the globe.

2.2 Overview of ICT integration in the classroom

ICT integration generally means technology-based teaching and learning process that closely relates to the utilization of learning technologies in schools (Ghavifekr & Rosdy, 2015).Bhasin (2012) defined ICT integrations as a comprehensive process of applying technology to the educational system to improve teaching and learning. Its success depends not only on the availability of technology, but also on the pedagogical design. While (Kotrlik & Redmann, 2009a) defined technology integration as employing technology to support, enhance, inspire, and create learning for the purpose

of this study ICTs integration will mean the process of innovatively combining pedagogical methods with ICTs in the classroom for a better teacher-learner engagement and learner motivation.

2.3 Models to evaluate ICTs to assess the levels of integration

In an effort to guide teachers and researchers in their ICTs integration efforts, researchers have established standards, frameworks, models and theories that may be utilized to inform research and practice around integration of technology in teaching and learning (Jude, et al., 2014). For this study the interest in these models that can be used to evaluate or to assess the teachers' level of ICT integration in the curriculum.

2.3.1 The Substitution, Augmentation, Modification and Redefinition (SAMR) model

The SAMR model, represented as a ladder, is a four-level approach to selecting, using and evaluating technology integration in the classroom (Jude, 2014). SAMR model offers a process of seeing how computer technology might impact teaching and learning. It also shows the progression or advancement that teachers often follow as they progress through ICTs integration in the classroom (Budiman, etal, 2018). According to Puentedura (2006), the SAMR model is intended to be a tool through which researchers can describe and categorise secondary school teachers' use of classroom technology. The model emboldens teachers to progress from lower level to higher levels of teaching with technology, which according to Puentedura yields to enhanced levels of teaching and learning**.**

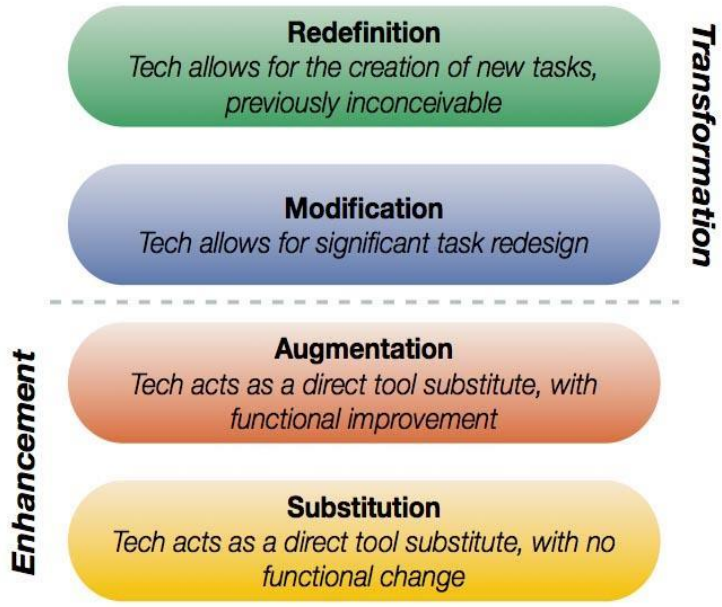


Figure 2: SAMR Model Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) model (retrieved from http://www.hippasus.com/rrpweblog/)

At the substitution level, digital technology is substituted for analog technology, but with no change (substitute) (Puentedura, 2006). At the augmentation level, technology is exchanged and the function of the task or tool positively changes in some way. At the modification level, technology integration requires a significant redesign of a task. Finally, the redefinition level is achieved when technology is used to create a novel task, previously inconceivable. All these levels clearly depend on the teacher's knowledge of integration and the availability of the tools.

2.3.2 The Kotrlik-Redmann Technology Integration (KoRTI) model

Kotrlik and Redmann (2002) developed a conceptual framework to differentiate phases of technology adoption for teaching and learning. The KoRTI model identifies

four levels of technology adoption: exploration, experimentation, adoption, and advance integration.

1*) Exploration* - Thinking About Using Technology. Teachers seek to learn about technology and how to use it.

2) Experimentation - Beginning to Use Technology. Physical changes start to occur in classrooms and laboratories. Instructors focus more on using technology in instruction by presenting information using presentation software and doing a few instructional exercises using spreadsheets, databases, word processors, games, simulations, the Internet, and/or other technology tools.

3) *Adoption* - Using Technology Regularly. Physical changes are very evident in the classroom and/or laboratory with technology becoming a focal point in the classroom and/ or laboratory organization. Instructors employ presentation software and technology based instructional exercises using games, simulations, spreadsheets, databases, word processors, the Internet or other technology tools as a regular and normal feature of instructional activities. Student-shared responsibility for learning emerges as a major instructional theme.

4) *Advanced Integration* - Using Technology Innovatively. Instructors pursue innovative ways to use technology to improve learning. Students take on new challenges beyond traditional assignments and activities. Learners use technology to collaborate with others from various disciplines to gather and analyze information for student learning projects. The integration of technology into the teaching/learning process leads to a higher level of learning.

2.3.3 Teachers' levels of Technology integration and the four stages of learner technology integration that teachers should strive for in their practices.

Technology integration has five (5) levels namely: entry, adoption, adaptation, infusion and transformation. The first level is the entry level in which the teacher is the only one who actively uses technology. This includes using presentations on lectures, giving directions and delivering information to students. The second level is the adoption. In this level, the teacher controls the type of technology to be used; directs students in the conventional use of technology tools for working with others and for learning; and provides some opportunities for students to use technology in conventional ways to build knowledge and experience. Adaptation is the third level and in this level in which the teacher acts as a facilitator towards learning which allows greater student engagement with technology tools. The fourth one is the infusion, and, in this level, the teacher guides, informs, contextualizes student choices of technology tools and makes lessons structured so that students‟ use of technology is self-directed. Lastly, is the transformation level and in this level, the teacher serves as a guide, mentor and model in the use of technology (Welsh et al., 2011).

The teachers' levels of integration will automatically influence how learners use technology through their learning. Terry (2021) highlights the four stages of learner technology integration:

Stage 1: Directed

At this stage learners are directed in their use of technology in the learning process. Asynchronous access to information and peer networks. Some ability for learners to

select platform, technology, or even content. Traditional classroom learning begins to be disrupted.

Statge 2: Access

This stage is characterized by powerful access to information, networks, and communities, but mostly unable to leverage that access without supporting frameworks or planning. Learners are directed in their selection of constructivist use of technology in the learning process, traditionally to accomplish purely academic tasks that are fully accessible without the technology.

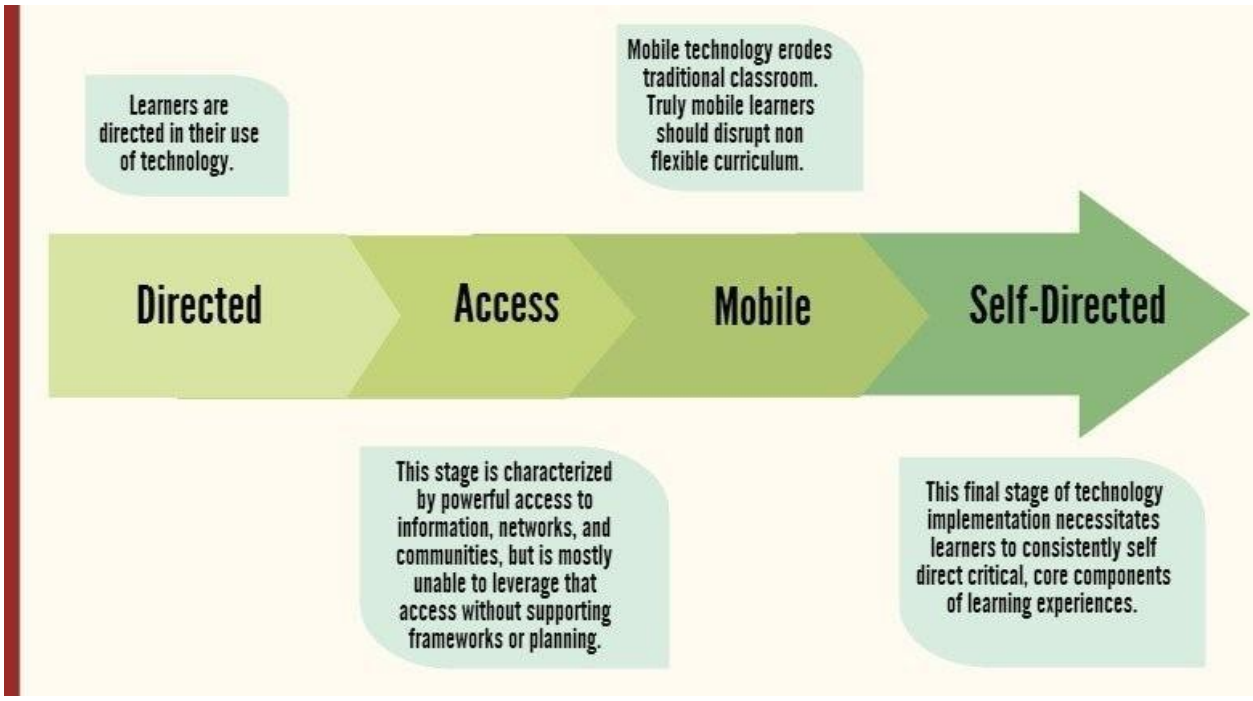
Stage 3: Mobile technology

Mobile technology erodes traditional classrooms. Truly mobile learners should disrupt non-flexible curriculum. Mobile learning experiences are inherently unpredictable, requiring varied communication, critical thinking, and aggressive resourcefulness. Standards-based academic work struggles for gravity working against this stage of technology integration.

Stage 4: Self-directed:

This final stage of technology implementation necessitates learners to consistently self-direct critical, core components of learning experiences. Self-direction based on curiosity and play while supported by personalized learning algorithms and the connectivity of authentic networks characterizes this final stage of technology integration. Traditional classroom

Figure 3: *Integration technology of learning*



Note. Four stages: the integration of technology in learning from *Teachthought*, by Terry H. 2013 from (*https://*www.teachthought.com/wp-content/uploads/2013/04/stages-of-technology-integration-in-learning.jpg)

Current settings in education across the globe are encouraging the use of technology in the classrooms. The adoption of Information and Communication Technologies (ICTs) in teaching and learning has introduced new opportunities in the education sector. Simultaneously, it has also placed new demands on teachers with regards to technical skills and the use of computers as tools to integrate ICTs in the classrooms (Karipi, 2019). In line with the current setting in our education systems, teachers are required to integrate ICTs in their daily lesson presentations. Traditional ways of teaching should be replaced by novel tools and facilities (Ghavifekr, 2015). Challenges such as digital divide, poor utilisation of ICT tools in subject content delivery and consistently changing new technologies and tool are what teachers are struggling with. However, the adoption and integration of ICTs into teaching and learning environment provides more opportunities for teachers and learners to work better in a globalised digital age (Lawrence & Tar, 2018). Opportunities of learners being able to learn even

when the teacher is not physically present, opportunities of being able to access relevant resource in one space, enhanced collaborative learning and sharing of resources and ideas with other experts.

Padayachee (2017), in her survey study of ICT integration in South African schools, mentioned that ICT integration in the classroom is often seen by policy makers as a solution to educational challenges such as schools stuck with outdated curriculum that teaches obsolete skills that are no longer needed in a digital era. However, ICTs integration in South Africa have been limited by operational, strategic and pedagogical challenges: inadequacy of existing structures ; lack of internet access in the classroom; insufficient ICT tools such as data projectors; lack of funding for ICT projects; teachers raised their concern around the issue of time with respect to workload and interruptions of school terms; power failure and network coverage; negative impact of technology on learners, cost on teachers as they have to use their own data to download materials for the lessons and that teachers do not have enough time to learn how to utilise new technologies.

Contemporary researchers such as Ghavifekr and Rosdy (2015), Kihoza et al. (2016) and Padayachee (2017) are having great discussion about how teachers should integrate ICTs in their classrooms in order to accommodate the comprehensive changes in education systems: issues such as review of curriculum is needed so that aims and objectives of the curriculum are assigned the appropriate ICT resources and software to make ICT integration easier and less time consuming, the need for teacher professional ICT training program, ICT use harmonized framework to guide technology integration in secondary education as well as that a technology-based lesson must make use of tools that offer various interesting ways to the learners. The study recommended that teachers could make use of educational videos, simulation,

usage of database and the World Wide Web to make the learning process more fulfilling.

There is no doubt that integration of ICTs in the classroom offers several benefits to both teachers and learners: sharing of resources and learning spaces as well as the strengthening of collaborative learning and generally the move towards learner independence (Eze, Adu & Ruramayi, 2013). It brings together traditionally separated educational technologies such as books, writing, telephone, television, photography, database, games and more, as a result, connecting forms of knowledge and literacy (Livingstone, 2012). Shihomeka, (2020), added that natural disasters such as floods, outbreaks and pandemics bring up the distance factor between the teacher and the learner that puts demands on the use of virtual classrooms in order for teaching and learning to take place. However, this is only possible if teachers' and learners' accessibility to proper and reliable ICTs is afforded. Therefore, appropriate integration of ICTs in the classroom is seen as a panacea to countries' educational challenges such as the ones that have been brought up by the Covid-19 pandemic that have affected about 166 countries across Africa, Asia and Latin America (UNESCO, 2020).

Countries such as Kenya, Botswana, South Africa and Namibia, since the inception of their ICT policies for education, have committed themselves to roll out programs and initiatives to assist teachers on integrating ICTs in their teaching and learning. For example, the Ministry of Education in Kenya in collaboration with the Flemish Association for Development Cooperation and Technical Assistance implemented a capacity building program on ICT-integration, established an ICT-integration team (ICTiT), responsible for coordinating and harmonising all ICT-initiatives within the Ministry and developed a strategy for ICT integration in Kenyan secondary schools (Tonder et al., 2015). South Africa on the other hand, has projects and initiatives such

as: Mindset Learn, Telkom's Thindana project; Microsoft Foundation's agreement with the National Department of Education and the South African Schoolnet that have been empowering teachers in ICT integration since 1997.

2.2.1 ICT integration in Asia and Pacific

Over the decade from 2006 to 2016, Asian countries have embarked on major developments of their ICT policies. The rationale for this development was to address their educational challenges. The ICT policies for Asian countries address their specific priorities, for example the ICT policies of countries such Malaysia, Singapore, Republic of Korea and others have priority areas that support knowledge deepening and knowledge creation (Yuen & Hew, 2018). This is considered an important step in acquiring a 21st century learning environment in order to prepare learners to become effective citizens of knowledge-based societies. The 21st century learning environment requires ICT facilities and well-trained teachers who are able to effectively integrate ICT in the classroom (Byabazaire & Busthami, 2015).

2.2.1.1 Malaysia

Malaysia has an education blueprint 2013-2025 policy that the ministry of education and multimedia development corporation has formulated (Malaysian Ministry of Education, 2013). This Blueprint put emphasis on three priority areas: Providing internet access and virtual learning environment, augmenting online content, and maximising the use of ICT for distance and self-paced learning. Through different initiative programs at a national and state level Malaysia managed to provide all schools and higher education institutions with computers and internet connection needed for technology integration in the teaching-learning process. (Yuen & Hew, 2018).

In Malaysia the integration of ICTs in the learning and teaching process was introduced in the early 1970s. Schools were upgraded with computer labs, internet connection, white boards, LCD and other ICT tools and equipment. (Ghavifekr & Rosdy, 2015). Malaysia started the process of providing one-to-one computing devices, to enable teachers to move to a higher level of ICT integration in their teaching (Malaysian Ministry of education, 2013). This means that teachers' access to internet connection and other ICT tools is no longer a challenge in Malaysia. However, the following challenges with regard to ICT integration have been cited: lack of manpower for technical support for teachers, lack of training teachers to acquaint themselves with new technology as they emerge, teacher limited knowledge of TPACK, administrative issues as well as fast emerging technologies (Byabazaire & Busthami, 2015; Gavifekr & Rosdy, 2015).

It was therefore resolved that Malaysian teachers be provided with a new form of training that would equip them with skills and understanding of TPACK and its application in teaching. Furthermore, teachers needed training sessions based on their subjects and appropriate ICTs integration strategies (Byabazaire & Busthami, 2015).

2.2.1.2 Singapore

Singapore introduced the Professional computer support program aimed at training all teachers to become proficient in software that they could use in teaching their subjects (Cetin & Solmaz, 2017). The country has also implemented 5-year master plans that guide the ICTs implementation by teachers at different phases. Currently, Singapore is implementing its fourth master plan () which has 4 approaches to ICT integration: deeper ICT integration in the curriculum, sustained professional learning, Connected

ICT learning ecosystem and innovation and scaling (ICT connection, 2015 as cited in Cetin & Solmaz, 2017).

In a study that was done with secondary school students in Singapore it was cited that most teachers used “visualizer and PowerPoint” to replace reading from a textbook. Teachers also used ICTs for group engagement and interaction to facilitate group discussion and communications (Pang et al., 2018).

It is reported that when it comes to ICTs integration in the classroom Singapore is facing challenges such as: Lack of guidelines to match technology with curriculum goals that would lead to successful integration; Teachers lack skills and competencies for effective integration; lack of time to prepare for ICTs-integrated lessons; Learners being distracted by online sites such as Facebook, YouTube and Twitter during lessons (Nikolopoulou & Gialamas, 2016; Lim, 2014).

To deal with the above challenges (Lim, 2014) suggested that teacher-coordinators should be appointed to sustain classroom innovations and that networking and collaborative learning among teachers should be promoted. Tay et al (2015), also suggested that continuous professional development for teachers is crucial to enhance their practices and beliefs in integrating ICTs in the classroom.

2.2.2 ICT integration in Sub-Saharan Africa

Countries, especially in Sub-Saharan Africa are still struggling to fully get every teacher integrating ICT in the classroom (UNESCO, 2015). Countries such as Namibia, Botswana, South Africa and Kenya have ICT policies for Education in place. Teachers have their part to play in the implementation of these policies. Through ICT

integration in the classroom teachers are able to prepare schools for quality learning and teaching in the 21st century. For example, through the Namibia ICT Policy for Education (MoE, 2006), the MoE has highlighted the specific educational goals to be achieved. These goals stressed the ICT integration in the classroom as an important tool in the teaching-learning process at all levels in the education system. Therefore, ICT competencies of teachers must be developed through a long period of guided practice and investigation (MoE, 2006). If teachers are well trained and supported this will have a snowball effect on the learners and community members.

2.2.2.1 Kenya

Studies done in Kenyan secondary schools on how mathematics teachers were integrating ICTs in their teaching revealed that teachers lacked technical support, insufficient time allocation to ICTs integration as well as lack of training opportunities (Wanjala, 2015; Amuko, Miheso & Ndeuthi, 2016).

On the other hand, a study by (Kisirkoi, 2015) in one secondary school in Kenya, involving 18 teachers across all fields of studies, revealed that all teachers were integrating ICTs in their classrooms. The school's strategy for enhancing ICT integration keyed on providing relevant ICT training to all new teachers joining the school. The ICT induction programme focused on basic computer literacy skills.

Another study involving Mathematics teachers in Kenya, indicated that teachers were not adequately trained in Integrating ICT in teaching and learning mathematics in secondary school. The study also suggested that there was a need to implement continuous teacher professional development programmes, where teachers can be trained every six months (Amuko et al., 2015).

2.2.2.2 Rwanda

A study that was done in Rwanda in 2017, after the implementation of One Laptop Per Child (OLPC) program, reveals that teachers were still struggling to integrate ICTs in their classrooms and many teachers have indicated the following challenges: (1) lack of adequate skills required to integrate ICT into teaching and learning processes, (2) lack of adequate technological tools, (3) lack of adequate infrastructures, (4) lack of teaching motivation because of their financial constraints (Munyengabe et al., 2017). However, it should be noted that the participants on this study were teachers teaching at the primary schools. So, these findings may not entirely represent secondary school teachers as they might have undergone a different training.

2.2.2.3 South Africa

To address the challenges of ICT integration in South African schools, Padayachee and Mbati, (2016) shared a guideline for technologically enhanced active learning. The guideline presents the recommended delivery mode and software tools for specific types of activities. Table 1 , below, shows the suggested delivery mode and software tools for four categories of activities.

Table 1*: A guideline for technologically enhanced active learning (adapted from (Padayachee & Mbati, 2016)*

Activity Type	Delivery mode	Categories of software tools
Sharing information and ideas	Primary and Secondary Sources Accessing information & ideas in class, out of class, online. More passive.	Self-created websites (e.g. Google Sites); Word-processing programs (e.g. MS Word); Video editing software (e.g. Final cut, Movie Maker, iMovie); Video/Record lessons; Presentation software (e.g. PowerPoint); Podcasts/Vodcasts (e.g. via iTunes); Online video sharing cites (e.g. Youtube); Online library services; File sharing (e.g.

		Dropbox); Downloadable eBooks and electronic texts; Audio software (e.g. Audacity, Garage Band)
experiential	Doing, Observing Actual, Simulated Rich Learning Experiences Independent of the Teacher	Virtual labs (i.e. interactive simulations in which students perform experiments); Statistical software (e.g. SPSS/PASW); Spread sheet software (e.g. Excel); Software referencing packages (e.g. Endnote, RefWorks); Software for qualitative text analysis (e.g. MaxQDA); Search Engines (e.g. Google); Online examinations/tests; Multimedia-based learning software; Internet-based learning platform (e. g. ANGEL, Moodle, Blackboard); Graphic software (e.g. Photoshop, Flash); Free multimedia-based learning software from the internet (e.g. simulations, animations); E-Portfolios; Educational computer games; Computer Simulations
Reflective Dialogue	Self-Reflective or Collaborative Reflection about the Subject and/or Learning Process	Online internal forums/newsgroups; Mailing lists Virtual seminars/webinars; Social Media (e.g. Twitter, Facebook); Online Slide Sharing Community (e.g. Slideshare); Blogs (e.g. WordPress); 3D Virtual Worlds (e.g. Second Life); Collaborative Project tools (e.g. Wikis, Google Docs); Mobile learning tools and applications (SMS, Whatsapp etc.); Class wiki (a website on which the pages can be edited by the learners)
Contextual tools	Data Projectors, Bring your own device (smartphones, tablets etc.), Remote access (electronic resources) refers to the use of electronic resources via computer networks, Direct Access (electronic resources) (e.g. CD-ROMs), Interactive Whiteboards (e.g. SmartBoard)	

2.2.2.4 Botswana

The Thuto-net project was launched to leverage the schools' internet connectivity in Botswana. It is reported that 104 out of 235 secondary schools in Botswana have

internet access. Botswana teachers are trained on using ICT as a classroom tool (Mpoeleng, 2016).

Two studies that were done in Secondary schools in Botswana revealed that ICT integration in the classroom still faced challenges of; inadequacy of teacher preparation in terms of ICT integration, insufficient ICT resources; classes were not suitable for ICT use, insufficient technical support and lack of knowledge on how to use ICT tools in the classroom (Mafuraga & Moremi, 2017; Kgwefane, 2018).

2.2.3 Namibia

Namibia prioritises the development of digital competency of students and teachers (MoE, 2006). Thus, the curriculum developed in educational centres has included the acquisition of skills in using technology to discover, evaluate, store, produce, presents and exchange information (Gil-Flores, Rodriquez &Torres, 2017). Teacher education institutions such as the University of Namibia, have been looking at how best teachers can be trained to integrate ICTs in the classroom in order to produce a competent learner who is able to survive in a digitised world (Kazondovi, 2018).

To achieve a comprehensive strategy of ICT integration in teaching and learning the MoE entered into a special agreement with the International Computer Driving License (ICDL)(SA) through national Education Technology Services and Support (NETSS) centre to offer ICDL training to all teachers (GRN, 2005). Kacelo (2018) investigated the impact of ICDL literacy training on teachers, where it was reported that only 14 percent of those who participated in this study were regularly integrating ICTs in their classrooms. The study further revealed that although the ICDL training has empowered teachers with confidence in utilizing the PowerPoint, Word

processing, excel and internet skills, this training could not equip teachers with critical thinking and technical skills that's vital to assess technologies and use them effectively in their classroom teaching. From 2015 to the year 2018 the National Institution for Educational Development (NIED) conducted ICTs integration workshops for Train of Trainers (ToT) teachers all over the country and ICT material development workshops for Teacher Resource Centres (TRC) education officers (NIED reports). In summary these workshops covered the following objectives:

- Apply the UNESCO ICT framework in teaching
- Identify 21st century ICT skills according to pedagogical content
- Identify ICT tools used for material development
- Use android OS to search online educational materials
- Use Skype, AutoCollage and Songsmith as teaching and learning aids
- Use freemaker downloader to download educational videos from YouTube
- Demonstrate the use of Kopano E-collaboration platform
- Mention and demonstrate the use of educational websites
- Demonstrate the use of Microsoft office 365 educational suite
- Microsoft partners in learning software (PiL)

TRC education officers were additionally trained on how to create teaching aids using different software in their subject specializations. Education officers are responsible to further disseminate this knowledge to teachers at schools in their respective regions with the assistance of ToT teachers at the schools. Education officers can also develop

materials in their subject specilizations and distribute them to schools for teachers to use to deliver lessons.

From these workshops it was established that due to the fast-evolving ICT tools and applications, the school principals find it difficult to monitor and support the integration of ICT in teaching and learning in their schools. Hence, only few schools conduct ICT related CPD activities. In response NIED organized a training for the principals from different regions of the country, targeted regions were Erongo, Oshikoto, Kunene, Ohangwena, Khomas, Omaheke, Omusati and Oshana. This training aimed to create platforms for principals to share ideas, experience, expertise, observation and challenges, develop ICT monitoring tools that they can use at schools as well as to develop possible measures to improve ICTs Integration in Namibian schools. Additionally, principals were expose to among others the UNESCO-ICT CFT and ICTS integration applications and platforms. NIED also encouraged the principals to support teachers and encourage them to use ICT resources available to deliver their lessons. “the focus must be on available resources to enhance teaching and learning, other than unavailability of resources hindering ICTs integration in the classroom” (NIED reports, 2019: no page). Hence, it is indeed important to explore how teachers are integrating ICTs in their classroom to enable further appropriate training.

2.2.4 Research on ICTs integration in Namibian schools

Studies on ICT integration by teachers have been carried out in different context and in various parts of the country. Isaacs, (2007) reported that Secondary school in Namibia have been provided with computers and internet connections. Teachers have been using these computers to plan their lesson and do PowerPoint presentations. Kacelo, (2018) reported that ICDL training has empowered the teachers with skills to

use technology in assessment, lesson presentations and browsing the internet. Teachers further indicated that teaching has become easier as learners find it exciting to learn with technology. Similarly, (Henoch, 2015) indicated that Namibia is among those with best ICT infrastructures in Southern Africa, however, most of the technological infrastructures is in urban areas.

Availability of devices and technologies in schools may not necessarily mean teachers will be able to use these technological resources effectively to impact positively the teaching process. Nuuyoma (2012) alluded that the schools where she did her study were beneficiaries of the deployment of ICTs by government, but teachers were still unable to utilize the resources made available to them. This can be attributed to varieties of challenges which may include reviewing of policies, conducting appropriate training for teachers and making sure that teachers know what is expected of them. On the other hand, Simon (2014) revealed that teacher demonstrated the use of ICTs in their classroom via Smartboards connected to e-learning management system as well as collaborating by sharing notes. Afunde (2015) did a study to investigate the integration of ICTs in teaching science subjects at the Namibian College of Open Learning (NAMCOL). This study revealed that most science tutors were confident in using computers for personal purposes and basic functional practice but lacked the pedagogical ICT skills. It should be noted that NAMCOL tutors are teachers from different schools in Namibia.

In an attempt to find solutions to poor performance in mathematics at a national examination level in omusati region, Kanandjebo (2016) carried out a study to investigate the effects of ICT-Driven pedagogy on learners especially when learning geometry. The findings revealed that the school were the teacher used a geometers'

sketchpad software during the lessons, learners performed better in the Geometry test than the learners that were taught the same content using the traditional approach (chalkboard and textbook). The study recommended that teachers should be encouraged among others to use ICT-driven pedagogy and Understanding by Design (UbD) lesson plan formats in order to improve academic achievements of their learners. To contextualize this further, the UbD lesson plan allows the teacher to focus among others on how available ICTs would be integrated in the lesson to equip learners for the expected learning outcome.

The question is no longer on whether the teachers have accepted using ICTs integration in their classroom but how they are using available ICTs in their classrooms to enhance teaching and learning. Nendongo (2018) carried out a study to determine teachers' use of technology in learners' assessment activities in grade 10 physical science in Ohangwena region. However, it was established that teachers who had access to computers were mainly using Microsoft office desktop applications for compiling assessment activities and recording marks. Teachers were also using internet to search subject related information and downloading shared pre-test activities. It was further determined that teachers had a belief that technology can ease he assessment process and improve the quality of assessment administered to learners. However, most teachers had limited knowledge on how to use technology in teaching physical science. Uugulu 2019 did a related study that investigated the effects of teacher-designed educational videos on grade 11learners' geometry performance. The findings revealed that 83.9% of learners found the videos relevant and had enjoyable learning experience.

Shilongo (2018) investigated whether videos and animations can improve secondary learners ’achievement in Geography. Through using quasi-experimental pre-test and post- test it was revealed that using videos and animations in Geography can improve their performance in Geography although not significantly. The significance in results and its effects may be determined by how effectively a particular ICT tool was integrated in the lesson and how often is it used. Similarly, Mwaamukange (2018) carried out a study to assess the impact of using videos in promoting learners’ English second language comprehension and listening. The study found out that using audio-visual materials in English 2nd language classrooms helps learners to improve the language comprehension. Videos is one of the technologies that can scaffold student learning especially in sciences.

In most countries social media has become the most popular place where one can engage the digital natives. Namibia is not an exception and therefore the use of social media is also popular in education. Kahne, Lee, and Feezel, (2012) as cited in Shihomeka 2019 supported this by saying that social media platforms such as Facebook, twitter and mobile phone are becoming cites where young people among others can share ideas and stories, watch games and videos, be active members of online communities, suggest and recommend development projects, advice and assist each other academically, disseminate information, and socially interact with others freely. Kadhimo (2019) in his study of teachers’ and learners’ perceptions of social media as one of the ways through which ICTs integration can take place in Geography, revealed that most participants supported the use of social media in teaching and learning Geography. 55% of the participants agreed that social media, if used in the

right way can improve Geography results. It was therefore recommended that teachers be properly trained on the use of social media to enhance their teaching and learning.

The use of Educational websites can also be other ways teachers are able to integrate ICTs in their classrooms. Amunyela (2020) explored the effectiveness of usage of websites in teaching transport in humans in Biology as school subjects. Use of website was found to have a great effect on both teachers and learners. However, challenges highlighted in this study was that teachers lacked proper website skills and also that poor internet connection was experienced. All the above information is important in establishing how teachers are integration ICTs in the classroom and hence the purpose of this study.

2.3 Cross-cutting issues

2.3.1 Teachers Technology-proficiency training

Strategies that prioritise training teachers to use ICTs effectively in the classroom have recently become appropriate (Wallet & Melgar, 2015). Khashkau, (2017) alluded that to address the challenges of the 21st century teachers are required to shape learners into becoming collaborative and creative. It is therefore important that teacher ICT training should not only focus on mere computer skills but rather seek to demonstrate how content knowledge intersect technologies (Cha et al.,2020). Mirzajani et al. (2015) therefore, investments towards ICT in education would not bear fruits unless teachers were trained to be technology-proficient educators. Therefore, collective information on the teachers training that includes quantity and quality aspects will be important moving forward. Teachers should confidently use these new technologies to ensure successful teaching and learning.

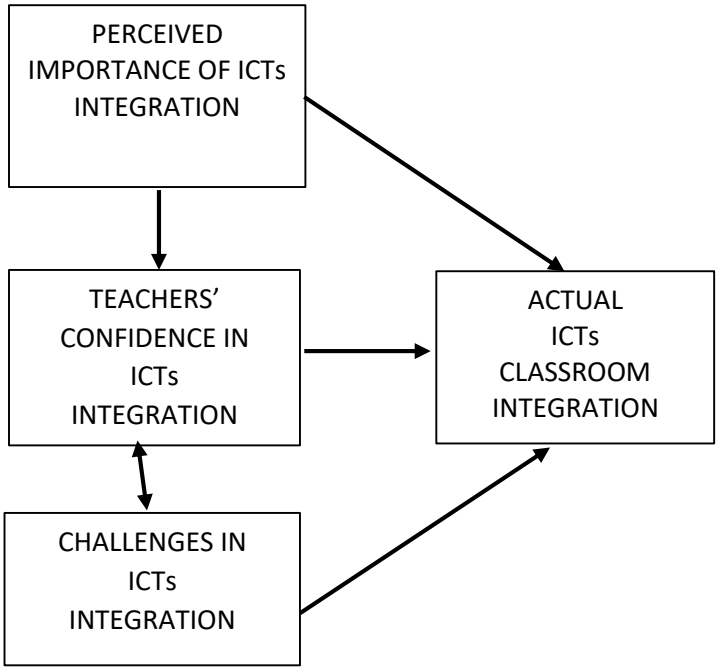
2.3.2 ICT Professional development for teachers

To remain confident in their knowledge about ICTs integration, teachers need to improve and update their skills on a regular basis (Kamaruddin et al., 2017). Similarly, (Simon, 2015) through her study of How Life science teachers were using and integrating ICT in the classroom, recommended that teachers should undergo Continuing Professional Development (CPD) programme at an equally repeated interval. This is important to allow teachers to update themselves with emerging new technologies. Teacher ICT professional development plan is necessary as technology keeps on changing and hence it is a requirement for teachers to keep themselves at par.

2.4 Theoretical framework adopted in this study

Theoretical frameworks are always constructed by researchers (Polit & Beck, 2004). Ravitch and Carl (2016) affirm that theoretical frameworks are generative frameworks that reflect the thinking of the entire research process. Mostly diagrams are used to clearly define the constructs or variables of the research topic and their relationships are shown by use of arrows. Latham (2017) argues that the entire methodology must agree with variables, as well as their relationships and context. Researchers are at liberty to adopt existing frameworks, but have to modify these to suit the nature of the context of their research questions (Fisher, 2007). The study's conceptual framework integrates elements from the Technology Acceptance Model (TAM) and the four levels of Kotrlik Pierson's model of technology integration (KPMTI) (Kotrlik & Redmann, 2002). Figure 2 illustrates the conceptual framework of the study as adopted from TAM and KPMTI

Figure 4*: The ICTs Classroom Integration Framework (ICTs CIF) adopted from TAM and KPMTI (2002).*



The Theoretical framework suggests that teachers' proficiency to integrate ICTs in their classrooms is influenced by various factors. The ICTs Classroom Integration Framework (ICTs CIF) consists of various parts representing the process of acquiring ICTs integration competencies by the teachers: actual ICTs classroom integration, perceived importance of ICTs integration, teachers' confidence in ICTs integration and challenges in ICTs integration. Actual ICTs classroom integration will be influenced by the KPMTI which describes the four levels of ICTs integration as summarized below:

1. **Exploration** - Teachers seek to learn about presentation software and how to do a few instructional exercises using spreadsheets, databases, word processors, games, simulations, the Internet, and/or other computer tools.

2. **Experimentation** - The use of technology is becoming obvious in the in classrooms and laboratories as teachers focus more on using technology in instruction by presenting information using presentation software and doing a

few instructional exercises using spreadsheets, databases, word processors, games, simulations, the Internet, and/or other computer tools.

3. **Adoption** - Teachers begin to use technology regularly. Physical changes are very evident in the classroom and/or laboratory with the computers becoming a focal point in the classroom and/or laboratory organization. Teachers employ ICT tools as a regular and normal feature of instructional activities while student shared responsibility for learning emerges as a major instructional theme.

4) **Advanced Integration** - Teachers begin to use technology innovatively as they pursue innovative ways to use technology to improve learning. Students also take on new challenges beyond traditional assignments and activities. Learners use technology to collaborate with others from various disciplines to gather and analyze information for student learning projects.

Perceived importance of ICTs integration refers to the extent to which a teacher believes that by integrating ICTS it will bring benefits by improving his/ her classroom performance. Teacher confidence in ICTs integration refers to the extent to which a teacher believes in the use of educational technology as being user friendly. Actual ICTs classroom integration refers to the self-reported teacher competencies in applying ICTs to conduct assessment, develop teaching resources and collaborate with other subject experts, while teachers' ICTs professional development would be the programme designed to address any shortcomings in order to improve teacher ICT integration competencies. These all will determine the nature of ICTs professional development programmes needed to address any shortcomings.

This study is not addressing the issues of ICT infrastructure, as that has already been dealt with in various studies that have been done previously, for example; Ngololo (2012), Iipinge (2010), and Kacelo, 2018. The focus of this study is on how teachers, with all the necessary hardware and software resources at their disposal, integrate ICTs in their teaching, and what new challenges, if any they still encounter. Therefore, the study has adopted the ICTs CIF to understand how teachers are integrating ICTs in their classrooms and how they see the importance of ICT integration and how they are actually integrating ICTs in their teaching. The design of research instrument was mostly influenced by the KPMTI. However, there was a limitation on the confirmation of some parts of the variable on the actual ICT integration, since the study did not conduct any classroom observation due to the Covid-19 pandemic restrictions. The adapted framework has guided this study in evaluating how secondary school teachers are integrating ICTs in their teaching and learning and what challenges they are experiencing in doing so.

2.5 Summary

Chapter 2 focused on ICTs integration evaluations on some Asian-Pacific and Sub-Saharan African countries. How ICTs are integrated in the classroom, Challenges faced and possible strategies to address the challenges. Cross-cutting issues between these countries were also discussed. Furthermore, the conceptual frameworks adopted in the study have also been discussed. The next chapter explains the methods and procedures used in this study,

CHAPTER 3: RESEARCH METHODS

3.1 Introduction

The focus of this study was to explore teachers' ICTs integration levels in Windhoek and hence attempted to answer the following research questions: What is the status of selected Windhoek Secondary school teachers ICT integration practices in their classroom?, What challenges, if any, are secondary school teachers in Windhoek, facing in integrating ICTs in the teaching of their subjects?, and what intervention strategies do teachers indicate are needed to ensure effective integration of ICTs in their teaching?. This chapter therefore describes the methodology that was used to answer the above research questions, and collect, and analyse the data from the participants' responses. The chapter describes the research design, the population, sample and sampling techniques, the research instruments, data collection procedures and data analysis. To ensure that trust and integrity are maintained in the study, research ethics are also described in this chapter.

3.2 Research methodology

The study employed a qualitative research approach. According to Punch (2013), qualitative research is a type of social science research that collects and works with non-numerical data that seeks to interpret meaning from these data that help us to understand social life through the study of targeted populations or places. It is the observations and interpretations of people's perception of different events, and it takes the snapshot of the people's perception in a natural setting (Gentles et al., 2015). It investigates local knowledge and understanding of a given program, people's

experiences, meanings and relationships, and social processes and contextual factors that marginalize a group of people. It is less structured in description, because it formulates and builds new theories (Leedy & Ormrod, 2001). It focuses on words rather than numbers, this type of research observes the world in its natural setting, interpreting situations to understand the meanings that people make from day to day life (Walia, 2015).

In qualitative research the objective tends to be exploratory and descriptive rather than explanatory (Ferreira et al.,1998). The descriptive nature of qualitative research allows the researcher to provide a description of the experiences of the participants, which will either sustain or confront the theoretical assumptions on which the study is based (Meyer, 2001). The descriptive nature of qualitative research enables readers to understand the meaning attached to the experience, the distinct nature of the problem and the impact of the problem (Meyer, 2001).

On the other hand, Creswell (2009), defines qualitative research as the exploration of the multiple social meanings of individual experiences in order to reveal a theory or pattern (Creswell, 2007, 2009). Qualitative research maintains a focus on the importance of the participant's perspective and how it informs the personal meaning held by the participant (Creswell, 2009), through gaining an in-depth understanding, possibly leading to a new observation or highlighting the opportunity for further exploration of potential predictors and key factors in another study (Yoshikawa et al., 2008).

Qualitative research makes use of interviews, diaries, journals, classroom observations and immersions; and open-ended questionnaires to obtain, analyse, and interpret the data (Zohrabi, 2013). It is exploratory, and seeks to explain 'how' and 'why' a

particular social phenomenon, or program, operates as it does in a particular context. It tries to help us to understand the social world in which we live, and why things are the way they are (Polkinghorne, 2005).

This study was designed to explore the experiences of teachers with regard to their integration of ICTs in their classrooms, highlighting successes and challenges encountered as well as professional development needs for compliance with the ICT policy for education.

3.3 Research Design

An exploratory case study research design was employed to provide answers to the research question and, thus, fulfilled the objectives of the study. According to Neuman (2011), a case study is a methodology that "intensively investigates one or a small set of cases, focuses on many details within each case and context. In short, it examines both [emphasis added] details of each case's internal features as well as the surrounding situation" (p. 42). It has been stated that the case study "emphasizes episodes of nuance, the sequentially of happenings, and the wholeness of the individual." (Stake, 1995, p. xii).

The case study methodology is less structured than many types of research methodologies. It is the flexibility of the case study model that ". . . allows tailoring the design and data collection procedures to the [specific] research questions . . ." (Meyer, 2001, p. 330) and the openness for "the use of theory or conceptual categories that guide the research and analysis of data" (Meyer, 2001, p. 331).

Case study design is relevant for exploratory research situations as in the current study where the goal of the researcher is to ultimately "develop pertinent hypothesis and

propositions for further inquiry" (Yin, 2014, p. 10) and the researcher does not have control of the behavioral events being observed (Yin, 2014).

3.4 Population

According to Mertens (2015, p.321) population refers to the list of people who fit the conceptual definition of your study. Gay (1987, p.102) further states that population is the group that is of interest to the researcher. The study focused on schools that had the basic hardware and software resources and requirements as specified in the ICT policy for education. The researcher approached the regional education officer for ICT to obtain this data on schools. 15 schools were identified as meeting the basic infrastructural requirements as specified in the ICT policy. The Namibian ICT policy for education states that: All schools with secondary grades should be at least level 2, level 2 requirements are that "All level 1 attributes apply. In addition, all teaching and administrative staff should have reasonable access to a computer (at least 1 computer for every 5 staff and 1 to 10 for learners/ students) and are able to use the Internet and e-mail, as well as a word processor. The site is connected to the Internet. Learning materials are downloaded and occasionally created by teaching staff. Significant communication and administration with the rest of the parent Ministry is done via e-mail and web services. Students will spend about one hour every two weeks on the computer. At least two of the site staff will have an ICT qualification. The site will have a classroom equipped with a computer and projector system and/or the ability to display audiovisual materials to students" (MoE, 2005)

The population of the study was therefore the 15 secondary schools and a total of 173 teachers for promotional subjects. Teachers for non-promotional subjects like Life

skills, Art and Physical Education, were not considered, since some were volunteers with no teaching qualifications.

3.5 Sample

Qualitative research is inductive in nature, and researchers generally explores meanings and insights in a given situation (Strauss & Corbin, 2008; Levitt et al., 2017). It refers to a range of data collection and analysis techniques including the use purposive sampling (Dudwick et al., 2006; Gopaldas, 2016).

Against backdrop that the study used the purposive sampling technique, ensuring that the selected schools had basic resources for ICTs integration, as outlined in the ICT policy for education. In the Tech/Na! implementation plan, all schools should be at least at level 2 development. Development level 2 means:

- At least a school has one room equipped with ICTs
- A school is able to display audiovisual material through a Smartboard.
- Availability of internet connectivity
- All teachers have achieved the Foundation Level ICT literacy certificate;
- At least 2 staff members have achieved the intermediate level ICT literacy Certificate or higher ICT qualification;
- All learners completing grade 10 will have achieved the foundation level ICT literacy certificate;
- Learners have at least 1 class period per week where ICTs are utilized; and over
- 20% of the communication with the Ministry done via e-mail.

Additionally, in urban schools in the capital city of Namibia, the expectations are higher due to the assumption that better ICT infrastructure are present as compared to the rural areas.

According to Gay et al., 2009), there are no definite rules that specify the correct number of participants in qualitative research. They further state that qualitative research can be carried out with one or as many as 60 participants. Hence for this study the researcher deemed it sufficient to select four teachers per school, one each from the Commerce (Accounting, Business Studies and Economics), Mathematics and Science, Social Science (History, Geography and Development Studies) and Languages. Thus, a total of 28 teachers from 7 schools participated.

3.6 Research Instruments

3.6.1 Open-Ended Questionnaire

Due to the Corona virus pandemic, it was not possible to conduct in person interviews. After exploring other avenues such as WhatsApp call or telephonic call, the only best option among others was to use open-ended questionnaires. The open-ended questionnaire, as Cohen et al. (2005) explain, enable respondents to "reply in their own terms and give their own opinions" (p. 328). The rationale for the use of open-ended questions was that it would allow respondents, the teachers, feel more comfortable writing freely about their experiences in the integration of ICTs in their teaching. Open-ended questionnaires were opted for in order to enable the researcher to get maximum teachers and maximum response. There were nine (9) questions to prompt the teachers to; (a) express their views on the importance of ICTs integration in the

classroom, (b) explain how they integrate ICTs in their classrooms, with reference to assessment, development of teaching resources and collaboration with other subject experts, (c) identify challenges they might be experiencing with ICTs integration and (d) suggest any professional development needs to address the identified challenges.

3.6.2 Reliability and validity of questionnaire

To ensure construct validity, the questionnaires were benchmarked against the ones used by Udeani et al. (2011), in a study in which they used the four levels of Kotrlik Pierson's model of technology integration (Kotrlik & Redmann, 2002) and Rogers' technology diffusion model (1995) to investigate how ICT was being integrated in Science and Technology classrooms in Nigeria Junior and Senior Secondary Schools. Internal consistency reliability was employed to examine the instrument's reliability. The inter-item correlation was assessed by using Cronbach's coefficient alpha of over 0.7 (Muijs, 2004). Content and construct validity were used to evaluate the validity of the questionnaire. Regarding content validity, as mentioned previously, the development of the questionnaire was based on the literature review and conceptual framework as well as the existing instruments. Moreover, the process of development took several stages involving experts reviewing the instrument aiming to enhance content validity of the instrument.

3.7 Procedure

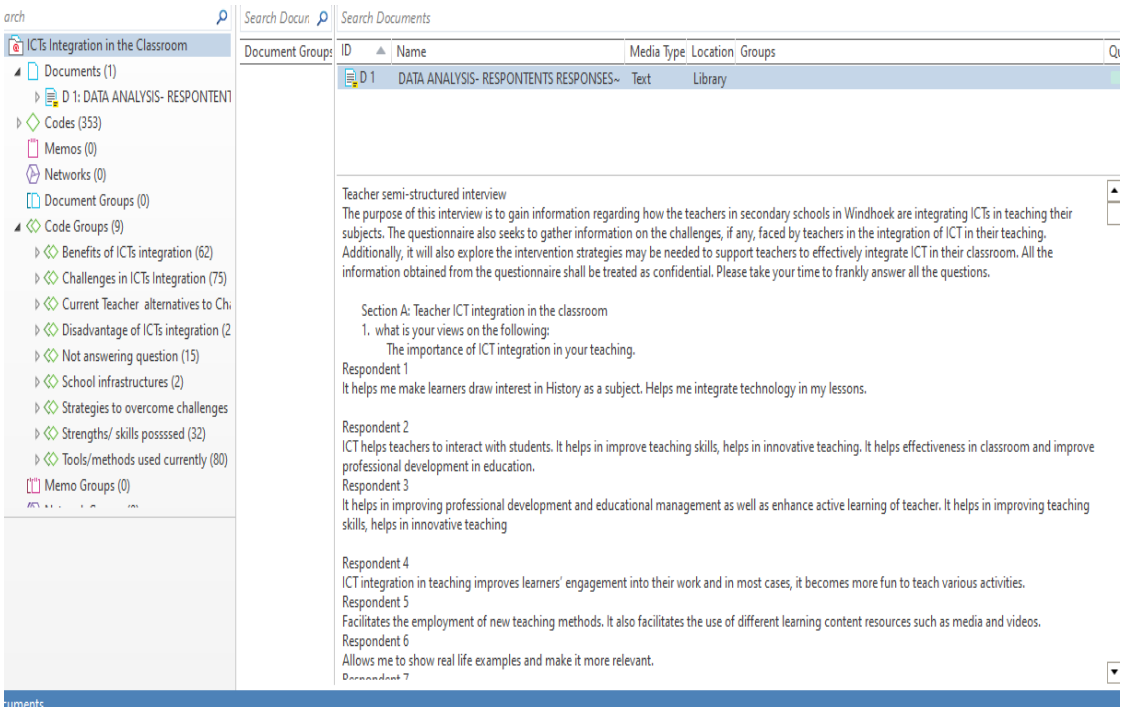
Initially, the researcher's intention was to collect data through semi-structured face to face interview and through classroom observation. Classroom observation was to be done for the purpose of triangulation. The data collection procedure had to take a different turn when the corona virus pandemic took the global centre stage. Instead, the semi-structured interviews were turned into open-ended questionnaires. The questions functioned somewhat like interviews, opening up experiences, motivations,

and viewpoints that might not have been broached in closed-end survey. The researcher also hoped using this instrument would result in more candid responses. The open-ended questionnaires were administered and returned via e-mail.

3.8 Data analysis

In this study, qualitative data were analysed by using the content analysis procedure. Thematization and categorisation have been used to make sense of the data collected during interviews as well as to be able to group the data and look for relationships and gain in-depth understanding of the issues under this study. Content analysis is a form of qualitative research where a researcher is central to the analysis of information gained (Gorman & Clayton, 2005). Each interview was then transcribed to find meaning. The data was organized into themes, sub-themes and lastly categories using Microsoft Excel Spreadsheet (Johnson & Christensen, 2010). Participants' verbatim quotes were used as low- inference descriptions to support the sub-themes and categories identified. The responses from participants were first put under the respective questions. This document was then transferred to the Atlas ti, a software used to analyse qualitative data. In Atlas ti, the data were put into codes and code groups. The researcher then exported these codes and code groups to excel sheet, were data was then put into themes and sub-themes. A code group becomes the main theme and codes are categorized into sub-themes.

Figure 5: Atlas TI screenshot of organised data



Above are screenshots for the atlas ti software, and below are screenshots of a table from an excel sheet showing how data were organized into themes, sub-themes and categories. As the researcher stated previously, codes were categorized into sub-themes of the main theme.

Figure 6: showing categories and themes

	Codes	Categories	Code Group/ main theme
•	all subjects not taught online	A	Challenges in ICTs Integration
•	Cheating and copying	A	Challenges in ICTs Integration
•	Child pornography	A	Challenges in ICTs Integration
•	Drug trafficking	A	Challenges in ICTs Integration
•	Learner easily disrupted	A	Challenges in ICTs Integration
•	Hesitation in using ICTs	A	Challenges in ICTs Integration
•	Lack of time	A	Challenges in ICTs Integration
•	Learner easily disrupted	A	Challenges in ICTs Integration
•	less interest from the teachers	A	Challenges in ICTs Integration
•	Teachers afraid of change	A	Challenges in ICTs Integration
•	teachers lack interest	A	Challenges in ICTs Integration
•	Time consuming	A	Challenges in ICTs Integration
•	Classes without internet	B	Challenges in ICTs Integration
•	Computers	B	Challenges in ICTs Integration
•	constant internet connection	B	Challenges in ICTs Integration
•	Computers	B	Challenges in ICTs Integration
•	Lack of ICT gadgets	B	Challenges in ICTs Integration
•	Lack of ICTs tools	B	Challenges in ICTs Integration
•	No access to comp. lab	C	Challenges in ICTs Integration
•	No ICT infrastructures	C	Challenges in ICTs Integration
•	online teaching a challenge	C	Challenges in ICTs Integration
•	Power outage	C	Challenges in ICTs Integration
•	Resources availability	C	Challenges in ICTs Integration
•	difficulty in setting up	D	Challenges in ICTs Integration
•	ICDL classes	D	Challenges in ICTs Integration
•	Inability of learners on ICTs use	D	Challenges in ICTs Integration
•	lack of know-how	D	Challenges in ICTs Integration
•	Lack of PD for teachers	D	Challenges in ICTs Integration
•	lack of skills	D	Challenges in ICTs Integration
•	lack of skills to handle	D	Challenges in ICTs Integration
•	Lack of teacher ICT skills	D	Challenges in ICTs Integration
•	lack of training	D	Challenges in ICTs Integration
•	Teachers not properly trained	D	Challenges in ICTs Integration
•	Teachers not sufficiently trained	D	Challenges in ICTs Integration
•	unaligned ICTs to curriculum	D	Challenges in ICTs Integration
•	Unfocused ICTs use	D	Challenges in ICTs Integration
•	unskilled heads make the implementation difficult	D	Challenges in ICTs Integration
•	No challenges	E	Challenges in ICTs Integration
•	No concern	E	Challenges in ICTs Integration
•	not widely used	E	Challenges in ICTs Integration
•	Access free online Courses	E	Challenges in ICTs Integration Strategies to overcome

3.9 Research Ethics

According to Bertram and Christiansen (2014), ethical consideration issues refer to the researcher's conduct towards human subjects when conducting research, which should benefit participants in a positive manner. Additionally, Denzin and Lincoln (2005) write that qualitative researchers are guests in the private space of the participants' worlds. As a result, their manners should be good and their code of ethics strict and sound. Accordingly, to adhere to good ethics in this study, the researcher acquired permission to access the schools from the Ministry of education, Arts and Culture (MoEAC) before the data collection. It is also worth mentioning that, prior to embarking on this research, an ethical clearance certificate was obtained from the University of Namibia.

The researchers then sought consent from the participants and informed them about the purpose of the study and attaching the ministry of education's permission letter obtained. Furthermore, the participants were then informed that they were free to withdraw from the study at any time should they start to feel uncomfortable with participating in the study. The principles of confidentiality, anonymity, personal integrity, honesty and respect were fully maintained in the study as the participants were not requested to reveal their identity. Participants were told to be open as the information recorded will not be shared with other people apart from being used for the study. The information that the participants provided was kept strictly confidential in the researcher's Personal Computer, with the password only known to the researcher. The data will be kept safely for two years before being destroyed by deleting the file with the data from the computer i.e. also removing it from the trash bin for the purpose of honoring participants' expectations and rights to privacy and confidentiality.

3.9 Conclusions

This chapter covered the methods and procedures employed to collect and analyze data for this study. An exploratory case study research design was used and the population of 173 teachers was involved in the study. Purposive sampling procedures were used for participant sampling. Open-ended questionnaires were employed in data collection.

CHAPTER FOUR: FINDINGS

4.1 Introduction

In this chapter, the research findings focus on answering the main research questions of the study. The analysis of data included organizing data into themes, sub-themes and categories is presented to support answering the research questions. The research questions centred around the following areas: How is the status of ICTs integration in the classroom, Challenges experienced when integrating ICTs and intervention strategies to these challenges if any. Demographic data of the schools are presented and linked data to research questions. The researcher used [T_xS_Y] where T represents a certain teacher and S represents a certain school.

4.2 Research Question 1: What is statuses of selected Windhoek Secondary school teachers' ICT integration practices in their classroom?

The status of ICT integration practices in their classroom is a key component of this study to explore the current practices using the available tools and pedagogical practices.

4.2.1 Sub theme one: ICTs integration implementation in the classroom

The participants presented diversified strategies they use to enhance ICT integration during the classroom teaching learning process. As a way of encouraging learner

exploration, the participants indicated how assignments are given over an extended period to enhance learner exploration. When delivering content and enhancing learner understanding, a repertoire of strategies was given and these included giving assignments which require internet use, embracing interactive online assignments, downloading and listening to videos and giving learner tasks which require searching information on the internet. The participants also indicated posting quizzes and assignments online when sharing information. The following highlights from [T1S1] and [T2S1] illustrate ICT integration implementation in the classroom.

> *"I give online-classes for example via a zoom app, learners interact with each other and also be able to ask questions from the teacher where they do not understand. It also gives opportunities to master content. I also provide videos so that learners can watch in their free time. Learners can summarise and make their own notes from the videos," (T1S1)*

> *"I use technology to support assessment in many different ways, such as to track student progress over time. It is used to aid formative assessment; helping to boost engagement, identify knowledge gaps, and support further/deeper learning." (T2S2).*

Both [T1S1] and [T2S1] present a number of ways they use ICT integration in the classroom situation. Commenting on how teachers use ICT integration in teaching and learning, Ghavifekr (2015) and Karipi (2018) acknowledge the superior effect of ICT integration in teaching and learning process over traditional approaches and diversified ways it can be applied. The same authorities indicated the flexibility and easy to adapt

ICT to various learning encounters. The advantage of flexibility is reflected in this section of the study where participants describe how they use different ICT resources to develop specific pedagogical skills.

4.2.2 Sub theme two: Platforms used in ICT integration

The study found diversified platforms used by the participants in ICT integration. The platforms given included class blog, Edmodo, kahoot com, khan academy, YouTube, google scholar, google classroom, school link and social media. Illustrating the ICT platforms used, [T12S3] said,

> *"I set up quizzes on google classroom and kahoot.com. I also use WhatsApp to share quizzes and questions with the learners," (T12S3]).*

Commenting on ICT integration platforms, Yuen and Hew (2018) stated that the diversity of the platforms implies that there are specific learning situations where a platform may be effective. It is then the responsibility of the teacher to select a platform that suits the particular lesson and that maximises learning. The study found the use of diversified ICT integration platforms by the participants.

4.2.3 Sub theme three: Possible tools used in ICTs integration

The following ICT integration tools were found to be commonly used by the participants: websites, videos, television, smart phones, smart boards, computing devises, Microsoft teams, projectors, laptops, electronic whiteboard, cloud-based tool and google assessment tools. These results show that participants use diversified ICT

tools, an implication which shows the link with the previous section which also showed use of diversified platforms. Illustrating the tools, they use, [T2S1] and [T4S1] indicated, thus,

> *"It allows access to a wide range of information in various formats, and interactive whiteboards have become essential tools in the classroom. Computers, software, cameras and a wide range of ICT devices can all make teaching more effective and more fun for the pupils,"[T2S1].*

> *"It allows access to a wide range of information to various formats and interactive white boards have become essential tools in the classroom. Tools like cell phones, computers, cameras and other ICT devices can make teaching effective by boosting the learners' interest in any lesson presented to them,"[T4S1].*

4.2.4 Sub theme four: benefits of ICT integration

The participants raised a number of benefits derived from ICT integration. The diversity focused on different disciplines and skills to be developed. The results reveal that ICT integration benefits both the teacher and the learners. The following description of ICT integration by [T21S6] reveal how it enhances the learner centred teaching approach.

> *"Technology increases efficiency by enabling teachers to use different apps to teach learners. The teacher can plan, mark*

and grade by using software and this saves time. Both teachers and learners develop essential skills for future use. Technology is likely to enhance performance in the school because learners will be more encouraged to work hard. They enjoy learning, unlike in a traditional approach. By integrating technology can secure the ministry during uncertainties e.g. the current pandemic disease (Covid19) where people are required to work from home," [T21S6].

[T21S6] highlights how ICT integration promotes active learner engagement, how it promotes cognitive development and problem solving and use of various tools. Also, important to note is the use of ICT integration for self-assessment.

Further presenting the benefits of ICT integration, [T25S7] focuses on how it enhances lesson preparation and its effects on motivating and sustain interest in learning. [T25S7] explains, thus,

"ICT has made my work easier in terms of less preparations and it enhance quality lesson delivery, presentation of lesson has become more exciting because it is easier to show videos, pictures and other media as a form of teaching aid that alone arouse learners' interest and encourage them to participate in lessons. ICT is helping in achieving the curricular goals and helping learners to effectively achieve their goals. When a teacher use correct media to show learners (e.g a demonstration) learners tend not to forget what they saw, it is easy for them to remember,"[T25S7].

The benefits presented by both [T21S6] and [T25S7] show how ICT integration has become a dispensable teaching and learning tool. Explaining the benefits of ICT integration of traditional method, Lawrence and Tar (2018) and Sea et al. (2018) contend that ICT integration in teaching and learning has brought robust approaches of engaging the learner and promotes effective learning and high retention rate. A study conducted and reported by Padayachee (2017) acknowledged the superiority of ICT integration in teaching and learning over the traditional approaches. The study established diversified benefits enjoyed by participants in using ICT integration in the classroom situation.

4.2.5 Summary

Table 2: Below is an overview of the sub-themes and the categories statuses of ICTs integration

Main Themes	**Sub-themes**	**Categories**
The status of ICT integration practices in their classroom.	1.ICT integration implementation	Give assignment over extended period, browse for books/ materials, BYOD, use clear colourful images, download movies, download YouTube videos, give assignments that require internet use, Interactive online assignments, Learners research and present findings, Learner self-assessment online, post assignment and quizzes online.

	2. Platforms used in ICTs integration	Class blog, Edmodo, Kahoot.com, Khan academy, blog, Edmodo, Kahoot.com, Khan academy, YouTube channel, Google scholar, Google classroom, Online classes, School-link and Social media.
	3. Possible tools used in ICTs integration	Websites, Wikipedia, Videos, television, smartphones, smartboards, mobile computing devices, Microsoft teams, Microsoft office, LCD projectors, laptop, google assessment tools, electronic whiteboard, educational note master, creative commonwealth education, cloud-based tools and application, audios.
	4. Pedagogical benefits of ICT integration	Easy preparation of lessons, active engagement of learners, motivating, flexibility, problem solving, virtual classroom, high concept retention, diversified media, interactive, self-assessment.

The study established that participants engage learners in ICT integration in different activities of learning. Main areas of the curriculum in which ICT integration is used include lesson delivery, issue assignments and homework, research tasks, Interactive class and group activities, use videos and online assessment and self-evaluation. The same section of the study revealed that participants use diversified ICT integration platforms and tools. The indication of diversified use of ICT integration is evidence that these resources are aligned with the educational needs of the students. The same section presented findings on the benefits of ICT integration as experienced by the

participants. Multi benefits of ICT integration were raised and among the notable benefits include enhancing lesson preparation, provides a diversified flexible interactive media, motivation of students and teachers and delivery of learning using virtual classrooms. The results show high level of the benefits of ICT integration, as implication that participants have positively embraced ICT integration.

4.3 Research Question 2: Challenges in ICTs integration

What challenges, if any, are secondary school teachers in Windhoek, facing in integrating ICTs in the teaching of their subjects?

The study obtained diversified challenges and these were categorized into themes. Four themes were generated and the following section presents findings under each sub theme.

4.3.1 Sub theme one: Challenges related to attitudes

The respondents explained how attitudes and perceptions affected integration of ICTs to teaching and learning. These attitudes and perceptions negatively affected the integration of ICTs in teaching and learning. The respondents reported some form of resistance to change. In this case, resistance to embrace ICTs integration was found to exist among teachers hence affected integration of ICTs into teaching and learning. Explaining the technology resistance challenge respondent [T7S2] said,

"Only a few teachers are interested in learning skills for ICT.

It seems the majority are not yet prepared to embrace change

and this is a significant barrier to the integration of ICTs in teaching and learning," [T 7S2].

Further challenges of attitudes were shown by conservative behaviour of teachers for example [T11S3] explained,

"Most teachers are reluctant to engage in learning on anything related to ICT development. Some teachers claim that they have been teaching for many years without ICTs and learners have been passing," [T11S3].

The response by T11 insinuated that ICTs will not bring any change to effective teaching and learning because traditional pedagogical practices have and are still effective. In addition to challenges of resistance to change, some unfounded perceptions were shown through claiming that there is no time to integrate ICTs into teaching and learning. This claim of inadequate time may not be valid because integration of ICTs into teaching and learning does not need separate time. ICT is integrated into the very subjects on the teachers' time table and therefore the claim that there is lack of time may not be true. However, the claim is an attitudinal barrier to the implementation of ICTs integration in teaching and learning. Commenting on the adoption of any change such introduction of ICT integration in the curriculum, Kisirkoi (2015) acknowledges resistance which may be caused by lack of skills. Therefore, it is an issue that there is a need to look at skill availability on participants and train those who do not want to manage resistance.

The study also noted claims by respondents that there is no money to implement ICTs integration in schools. [T21S6] explained the challenge of lack of funding as follows:

"It might be too expensive to integrate technology in a school. Example, in my school where majority are from the poor backgrounds, parents are not able to contribute much," [T21S6]

According to T21, ICTs integration in teaching and learning cannot be implemented because the community is poor. The challenge of attitudes and maintaining the status quo is shown by considering that the parents are the only stakeholders to finance or fund school programmes. Being inflexible considering parents as the only source of funding thwarts creativity, innovativeness and flexibility in sourcing funding to secure ICT gadgets. In this case of T21, attitudes of considering poverty among parents as the barrier to ICTs integration inhibits looking at alternative sources hence maintains the status quo. Commenting on the challenge of funding, Mafunga and Moremi (2017) note that programmes such as ICT integration presents resource challenges in rural areas but still there is need to take effort to find ways of getting the resources.

4.3.2 Sub theme two: Challenges related to support

Challenges related to lack of support were indicated as barriers to integration of ICTs in secondary schools. A number of respondents identified lack of financial support as a significant challenge affecting availability of ICTs in schools. However, the respondents openly indicated that there is expectation that the government should take the leading responsibility to sponsor its policy on ICT since the introduction of ICT in schools is the brain child of the government, hence according to [T18S5],

> *"Lack of school funds at school to make school libraries operational and equip them with ICT tools such as computers, laptops. The government do not invest in ICT tools or supply the tools at school as the ICT implementation policy stated. It remains a challenge in both urban and rural areas," [T18S5].*

The views given by T18 reveal that schools expect the government to sponsor ICT in schools. Similar views were expressed by [T23S6] who said,

> *"The school has little or limited ICT resources, and this causes lack of usage to other learners and teachers in the school settings. The community does not take an active role in supporting ICT programmes. The community assumes that it is the responsibility of the government since the government is the one initiating such programmes," [T23S6].*

Both T18 and T23 show responsibility conflict in supporting ICT in schools. The situation of lack of funding support, according to the Teachers is affecting the availability use and integration of ICT in teaching and learning. The views expressed by the two teachers show that the community expects the government to support the ICTs integration programme and failure to do so is negatively affecting the programme.

Further explaining how lack of financial support affects the integration of ICTs in secondary schools [T6S2] expressed the burden parents have, thus,

> *"The community struggles to pay other school levies. Talking of paying for ICT is an over burden. Lack of financial support*

to pay for internet and buy gadgets is a barrier to the use of ICT integration," [T6S1].

The responses so far made in this section exonerates the community from supporting ICTs in schools and puts the burden on the government.

However still on the challenge of support, a few teachers raised the issues of lack of teacher support. According to these respondents, teachers do not get support in form of training to acquire necessary skills for ICTs integration. Registering the challenge of lack of teacher training support, [T8S1] stated,

"The school has some computers but teachers have not been trained how to use the ICT. There are a few who have taken initiative to learn on their own. Lack of human resources support in form of training is affecting integration of ICT," [T8S2].

The respondents also expressed concern over ICT facilities installed in school without engaging a technician for up keep and maintenance. According to the respondents, some ICT projects have become white elephants because of lack of support and maintenance. Considering how dynamic ICT is, some ICTs in schools have become outdated, reported the teachers. In such cases lack of updating and aligning ICT to current educational needs has rendered the ICT obsolete. Expressing this challenge [T9S3] said,

"The ICT infrastructure is quite okay, but some maintenances need to be done in order to keep it going," [T9S3].

According to Hautemo (2018), there needs to be more corporate sector involvement in the growth of the education sector. Strong public-private partnerships are required in order to provide educational institutions, with ICT infrastructure and equipment. Similarly, Dhital (2018) also recommended that Both government and non-government organizations should help to facilitate skilled manpower, stabilized electricity supply, hardware resources and software resources to support teachers use of ICTs in their teaching. Both of these authors conquer with the respondents' sentiments.

4.3.3 Sub theme three: Challenges related to accessibility and affordability

The majority of the respondents raised the challenges of affordability with regard to acquiring components of an ICT integration programme. The respondents explained how financial challenges inhibit schools from affording ICT components which include the computers, laptops and internet. The following indication by [T6S2] expresses this challenge,

"Not well developed. No money to buy enough laptops and projectors," [T6S2].

Quite a number of respondents reported their schools having challenges with financial resources as indicated by T6. However, some respondents expressed inadequacy of ICT hard ware as shown by what [T16S4] and [T26S7] said respectively

There are no enough computers and most classrooms are not equipped with whiteboards or screens for teaching using power-point or so. The school has no resources to purchase these, "[T16S4].

"There are inadequate ICT tools at school. The school is not well equipped with enough computers. Even there is a computer laboratory at school, those computers are not enough because learners have to share one computer," [T26S7].

The responses by both T16 and T26 reveal a situation where it is difficult to embrace a full ICTs programme because of inadequacy of set of ICTs components. An effective ICTs integration requires an adequate set of components, reported the teachers.

Access, mostly to internet was raised as a common challenge in some schools. The respondents indicated that some schools have internet which is meant to serve the school administration only, as indicated by [T4S1], thus,

"Inadequate computers and internet is accessible to the school administration only," [T4S1]

Therefore, as indicated by T4, the internet meant for administration is not accessible to the classes. The challenge is lack of internet access.

However, the teachers indicated that in some schools the internet is allowed to be used by the teachers for ICTs integration but the classrooms are beyond internet reception. For teachers to use internet, [T25S7] explained,

> *"The fact that the internet connection is not accessible in classes it creates a bit of stressful situation especial when one need to use it during lesson period. For that reason, one is forced to leave the class during lessons period and move to the office block in order to access internet," [T25S7].*

As indicated by T25, the challenge is moving out and go near the administration block to access internet. This is a concern that every time learners and teachers want to use internet they move to the administration block.

Though this study was conducted in an urban area, Windhoek, where all classrooms at schools are assumed to have electricity [T12S3] presented thus,

> *"Very poor, my classroom does not have power (electricity), I ask to use another classroom if I want to present a lesson electronically," [T12S3].*

As indicated by T12, lack of electricity in the classroom compels the teacher to move to another classroom. According to the teacher lack of power in the classroom results in inconvenience to the class and also disturbs the other class where the teacher moves to conduct a lesson electronically.

Henock (2015), Dhital (2018) and Ghavifekr et al. (2015) have also highlighted lack of electricity, lack of computers and internet connectivity issues as barriers to ICTs integration in teaching and learning. For optimal use, information and communication technologies (ICT) need steady electricity. In order to promote the usage of ICTs integration in the classrooms the power supply needs to be significantly enhanced, expanded, and worked on (Dhital, 2018).

4.3.4 Sub theme four: Challenges related to skills

The challenge of lack of skills and know how to use ICTs integration into teaching and learning was found to be the most contributor barrier. The respondents expressed that without teacher skills to use ICTs integration, even if the schools have the infrastructure, it does not work. There was an indication that previously there had been a programme for training teachers in ICT, but according to [T12S3],

> *"There is no running CPD for teachers in ICT. ICDL stopped some few years back. I think teachers should just take up short courses with NUST or UNAM," [T12S3].*

Therefore, the termination of training of teachers in ICT has further resulted in many teachers not having skills to implement ICT integration in schools. Stating this problem [T8S2] and [T13S4] said respectively.

> *"Teachers are not trained in ICT," [T8S2].*

> *"Most of my fellow teachers are not really enlightened about the usage of ICT at our school there is a need of development," [T13S2].*

However, in some schools not all teachers are trained in ICT as indicated by [T17S5],

> *"Not all teachers are competent in using computers and smartphones," [T17S5].*

The challenges as described by T17 still exist. If some teachers cannot facilitate ICTs integration lessons, it creates gaps in the learning process. According to T17 all teachers need to be computer literate to ensure continuity of ICTs integration into

learning. Another highlight on computer lack of skills was raised by [T21S6] who revealed that:

> *"There are quite number of teachers especially those that have been in the system for so long, who cannot even open a computer. They have no knowledge on how to use a computer," [T21S6].*

As described by T21, the older teachers tend to be resistant in the use of technology. The resistance to embrace technology by the older teachers, reported by T21 affects the ICTs integration programme.

This section presented four types of challenges the study found to affect implementation of ICTs integration in teaching and learning process. Attitude related challenges were presented first. These concern the perceptions of teachers in adopting ICTs integration into learning. The second category of challenges presented was lack of support in form of funding provision and training support. The third type of challenges was lack of accessible to internet and lack of affordability to purchase ICT components including internet. Finally lack of skills among teachers was presented as a challenge which significantly affects implementation of ICTs integration.

4.3.5 Summary

Main theme two is based on research question 2 and was answered in section B of the research instrument**.**

Table 3: challenges in ICTs integration and their categories

Main Themes	**Sub-themes**	**Categories**
Challenges in ICTs integration	1. Challenges related to attitudes	Learner easily disrupted, all subjects not taught online, cheating and copying, child pornography, Drug trafficking, Hesitation in using ICTs, lack of time, less interest from teachers, Teachers afraid of change, time consuming.
	2. Challenges related to support	Poor internet connection, lack of computers, no smartboards in classrooms, insufficient ICT resources, no technical support, lack of space, teachers not comfortable, no program in place for ICTPDT.
	3. Challenges related to Accessibility and affordability.	Challenged accessibility to internet, Costly maintenance, expensive ICTs resources, government not investing in ICT integration, learner late exposure to the use of ICTs, Learners not having their own devices, network challenges, power outage, no access to computer lab, No ICT infrastructures.
	4. Challenges related to skills	Teachers poor ICT skills, learners' inability use of ICTs, learners' inappropriate use of ICTs, lack of PD for teachers, teachers not properly trained, ICDL classes never continued, unfocused ICT use, unaligned ICTs to curriculum, no knowledge of new technology, unskilled school heads in ICT makes implementation difficult.

Lack of teacher skill was cited as the most significant limiting challenge. The reason for this is that, schools may have all resources but without human skill, the ICT integration project will not succeed. The findings also show lack of support at both grassroots and higher levels a barrier to effective implementation of ICT integration. Support in the form of provision of resources, monitoring and supervision were indicated as weak resulting in weak implementation processes. The results on

challenges and barriers reveal a situation which requires serious commitment and attention, to the challenges.

4.4. Research Question 3: What intervention strategies do teachers indicate is needed to ensure effective integration of ICTs in their teaching?

Main theme three is based on research question 3 and was answered in section C of the research instrument**.**

4.4.1 Sub theme: Strategies related to training

The participants raised the need for continuous ICT training for professional development of teachers to effectively integrate ICT into teaching and learning. The participants expressed the investment of training teachers in ICT. In today's fourth industrial revolution, training teachers in ICT.

> *"……enhances effective learning and the teacher passes on ICT skills to the learners," [T23S6]*

The training of teachers is supported by Kacelo (2018) who indicates that training teachers to gain ICT skills will empowers them in teaching. The teacher becomes an agent of change especially in, rural areas where shortage of ICT skills is rampant. Therefore, in this study one of the main interventions suggested to solve challenges of ICT integration was indicated as teacher training in ICT. Training teachers would break resistance and show commitment to achieve a technology-oriented society.

> Still on strategies related to training, the study found a number of participants who expressed the need to train teacher in developing and marking online assessments. Justifying the need to train teachers in online facilitation, [T25S6] and [T6S2] indicated respectively,
>
> *"Teachers need to be trained in online facilitation and assessment. Technology has revolutionalised education and in Namibia we should not remain behind," [T25S6]*
> *"Training in online facilitation enables teachers to reach out to their students who are geographical located and can engage them at one," [T26S7]*

The views of T25 and T26 are acknowledged by Wallet and Melgar (2015) who indicate that virtual instruction and learning is becoming the order of the day where instructors engage their students without moving an inch out of their homes. Reiterating similar view, Kamaniddim et al., (2017) state that the use of technology in education has resulted in the need for teacher to be technological literacy to be relevant in their jobs. The study establishes strong support of training teacher in online facilitation.

> Not only did the participants call for training of teachers in ICT. School management was also indicated as in need of training. Being the overall administrators and the controller of all processes in schools [T2S1], expressed,

> *"School management should not be left out of training. For management to appreciate the importance of ICT in integration to teaching and learning, management need to be trained to have hands on skills."*

In support of T2, T21 considered the role of management in providing resources and said,

> *"Training of school management in ICT creates awareness of the need to provide tools for effective and successful implementation ICT." [T21S6]*

Both T2 and T21 bring out the roles of school management in supporting ICT in school. Training of school management according to the two participants is important because school principals will take effort and provide ICT tools. In addition, with knowledge and skills of integration of ICT into teaching and learning school principals will be able to supervise, staff develop teachers and help them to successfully implement ICT. Commenting on the need for school management to be on the forefront of learning ICT, Mirzajani et al. (2015) note that the active involvement of management in ICT enables integration of the programme in the school strategic plan. ICT becomes a component of the schools' mission and it will receive attention and budgetary support. The study establishes the need to train school management in ICT so that school principals are the drivers of the programme.

4.4.2 Sub theme: Strategies related to awareness

The participants expressed the need to make ICT a holistic programme by including key stakeholders on board. Indicating how parents can be embraced and their role in ICT integration in teaching and learning, [T26S7] states,

> *"Parents should be bought in by making them aware of the benefits of ICT. Among the parents, there may be experts in ICT and they can also support by buying the children technology gadgets such as computers," [T26S7]*

Sharing similar views with T26, T23 added another key stakeholder.

> *"There is need to involve local businesses in the ICT project. As social responsibility the business can donate computers, tablets or laptops. The business will get publicity and good reputation." [T23S6]*

The views of taking parents and local businesses on board in pursuit of ICT integration in school is supported by Patrikakou (2016) who highlights the value and role of key stakeholders to schools. Patrikakou (2016) expresses that those parents and local businesses are part of the school community and taking them on board may boost the availability of ICT. In addition, making parents aware of ICT integration enables parents to support learners at home. The study found strong support of embracing key school stakeholders in the Journey of ICT integration.

4.4.3 Sub theme: Strategies related to financial support

The study found overwhelming opinions on the need for government to budget separately for ICT integration in school. Adequate funding of the programme will enable provision of computers, internet and other tools to make ICT integration a success suggesting the government to commit funding to support ICT integration, [T25S7] stated:

> *"ICT integration is a national programme which requires government with adequate funding to purchase computers and other requirements. There is need to focus more on rural areas where electricity needs to be provided first."*

In support of [T25S7], [T18S5] further calls upon the government to have a budget allocation for ICT integration by expressing,

> *"The success of ICT integration is in the hands of the government which needs to adequately fund ICT integration by allocating a separate budget, so that all schools are fully equipped with ICT resources," [T18S5].*

The views expressed by T18 and T25 are noted by Janmaat, McCowan and Rao (2016), who indicated such national projects are government responsibility because there is need for uniform availability of resources. A study conducted by Tay et al. (2015) found inadequate government provision of ICT resources hence the situation compromised the implementation of the programme. Without adequate resource, ICT integration may remain the preserve of the haves while poor communities may never experience the programme. The study established the need for government to set aside

and sponsor ICT integration, to ensure that full attention is given to the programme still on the issue of financial strategies the participants indicated the needs to engage donor agents for funding. However, donor funding may be determined by the availability of the funds. Therefore, it is not a source to base planning on.

4.4.4 Sub theme: Strategies related to development

As an intervention to enhance effective ICT integration, participants raised self-development as a strategy of self-skilling. According to the findings, participants suggested accessing free training on ICT online, engaging self-resources learning ICT basics on their own. Expressing the need for teachers to engage in self-development, [T5S2] and [T15S4] stated respectively,

> *"Teachers need to be creativity and innovative and engage in self-development so that they become effective in teaching through ICT integration." [T5S2]*

> *"Teachers should not expect to always receive school-based training but should also take effort to improve ICT skills on their own. They can attend training courses on line or can attend private training. Own initiatives show that teachers like their work," [T15S4]*

Both T5 and T15 raise the need for teachers to take initiative to improve competences in ICT. The study found the proposal for teacher to engage in self-development as opposed being planned for training by school authorities. Yu (2014) alluded that when

teachers are motivated to engage in Self-development on how to use ICTs, their self-efficacy and competence in integrating ICTs in their classrooms is improved

4.4.5 Sub theme: Strategies related to accessibility

The participants raised the need for government to provide internet to all schools. In addition, all classrooms were to have smart boards. Expressing these needs, [T15S4] and [T21S6] stated,

> *"ICT integration is very important to the extent that it opens up for teachers and learners to have extra teaching aids either from the internet with multiple sources of videos or audios and pictures," [T15S4].*

> *"The government should consider ICT as an essential, provide and upgrade ICT tools such as electricity, internet, computers and computer labs [T21S6].*

The views expressed by both T15 and T21 highlight the benefits of ICT integration and the role the government needs to play to ensure accessibility of ICT to all schools. Isaacs (2007) notes that most secondary schools in Namibia have received ICT integration support from government. However, Kashkau (2017) hail government commitment to the provision and implementation of ICT integration but should be extended to all school to enhance nationwide adoption of the instruction learning programme.

In addition to ensuring availability of ICT in schools by government, the participants endorsed the need to enforce the implementation of ICT and to make ICT a compulsory to all curriculum subjects and therefore being not a standard alone subject, implies that

all teachers are involved in the implementation of ICT. The study established strong support of ICT integration and the need for the key stakeholders to play their respective roles to deliver the objectives of ICT integration.

The participants posited the need for the supervisory and inspectorate departments to play their role in attending to ICT integration clarifying this concern [T18S5] stated,

> *"ICT policies in education should be evaluated and amendments must be made in order to make sure that the goals and visions are met. School directors and inspectors should visit school often to have meetings with teaching staff and have discussions about ICT matters and challenges at school," [T18S5].*

The views expressed by T18 point to the value of supervision that it enables identifying strengths and weaknesses of the programs. The outcomes of evaluation lead to relooking at the policy of ICT and making changes to align with the schools and education needs. Supporting the need for monitoring new programmes such as ICT integration, Cha et al. (2020) indicate that monitoring provides planners with real data which is used to make concrete informed decisions. Policies and programmes dance to the tune of the dynamic environment hence monitoring and evaluation are essentials to tailor programs to current needs of society (Chai et al., 2020). The study established the need for the inspectorate department to play its role of continuous monitoring and evaluation of ICT to ensure compatibility with current needs of the education.

4.4.6 Summary

The findings presented interventions which should be implemented to improve the delivery of ICTs integration is summarized in this table below.

Table 3: A summary of strategies suggested to improve ICTs integration

Sub-themes	**Categories**
1. Strategies related to training	On-going ICT training for professional development of teachers should be enforced
	A course specifically on ICT integration is needed for all teachers
	Ensure all teachers are trained and given more opportunities to use ICT.
	More relevant extensive training on using ICTs should be offered
	Teachers should also be trained on digital literacy
	Training on developing online assessment and marking online should be offered to teachers.
	Upgrade school managers in term of ICTs use.
	Invest in it staff at all schools
2. Strategies related to awareness	Awareness programmes for parents and guardians should be done
	Encourage the use of ICTs in schools
	Principals and other school managers to encourage teachers to integrate ICTs in their classrooms.
3. Strategies related to Financial support	Government to invest more on ICT infrastructures
	Upgrading of existing infrastructures
	Making ICT tools less costly for teachers

	Provide enough funds and resources for ICTs integration programs
	Schools to request for donations from different organizations
	Make scholarship available for teachers to upgrade their ICT skills
	Equip school libraries with enough computers.
4. Strategies related to Self-development	Access to free ICT training and online courses.
	Encourage Self-resources usage learning.
	Subscribing to educational platforms.
	Teachers should learn ICT basics on their own.
5. Strategies related to accessibility	Make internet accessible in all schools i.e., school WIFI coverage.
	Equip all classrooms with smartboards and other relevant ICTs.
3.6 Other interventions	Ensure effective implementation of ICTs integration.
	Make ICT a compulsory subject in schools
	More school visits by inspectors/directors to ensure ICT integration is taking place
	There is a need for policy revisit and amendments

The study established that there is need to continually focus on skilling educators in ICT integration. Teachers as direct implementers of ICT integration were regarded as the key determinants of the programme success. Teachers are to be trained in practical use of various ICT platforms and tools and in alignment with the subject they teach. The findings revealed the need for all teachers to be conversant and skillful in online facilitation and assessment, considering the current Covid-19 environment. The study also raised the need to embrace school management in training, the reason being that

school managers cannot envision programmes they are illiterate on. A critical intervention to support teacher efforts, funding was indicated as important to provide adequate resources. The study also raised the need to take all school key stakeholders on board, an implication that parents and other local key stakeholders need to be engaged in ICT integration. The findings emphasised a holistic approach to ICT integration, where all components of the system should perform their roles to deliver ICT integration.

4.5 Conclusion

The chapter presented, analysed and discussed the findings of the study. The data was presented in three slots, under the three research questions. The first section presented findings on the status of ICT integration practices in the classroom. The findings showed that the teachers use ICT integration in various platforms and tools. Diversified platforms and tools were presented, an implication showing the flexibility nature of ICT integration. Finally, this section presented findings on the pedagogical benefits of ICT integration. Findings revealed participant high level awareness and experience of ICT integration.

On research questions two, which focused on barriers and challenges inhibiting the implementation of ICT integration, the study presented under funding, lack of resources, lack of educator skills, resistance to change and lack of support as challenges. These barriers were described as significant, but however educator skills were described as the focal skill.

The final section presented data on interventions which need to be implemented to

secure delivery of ICT integration objectives. A raft of interventions was raised which included continuous training of teachers and their principals, increase in funding ICT integration by the government, engagement of educators in planning and execution, embracing key education stakeholders such as parents. Teachers were also encouraged to enrich themselves by engaging in self-development initiatives. Overall the study found high awareness and appreciation of the value of ICT integration. Resources were indicated as stumbling barriers. The response was the need for government to consider ICT integration as a priority project and deploy adequate funding.

CHAPTER FIVE:

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the data findings in relation to answering the each of the research question and linking the state of ICT integration in the teaching and learning process in schools in Khomas Region through the theoretical lens used in this study. Based on the findings, conclusions and recommendations are drawn and suggestions for further research are made. The research study discussions are guided by the following study research questions:

- What is the status of selected Windhoek Secondary school teachers' ICT integration practices in their classroom?
- What challenges, if any, are secondary school teachers in Windhoek, facing in integrating ICTs in the teaching of their subjects?
- What intervention strategies do teachers indicate is needed to ensure effective integration of ICTs in their teaching?

How teachers in secondary schools integrate these ICT tools/digital tools in their classroom is of interest in this research study as it determines not only the progress of TECH/NA! implementation plan, but an evaluation of ICT integration and the intervention strategies.

5.2 ICT integration practices in the classroom

The study data findings established diversified learning activities where ICTs integration is used by both teachers and learners. The teachers indicated that they use ICT integration mainly for lesson preparation, Lesson presentation, to do assessments and for giving learners activities that enhance their learning. Through lesson preparation teachers indicated that they subscribe to varieties of online content that are related to their subjects' content especially on YouTube. This is done in order to broaden their knowledge in their specific area of teaching. Teachers also indicated that for collaborative learning they are part of collaborative sharing of knowledge groups such as on WhatsApp, Facebook, Twitter, Instagram and group emails. In these groups, information is shared with other experts and everyone is learning from everyone. These groups are formed on the basis of cluster schools, or sister school and/or same field of study. It was also indicated that teachers do engage in visual meetings with other experts via Zoom, Microsoft teams for academic discussion when the need arise. The processes of using ICTs for lesson preparation were described as cost effective, all done at one point and produced quality output which Padayachee's (2017) study acknowledged as notable advantage of ICT over traditional approaches. Concurring Seah et al. (2018) further adds that ICT integration in teaching and learning has relieved teachers from carrying heaps of books as the use of e-books enables teachers to keep all their textbook resources in their computers or smart phones.

For lesson presentation teachers indicated that they use PowerPoint presentation to present their lessons through using either their personal Laptops, LCD projectors and/or smart boards. Some teachers indicated that to enhance learners understanding

during the lesson, they use colourful images that they either download from the internet or that they took with their cameras during lesson preparation. Most teachers also indicated that they use Videos and/or movies that learners will watch in the classroom either for the purpose of lesson introduction or lesson consolidation. Alternatively, teachers indicated that learners are instructed to watch to watch videos/movies during their free time where they are given the opportunity to do their summaries and make their own notes. It has come out that videos and movies are commonly used in subjects such as History and Geography. Simulation in subjects such as business studies are done to enhance understanding of the business world.

Teachers indicated that learners are instructed to do research topics online and come and present their findings using laptops and/or smart boards. This is believed to encourage interaction and to allow learners to master the content easily. Links and website are provided to the learners at the end of the lesson to do further reading on a specific topic. Teachers further indicated that they have WhatsApp groups with their learners in their specific subjects. Additional notes, short audios and videos are shared with the learners. Learners are also at liberty to ask questions at appropriate times. Learners are also further encouraged to do practice and self-assessment online while at home.

On assessment teachers indicated that they use Microsoft-excel to record and calculate learners' CA marks. This is done in order to improve feedback and consolidate learning, as it allows the teacher to identify knowledge gap for individual learners and provide further support. Teachers also indicated that they make use of online past question papers when setting up tests, class quizzes and assignments.

On learners, the study established that ICTs integration addresses a number of learning activities and assignments. Considering the disturbances brought by COVID-19 with

regard to conducting normal face to face classroom lessons, the study found ICTs integration enhancing holding of virtual lessons. Virtual lessons are acknowledged by Shihomeka (2020) as effective alternative learning platform in times of not only COVID-19, but also during floods. Also holiday extra lesson were indicated as possible through ICTs. The study also established that ICT integration enables teachers to give online assignments, facilitate interactive discussions, present videos, and administer quizzes and online self-assessment tests. These diversified learning activities are noted in a study conducted by Kisirkoi (2015) in Kenya secondary school as the unique strength of the ICTs integration, of having unlimited resources which teachers select to match the needs of their learners. In essence teachers select activities which address the diversified learning needs of the learners, hence ICTs integration support learner centred education instruction.

On ICT integration platforms and tools, the study found that teachers use a number of both platforms and tools. Class blog, Edmodo, kahoot.com, YouTube, Google scholar, Google classroom school and social media were presented as some of the platforms used by teachers. The same use of diversified tools was reported, and websites, videos, television, smart boards and computing devices were indicated as commonly in use. The use of diversified ICT tools is hailed by Ghavifehr and Rosdy (2015) who regard the practice as suitable to cater for diversified learning needs among the learners. The use of diversified ICT tools is therefore indicative of unique learning needs of the learners and Kisirkoi (2015) hails flexibility of ICT tools as an advantage of tailoring instruction and media to the unique needs of learners.

On benefits derived from ICT integration, the study established that both teachers and learners derived positive benefits. The advantages of ICT integration were described as multiple but all resulting in effective teaching and learning. ICT integration

according to the teachers makes lesson preparation easy, has a variety of media which can be tailored to the interests and needs of learners and the lesson delivery catches the attention of learners. The approaches from the teachers using ICTS seems to show independent learning, interactive learning, self-spaced learning, discipline and self-control as some benefits of ICTs integration in teaching. A study conducted by Kisirkoi (2015) in Kenya acknowledged better benefits of using ICTs in teaching and learning over use of traditional approaches. In addition to benefits related to teaching and learning, Eze et al. (2013) indicate that ICTs integration develops ICTs skills among the learners and this addresses Namibia's Vision 2030 goal of being a technology-based economy. The study established that ICTs integration is schools in Khomas Region enhance assignment of diversified learning activities which address the unique learning needs of learners. The study also established that the various ICT platforms and tools enables teachers to prepare variety of tasks which motivates and sustains interest in learning. ICTs integration was also found to have profound benefits which result in effective teaching and learning.

5.3 Challenges in ICT integration in the classroom

While in the preceding section, the study presented various way teachers use ICT integration for teaching and learning in the classroom, there are challenges faced with ICT integration which the study identified. Attitudinal challenges were indicated to be exhibited by both teachers and students. Some students instead of using the facility for school work, they are using the learning facility for pornography and accessing drugs. Students were also indicated to use ICT integration for cheating, a situation which

compromises effective use if ICT integration. All these challenges were described as defeating the aims of ICT integration.

On the other hand, the study reported some resistance among teachers in embracing ICT integration. The possible cause of resistance was indicated as lack of skills. Lack of skills to shy away from ICT integration. The challenge as noted by Kacelo (2018) can be solved through training and confidence building. When teachers acquire the ICT integration skills, they become confident and it reduces attitudes of resistance.

The next category of challenges found in this study was lack of support. Lack of support was indicated to weaken the drive to implement ICT integration. Lack of internet, absence of infrastructure, no computers and lack of technical support were all found to affect the delivery of ICT integration effectively. These resources were found to be interdependent in ICT integration for example the school could have computers and needed internet. Also having computers without electricity affected ICT integration. Therefore, ICT integration support should be multidimensional.

Affordability was identified as a challenge that creates disparity in implementing ICT integration between the haves and have nots. The study established that schools in low and high density suburbs may have disparity in ICT integration. Learners from poor families may fail to purchase ICT tools. Some schools may not afford to pay for power. Having financial resources to purchase ICT resources and tools has effect on implementing an effective ICT integration programme. The challenge of affordability results in some schools and individuals failing to access resources and tools to implement ITC integration.

The study also found that skill related challenges were a critical barrier to the delivery of ICT integration. The majority of the teachers were found to have no skills of ICT. Those who have ICT skills were found to have limited skills. Skill absence among the

principals was described as a critical concern since it would be difficult to supervise teachers on ICT integration. The study also found that the ICDL training for teachers had been stopped. The stoppage of ICDL training affected the opportunity for teachers to acquire skills locally. Non-alignment of curriculum with ICT was identified as a challenge to teachers who had not been trained in ICT integration. A study by Kacelo (2018) found that a successful ICT integration programme is driven by teachers who have both soft and basic technical skills in ICT.

5.4 Intervention strategies for effective ICT integration in the classroom.

Intervention strategies for effective ICT integration were grouped into six categories. The first category were strategies related to training in ICT integration. It was indicated that school leadership, in particular the principals need to be ICT integration literature so that they can effectively manage ICT integration at their schools. The study underscored the need to make ICT integration a core module in teacher training colleges to ensure that when teachers leave college, they are adequately skilled in implementing ICT integration. For teachers who are already in the field, a needs analysis approach should be used to identify ICT integration skills gap to enable ongoing training focus on these specific needs. Ongoing training is also important to keep teachers abreast with changes in the ICT integration. In a nutshell the government should invest in ICT training. Mirzajani et al. (2015) regard skilled personnel as guarantee for quality ICT integration. Concurring, Kamaniddim et al. (2017) further raise the need of having a training unit which specifically research, monitors and assist teachers to effectively deliver ICT integration.

Though ICT integration in teaching and learning is a policy issue, the study established the need for continuous making stakeholders aware of the value and compliance in implementing ICT integration. School management was indicated as having the responsibility to make teachers, parents and other stakeholders aware of the need to embrace ICT integration. The study emphasised the need to prioritise engaging parents because they play an active role in provision of ICT tools. Explaining the importance of parents in ICT integration, Patrikakou (2016) states that parents, in addition to the provision of ICT resources at home, they act as supervisors by helping the students and ensuring ICT integration tasks are accomplished. Parents therefore were considered as an important partner in the delivery of ICT integration.

Financial support was considered as important resource which enables having the required infrastructure and tools to implement ICT integration. The study called upon the government to ensure that the relevant infrastructure, resources and tools to support ICT integration in schools are in place. Investing in ICT infrastructure and equipping schools with libraries with adequate computers supported by unlimited internet were cited as examples of supporting ICT integration. The study considered that ICT integration will be successful if the programme is provided with adequate budget, an issue which Tay et al. (2015) states that such an important programme should have a stand-alone budget. A separate budget ensures that priorities are taken care of and the adequacy of the budget can be monitored. In addition to provision of adequate budget to support ICT integration, the study established the need to create a facility that enables teachers to get ICT related resources at low cost. Such a facility enhances affordability to access ICT tools and resources for the implementation of ICT integration.

The study considered the need for teachers to take responsibility of upgrading themselves. Self-development can be done through accessing training on line and subscribe to different education platforms. This intervention success is dependent on the teachers' attitudes of taking ICT integration knowledge and skills as personal asset. Positive attitudes towards self-development results in teachers taking initiative to improve themselves in ICT integration.

The study raised the need for government to make internet available to all schools. Availability of internet will enhance equitable access of ICT integration. Other resources such as smart boards were needed to support ICT integration. The role of the government in supporting the availability of ICT resources and tools enhances accessibility to all schools.

The study considered policy issues as another area of concern which requires revisiting and aligning with ICT integration to strengthen the implementation of the programme. Making ICT a compulsory discipline was also a policy issue which enhances inclusivity. The study also raised the need to put in place an inspection unit that continuously track the implementation and challenges faced in ICT integration. Rather than taking the role of inspection, Park and Seo (2020) suggest a supervisory unit that focuses on supporting ICT integration implementation. The supervisory unit thus does not focus on fault finding but devote effort in establishing areas of weaknesses and engage teachers in a mutual associate relationship. Such an approach builds confidence and trust among stakeholders working on ICT integration.

5.5 Summaries of Findings

The study sought to investigate the status of teachings in ICT integration practices in the classroom, the challenges the teachers are facing in ICT integration and intervention strategies which led to be implemented to ensure effective ICT integration. The study found diversified uses of ICT integration in the teaching and learning process. A variety of tools and platforms were found to be used. Attitudinal, lack of support, affordability and lack of skills were identified as constraints that affect effective implementation of ICT. On interventions to improve delivery of ICT integration, the study raised the need for training of staff including the principals, making stakeholders aware of the need to implement ICT integration, financial support, teacher taking own initiative to develop skills in ICT integration and improving access to ICT resources and tools. The study also raised the need to align policy in line with the prevailing needs of ICT integration.

5.6. Linking data to framework

The study's conceptual framework integrates elements from the Technology Acceptance Model (TAM) and the four levels of Kotrlik Pierson's model of technology integration (KPMTI) (Kotrlik & Redmann, 2002). The lens of analysis focusses on Exploration, Experimentation, Adoption and Advanced integration of ICT integration of teachers.

The teachers in the study are using ICTs mainly for lesson preparation, and traditional Lesson presentation. Exploration has extended to integrating ICTs for assessments using APPs such as Kahoot and online quizzes in Edmodo and to give learners activities that enhance their learning. Through lesson preparation teachers indicated that they subscribe to varieties of online content that are related to their subjects' content especially on YouTube. Teachers indicated that learners are instructed to do research topics online and come and present their findings using laptops and/or smart boards. The study also established that ICT integration extended to giving online assignments, facilitate interactive discussions, present videos, and administer quizzes and online self-assessment tests.

5.7 Recommendations

Based on the results of this study, the researcher draws up the following recommendations:

- The government needs to increase the budget for the ICT project so that adequate resources, tools, infrastructure and other support for ICT are availed.
- The government needs to establish an ICT training unit which will be responsible for research, act as advisory board and make recommendations on ICT integration implementation in schools.
- The Ministry of Higher Education should see to it that ICT curriculum is made a core subject to enable every teacher trainee be ICT integration literate

- The Ministry of Education should conduct an ICT needs analysis among teachers, so that training is tailored to the needs of the serving teachers.
- The government should partner with development partners and private organisations to boost resource and expertise availability. The partnership approach will benefit from pooling resources, expertise hence these synergetic benefits will strengthen the delivery of ICT integration.
- Schools should establish ICT integration committee which should be composed of teachers, parents and other key stakeholders. The committees should be responsible for driving ICT integration at school level.
- There should be continuous assessment of ICT integration, so that adjustments of ICT integration, changes and improvements are made to keep the programme on track.

5.8 Areas for further research

Given the limitations of this research study, the following areas for further research are suggested:

- Further study may be carried out focusing more on classroom observation for practicality and whether these schools have constant internet connection.
- The study to explore the establishment of the Centre for ICTs-supported pedagogy in each region that will be responsible to plan teacher support programs, training and evaluation, and quality assurance for teaching and learning.

- A study can be carried out to explore the assessment need to develop a generic pedagogical curriculum for teachers in ICTs integration. This might address the need for teachers to understand the convergence of their subject areas and technological knowledge.

5.9 Conclusion

The study sought to explore how teachers in secondary schools in Namibia are integrating ICTs in the classroom and what challenges, if any, are experienced. The study also explored intervention strategies to ensure effective integration of ICTs in Namibian secondary schools. The study found ICT integration being applied in diversified learning activities and use of a variety of platforms and tools. A number of challenges, among them unavailability of ICT infrastructure and tools and lack of skills among teachers were identified. The study raised the need to increase budget, training of teachers and embracing parents as key interventions to improve ICT delivery. Based on these findings, the study noted that teachers are using ICT integration in a number of learning areas. This was shown by the diversified activities and platforms of which they apply ICT integration. However, while the study established a positive response to ICT integration, effective implementation of ICT integration is hampered by the challenges of which lack of ICT skills among the teachers and unavailability of infrastructure and ICT tools were identified as main barriers. The study noted that effective implementation of ICT integration was possible after these barriers have been attended to hence recommendations were made to ensure effective implementation of ICT integration.

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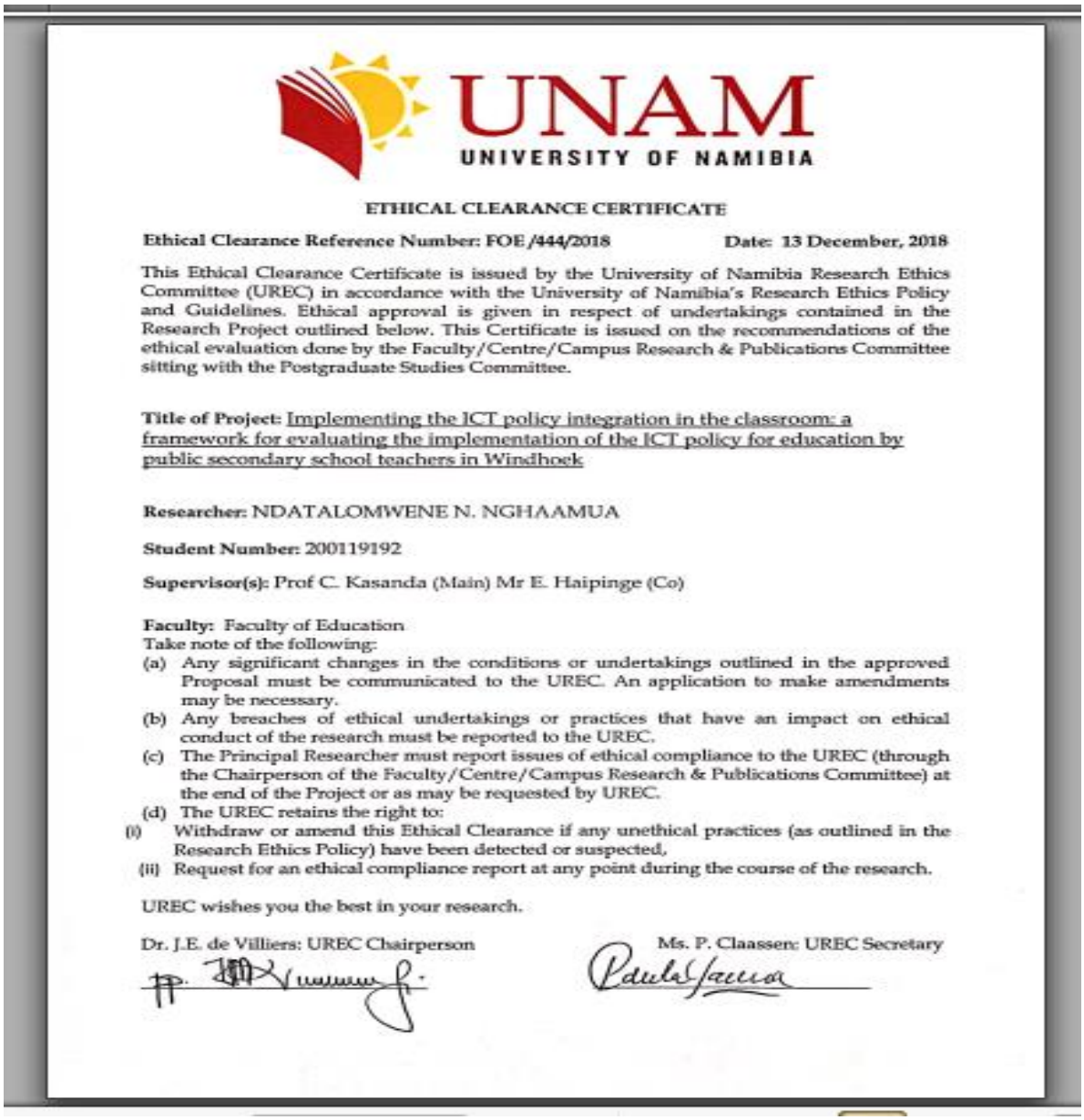
APPENDICES

Appendix A: Ethical Clearance Certificate



UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: FOE /444/2018 **Date: 13 December, 2018**

This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.

Title of Project: Implementing the ICT policy integration in the classroom: a framework for evaluating the implementation of the ICT policy for education by public secondary school teachers in Windhoek

Researcher: NDATALOMWENE N. NGHAAMUA

Student Number: 200119192

Supervisor(s): Prof C. Kasanda (Main) Mr E. Haipinge (Co)

Faculty: Faculty of Education
Take note of the following:

(a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.
(b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.
(c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.
(d) The UREC retains the right to:
(i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,
(ii) Request for an ethical compliance report at any point during the course of the research.

UREC wishes you the best in your research.

Dr. J.E. de Villiers: UREC Chairperson

Ms. P. Claassen: UREC Secretary

Appendix B: Permission to conduct Research at Khomas Region

REPUBLIC OF NAMIBIA

MINISTRY OF EDUCATION, ARTS AND CULTURE

Tel: +264 61 -2933202
Fax: +264 61- 2933922
Enquiries: G. Munene
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File no: 12/2/5/7

Luther Street, Govt. Office Park
Private Bag 13186
Windhoek
Namibia

Ms Ndatalomwene Nghaamwa
P. O. Box 21208
Windhoek
Cell: No. 081 143 6871
Email: ndatala1981@gmail.com

Dear Ms Nghaamwa,

SUBJECT: PERMISSION TO CONDUCT RESEARCH AT KHOMAS REGION

Kindly be informed that permission to conduct an academic research for your Master's Degree in Educational Technology in *"Implementing the ICT Policy Integration in the Classroom: A Framework for Evaluating the Implementation of the ICT Policy for Education by Public Secondary School Teachers in Windhoek, Khomas region in Namibia,"* is hereby granted. You are requested to present this letter of approval to the Regional Director of Khomas to ensure that research ethics are adhered to.

Furthermore, you are kindly requested to share your research findings with the Ministry after completion of the research project. You may contact Mr G. Munene at the Directorate: Programmes and Quality Assurance (PQA) for submission of a summary of your research findings at the above indicated details.

I wish you the best in conducting your research and I look forward to hearing from you upon completion of your study.

Yours Sincerely,

03 06 2013

Sanet L. Steenkamp
EXECUTIVE DIRECTOR

All official correspondence must be addressed to the Executive Director.

Appendix C: Teacher semi-structured interview

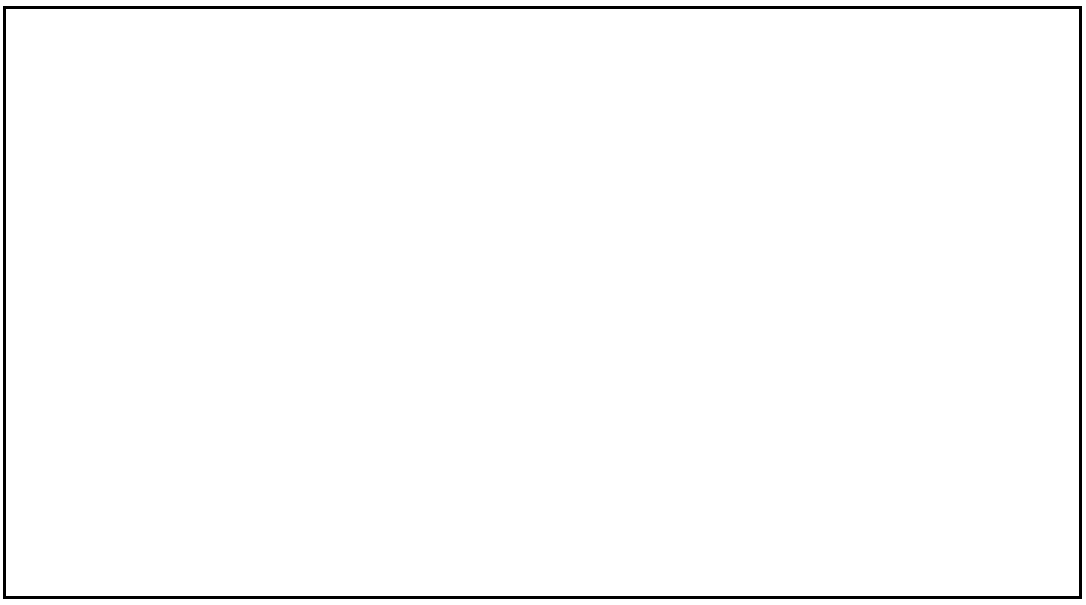
Teacher semi-structured interview

The purpose of this interview is to gain information regarding how the teachers in secondary schools in Windhoek are integrating ICTs in teaching their subjects. The questionnaire also seeks to gather information on the challenges, if any, faced by teachers in the integration of ICT in their teaching. Additionally, it will also explore the intervention strategies may be needed to support teachers to effectively integrate ICT in their classroom. All the information obtained from the questionnaire shall be treated as confidential. Please take your time to frankly answer all the questions.

Section A: Teacher ICT integration in the classroom

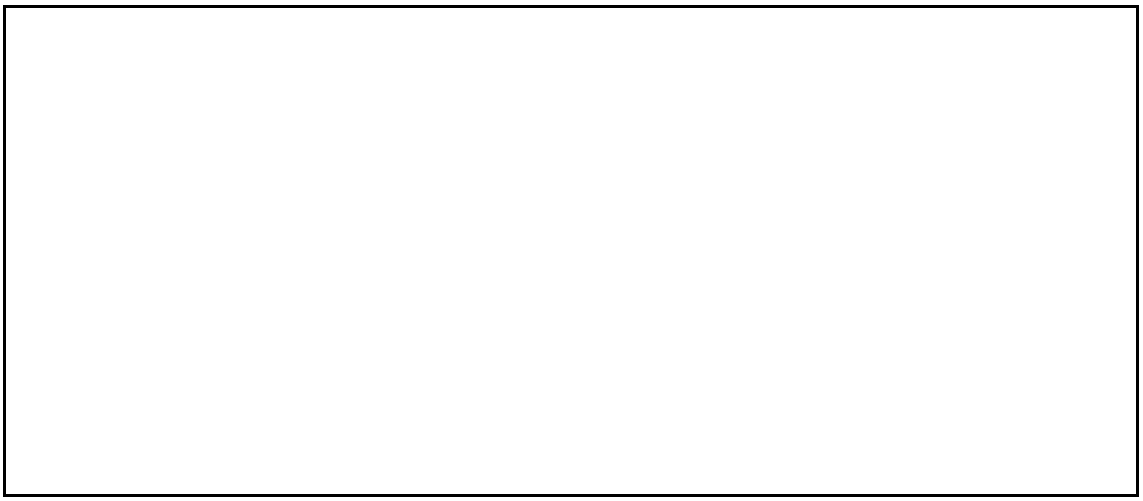
1. what is your views on the following:

   a. The importance of ICT integration in your teaching.

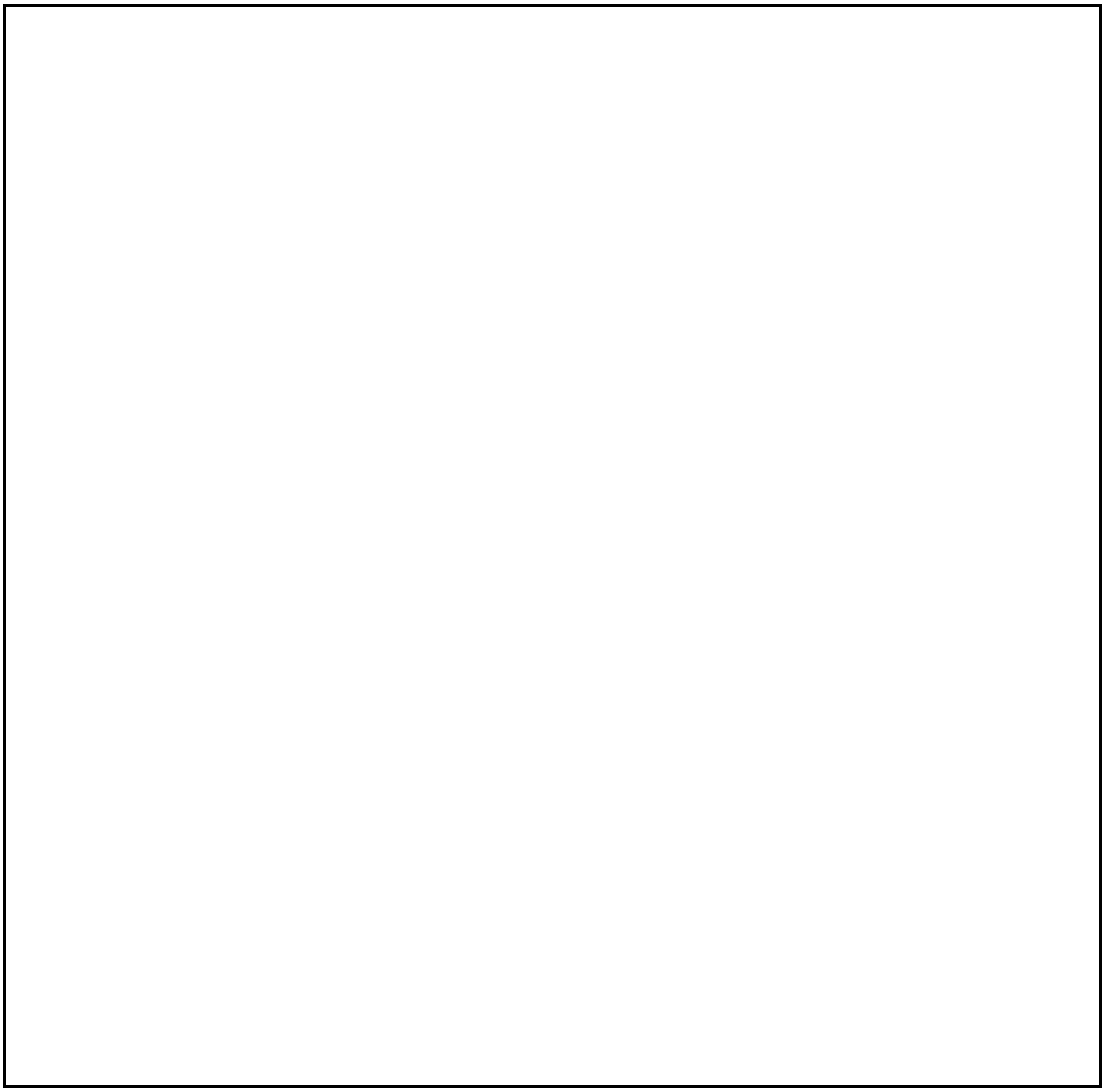


2. Advantages and disadvantages of integrating ICT in teaching and learning

2. Briefly highlight how you use ICTs to support learner-centred teaching?



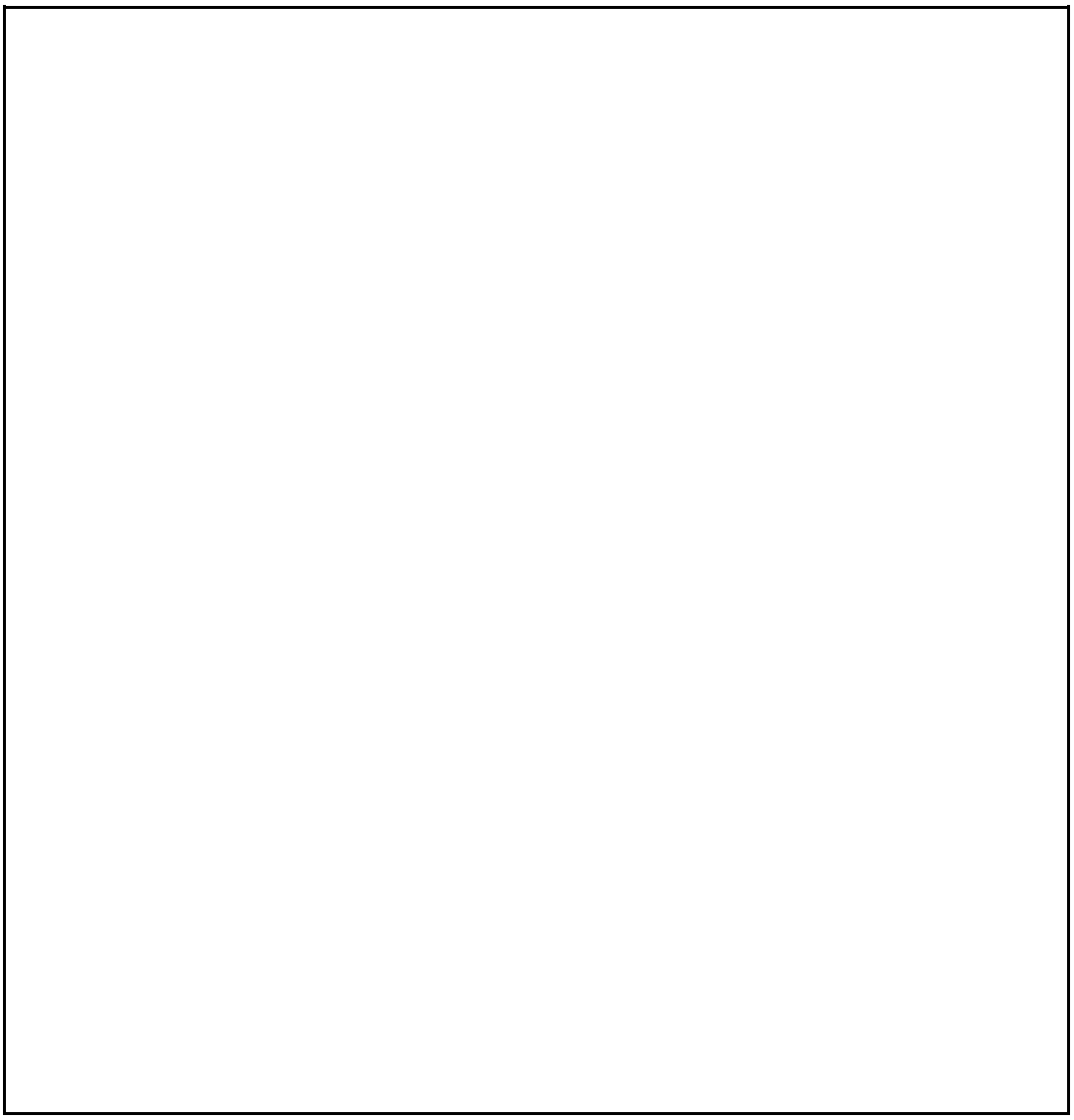
3. In what ways do you use technology in assessment in the course of your teaching?



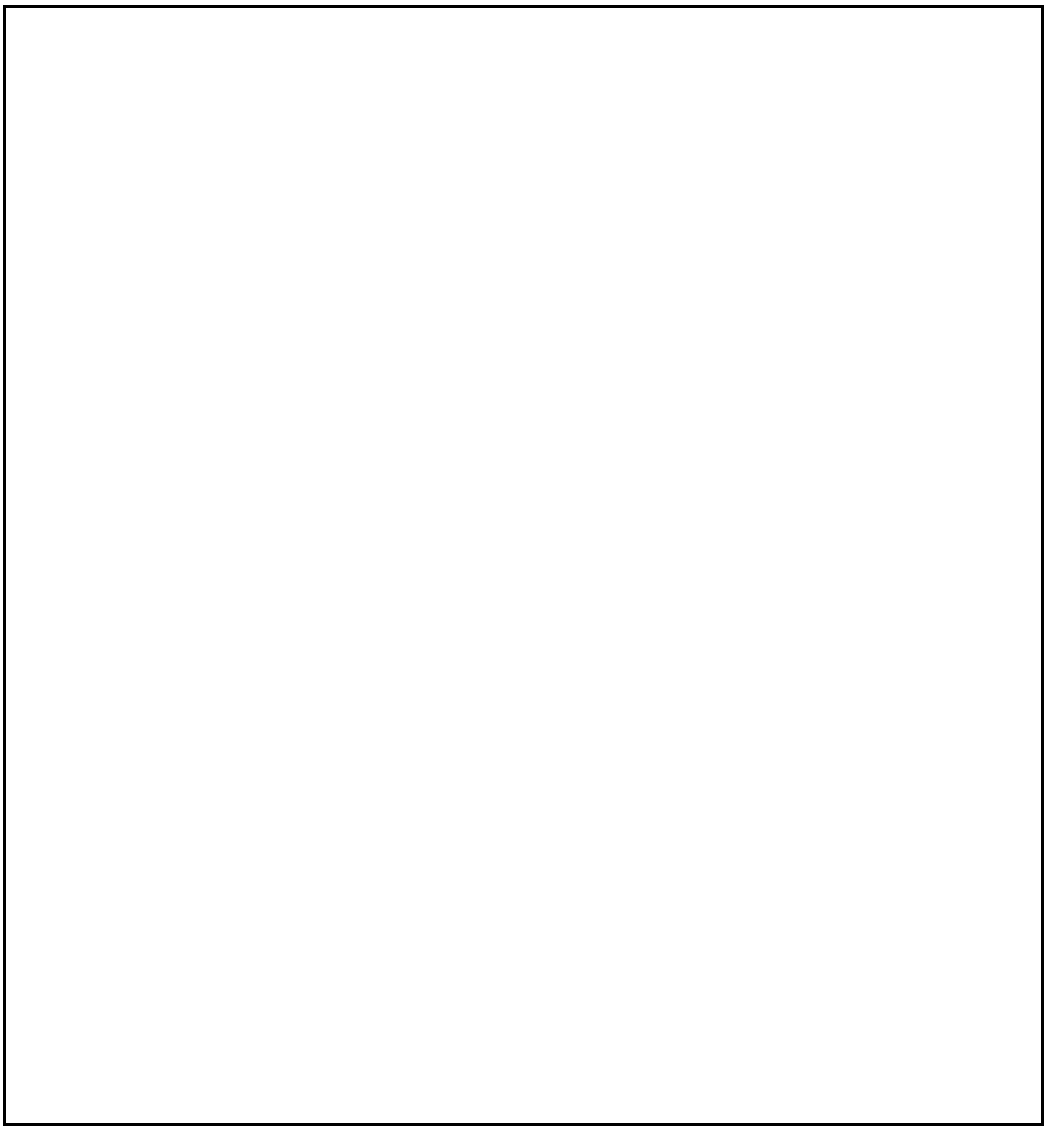
4. How do you use ICTs to do the following:

a. To acquire additional teaching and learning resources for your lesson plan?

2. To collaborate with other experts in your subject?



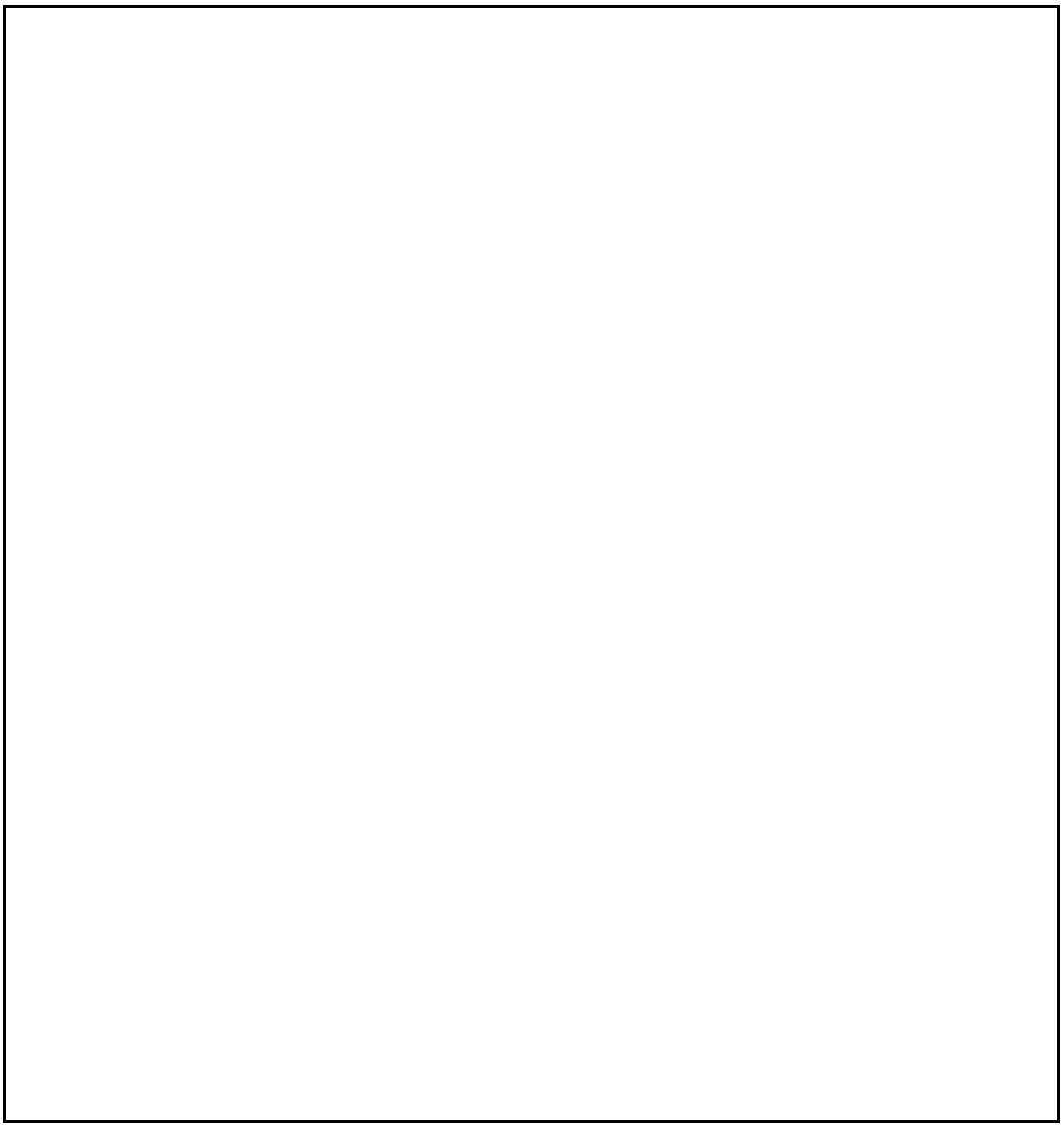
5. Overall, how is your confidence in the use of ICTs to aid teaching and learning?



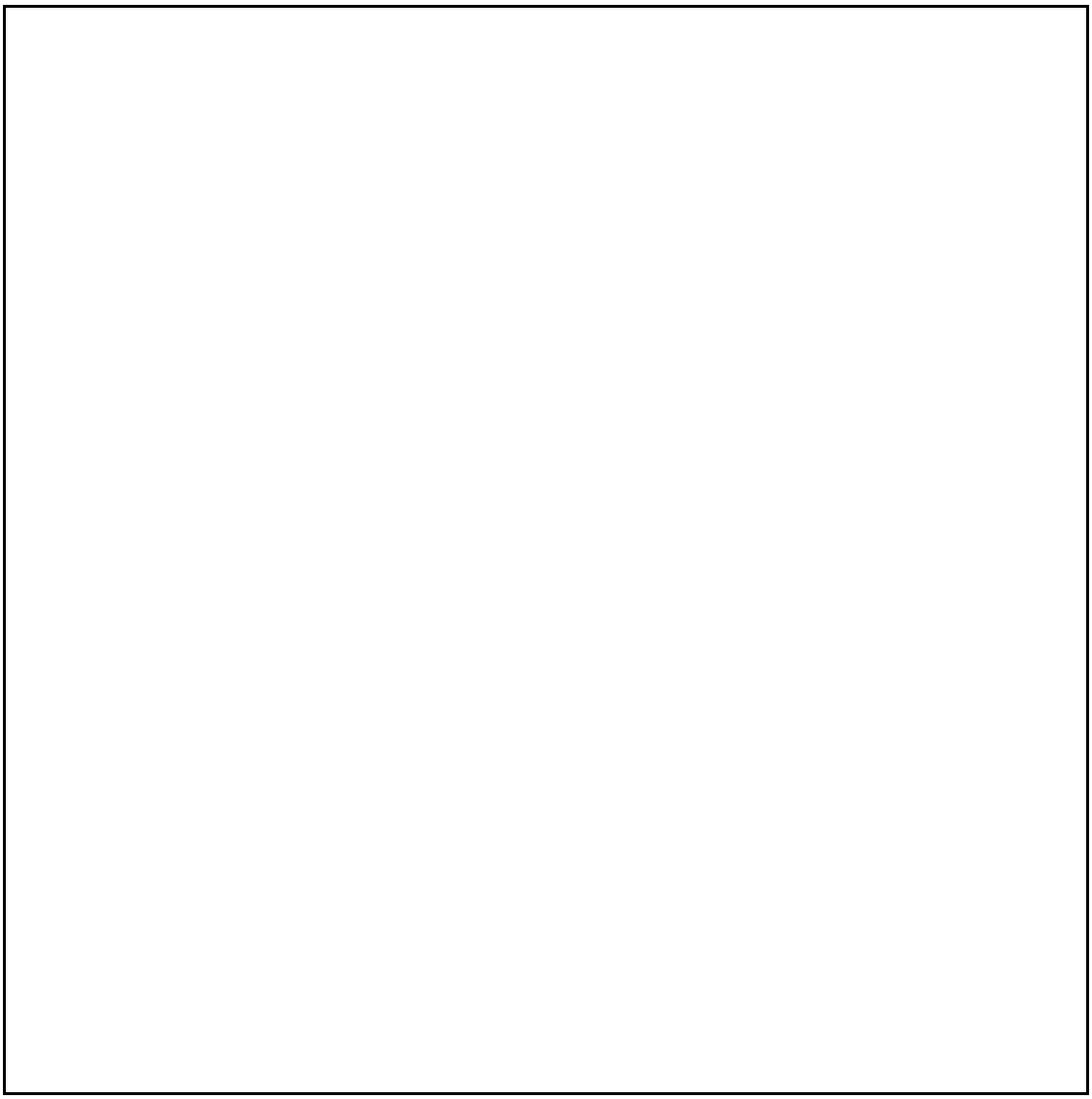
Section B: Challenges in ICT integration

6. What do you think about:

a. ICT infrastructure in your school?

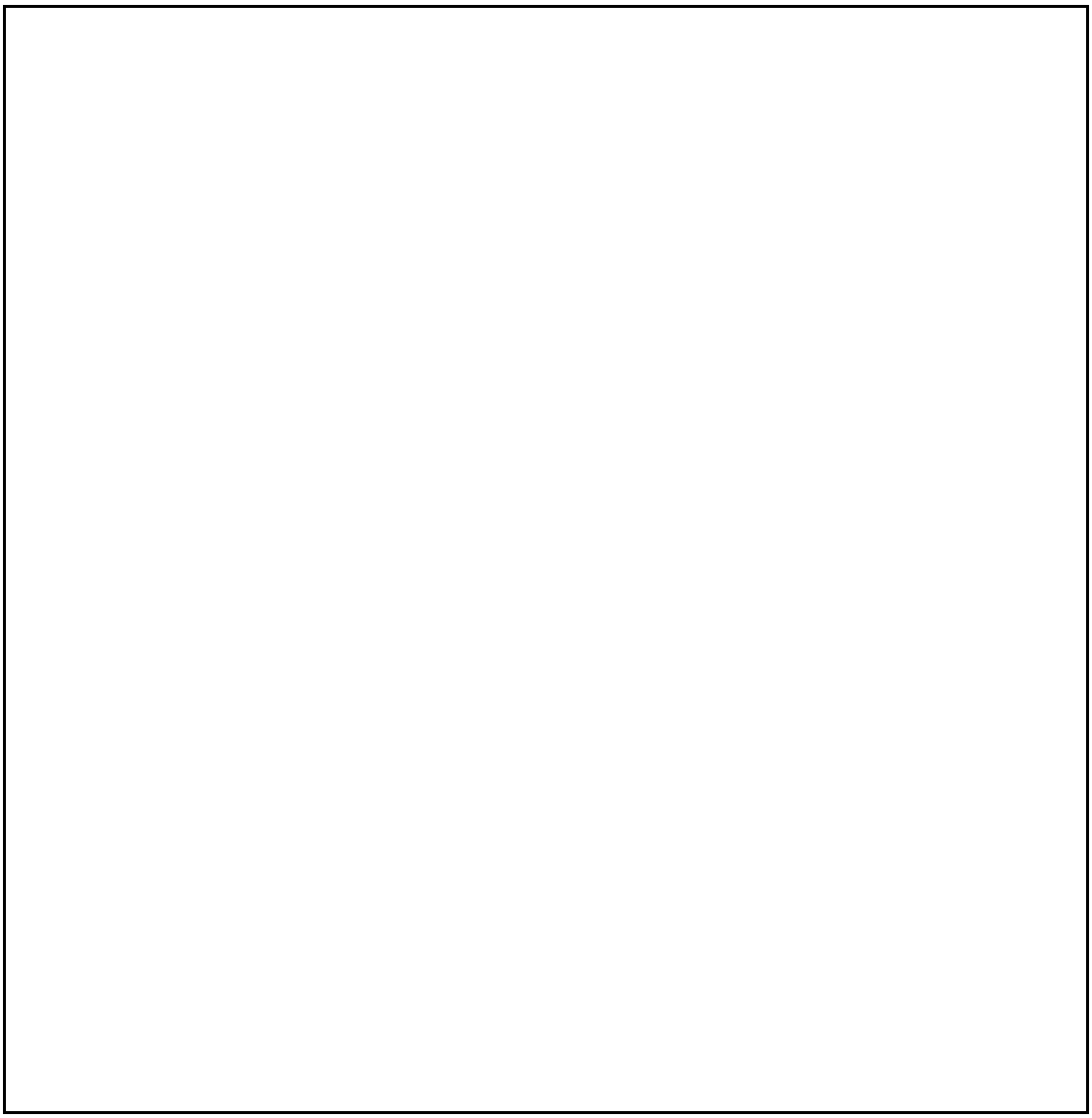


2. ICT Professional development for teachers?



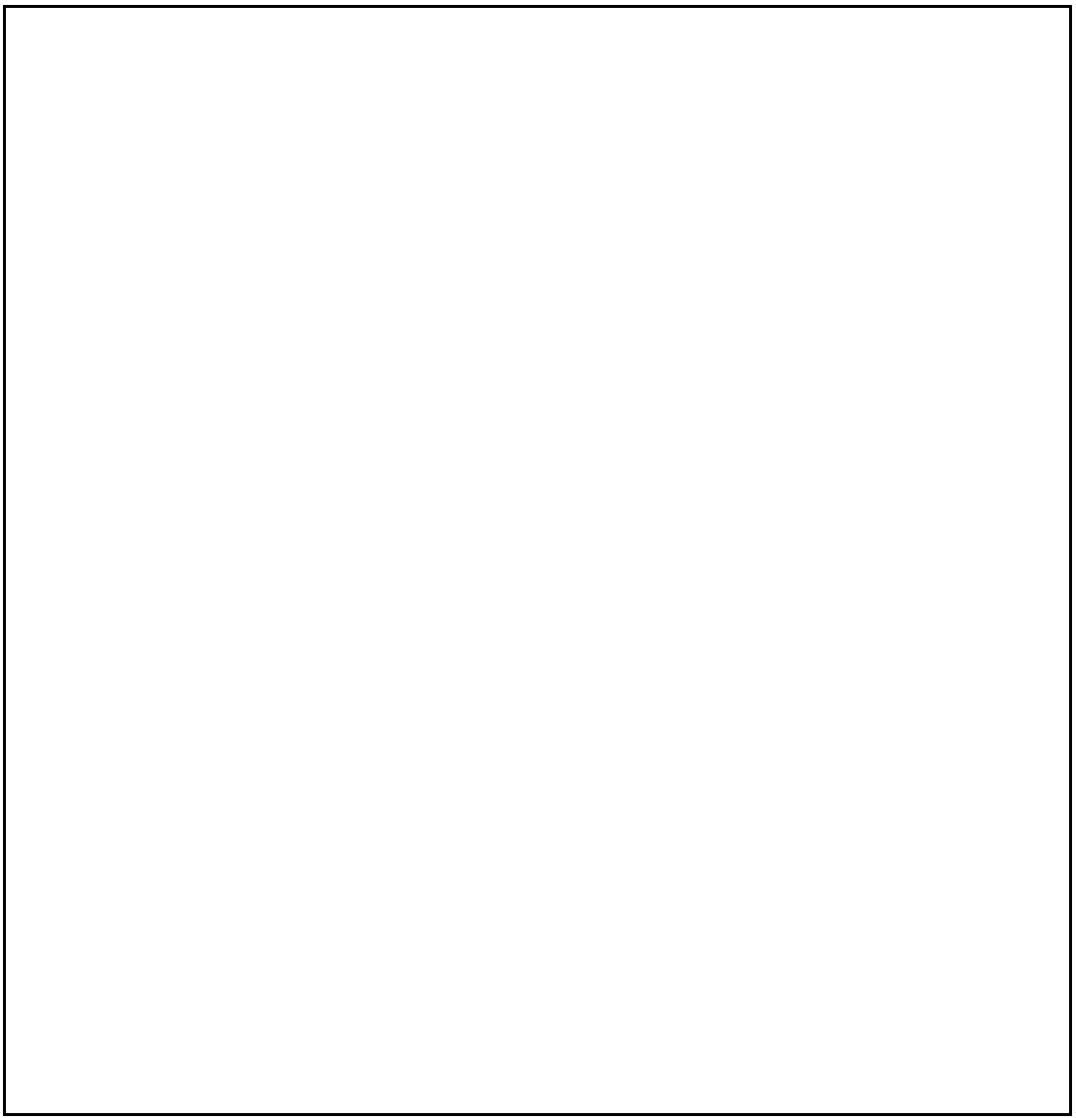
7. What are the main challenges you have encountered in integrating ICT in teaching and how did

you address these challenges?



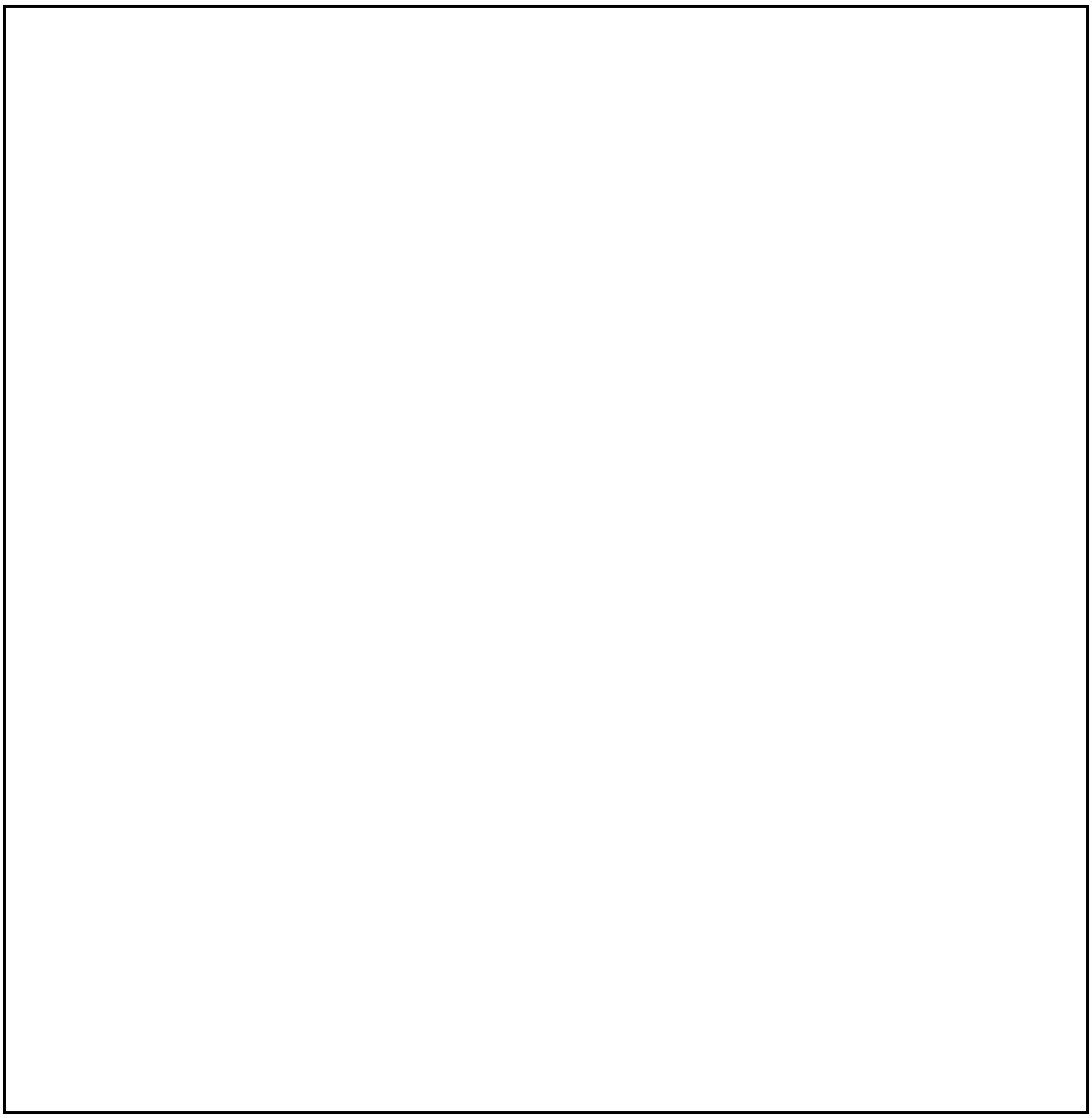
8. What concerns do you have regarding integrating ICT in teaching and learning by teachers as

compared to our traditional way of teaching? How can these concerns be addressed?

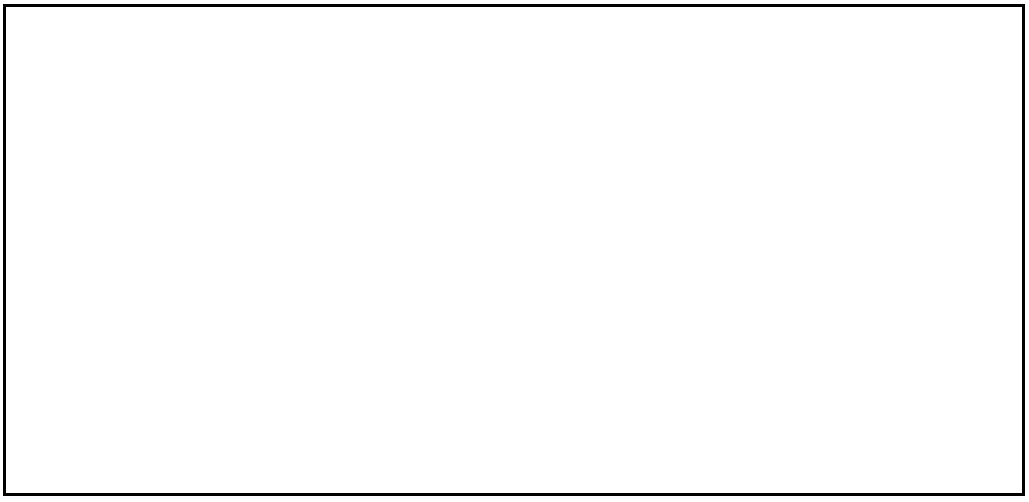


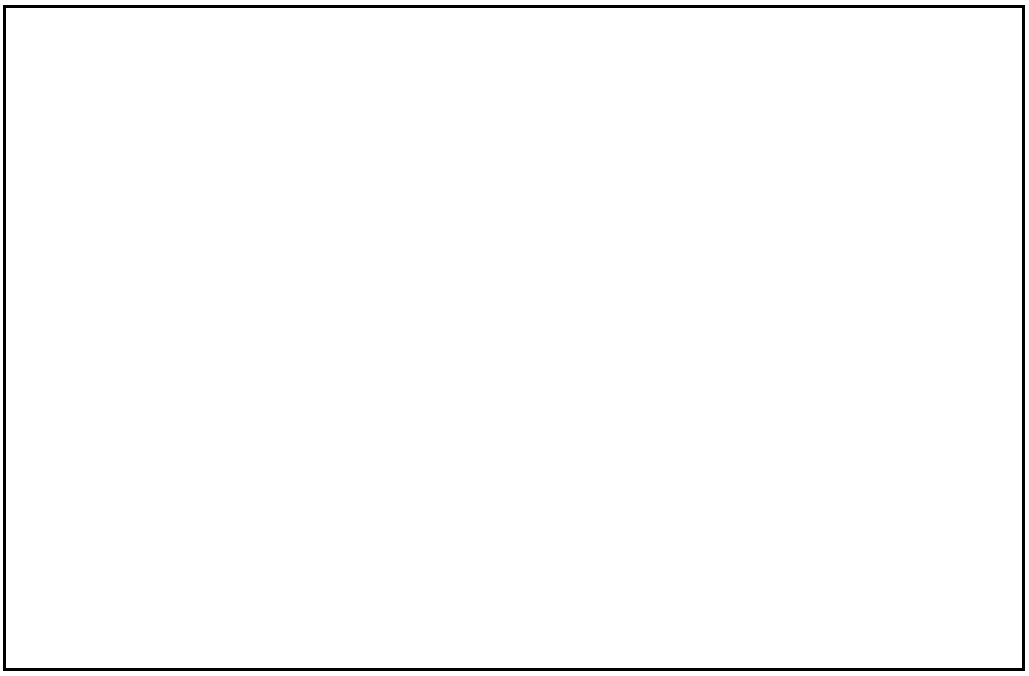
Section C: ICT integration strategic intervention

9. Highlight your strengths and weaknesses in using ICT tools in teaching and learning.



10. What else could be done to improve your ICT integration skills?





This is the end of the interview. Thank you very much for your time. Your participation is highly valued.