FACTORS AFFECTING THE IMPLEMENTATION OF E-LEARNING TEACHING IN GRADE 8 COMPUTER SCIENCE: A CASE STUDY OF SIX SELECTED SCHOOLS IN THE KHOMAS REGION, NAMIBIA

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Abstract

The implementation of E-learning has become increasingly relevant, especially during the COVID-19 pandemic. The sudden shift to online education during the pandemic highlighted the need to understand the dynamics of E-learning. E-learning is a mode of learning that takes place electronically, often via the Internet. It requires learners to use electronic devices such as computers, tablets and cell phones. This research aimed to comprehend the factors affecting the implementation of E-learning in Computer Science, at the selected secondary schools in the Khomas Region, where Computer Science is taught in Grade 8. The study investigates the factors and challenges that learners and teachers faced during the COVID-19 pandemic and the teacher's self-efficacy regarding their ICT skills. An explanatory sequential mixed method was used for this study. The study population consisted of all the computer study teachers and Grade 8 learners at the six selected schools, with a sample of 12 teachers and 90 learners. Random sampling was used to select the quantitative phase, and purposive sampling was used for the qualitative phase. In addition, self-administered questionnaires were used to collect quantitative data and semi-structured interviews were conducted to gather qualitative data. The data were analysed using SPSS and thematic analysis for qualitative data. According to the learners and teachers, the key benefits were convenience of time and place, a greater degree of trust in adopting E-learning as a teaching and learning instrument, and ease of contact between teachers and learners. However, similarly, learners and teachers complained about challenges such as limited computer and Internet access, a lack of technical support, and a lack of enthusiasm to use the E-learning platform. The results indicated that a lack of E-learning training for teachers and learners, poor awareness programs, and inadequate

infrastructure contributed to the failure of E-learning implementation in schools. The study recommends that the Ministry of Education introduce mandatory E-learning courses into the curriculum for all learners, particularly those in primary schools, to prepare the learners well for E-learning and increase their accessibility to it. Once E-learning is introduced in schools, stakeholders in the field of education must ensure that the necessary resources, such as stable Internet, computers, and trained teachers, are accessible for successful E-learning.

Keywords: Computer, E-learning, Implementation, Learners, Performance, Teachers, WhatsApp, Zoom

Table of Contents

List of Tables

List of Figures

List of Acronyms & Abbreviations

ICT	-	Information Communication Technology
ICTED	-	International Conference on Teacher Education
MOE	-	Ministry of Education
TPACK	-	Technology Pedagogy Content Knowledge
TCK	-	Technological Content Knowledge
PCK	-	Pedagogical Content Knowledge
IMTE	-	Media and Technology Education
MTC	-	Mobile Telecommunications Company
MBESC	-	Ministry of Basic Education, Sport and Culture
TRC	-	Teacher Resources Center
NAMCOL	-	Namibia College
NIED	-	National Institute for Educational Development
ACS	-	Advanced Computer Skills
BCS	-	Basic Computer Skills

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Dedication

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Declaration

I, Martha Eliaser, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution. No part of this thesis/dissertation may be reproduced, stored in any retrieval system, or transmitted in any form, or by means (e.g. electronic, mechanical, photocopying, recording or otherwise) without the prior permission of the author, or The University of Namibia in that behalf. I, Martha Eliaser, grant The University of Namibia the right to reproduce this thesis in whole or in part, in any manner or format, which The University of Namibia may deem fit.

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Name of Student	**Signature**	**Date**

CHAPTER ONE: INTRODUCTION

This chapter presents the introduction through a discussion of the background of the study, outlines the problem statement, presents the research questions, discusses the significance of the study, explains the limitations and delimitations, and ends with the layout of the chapters.

1.1 Background of the study

E-learning has become a crucial aspect of education, enabling remote learning and delivering educational content. Bidry et al. (2024) describe E-learning as the use of electronic technologies for delivering educational content and enabling remote learning. E-learning sources can be the Internet, networks, computers, Web-based learning, virtual classrooms, online tutorials, satellite TV, mobile telephony, audio and video, CD and DVD media, and other devices, Schulz (2023). The E-learning platforms are getting more popular at all levels of education from primary to university level of education (Kharate & Zaware, 2021).

However, challenges such as the availability of appropriate devices, equipment failure, inadequate internet access, slow loading times, and ineffective employee training assessments are significant (Spangenberg, 2023). Other challenges include poor technological infrastructure, digital platform failures, slow internet connectivity, lack of prior experience, potential for cheating and impersonation, inaccuracy in grading, poor security of digital platforms, and financial conditions of students (Bidry et al., 2024, Kondra, 2024).

Namibia, a large country with a small population of 3.0 million and a 1,500 km-long coastline on the South Atlantic, has a well-developed ICT system that has been carefully crafted by ICT and education stakeholders (World Bank, 2024; Ratheeswari, 2018).

In the context of Namibia education is free from primary school to secondary school (Grades 1-12). The Ministry of Education (MoE) has implemented the ICT policy to enhance the use, and development of ICT in the teaching and learning environment (Ministry of Education, 2011). Secondary schools must have at least two sites and be at least at ICT development Level 2, including ICT-trained personnel, a computer and projector system, and audio-visual resources (Ministry of Education, 2002). According to January (2022) primary, secondary, and university students are tech-savvy but need structured ways to harness and improve their knowledge and skills. Introducing ICT classes at primary schools lays the foundation for building and developing their skill set. Furthermore, many schools in Namibia provide Computer Science as an elective and theoretical topic, which is essential for effective E-learning.

Further, The University of Namibia has implemented three ICT integration courses in its B. Ed. Honours program, Integrated Media and Technology Education (IMTE) 1, IMTE 2 and Educational Technology Career Specialisation, to equip aspiring teachers with the necessary pedagogical knowledge to incorporate ICT and prepare for online learning environments (Boer et al., 2021). However, some academics argue that ICT literacy training alone does not guarantee teachers can implement technology integration or create E-learning courses.

(Kacelo et al., 2019). This study aimed to find the factors and challenges that are faced by learners and teachers in the implementation of E-learning in Grade 8 Computer Science.

1.2 Statement of the problem

During the COVID-19 pandemic lockdown, the Ministry of Education Arts and Culture (MoEAC) considered classes through E-learning (Bayer, 2020). It was not long before the Executive Director of Education announced that there were challenges faced with the implementation of E-learning (Kahiurika & Miyaniwe, 2020). Additionally, Kahiurika and Miyaniwe (2020) explain that there were some learners with access and those without access to the Internet and computers. Henceforth, this situation showed the strengths and weaknesses faced by the education systems regarding digitalisation such as technological challenges (lack of Internet connectivity and electronic devices) and teaching challenges (teachers' and learners' lack of digital skills in implementing online education), (Valverde-Berrocoso et al., 2020; Ferri et al., 2020).The competencies that direct teachers' use of ICTs in their learning and teaching processes are contained in a well-articulated study guide for ICTED standards. According to ICTED02, instructors are supposed to use ICT tools to plan and deliver lessons (Namibia Training Authority, 2006). Additionally, both teachers' and students' knowledge of it and exposure to information and communications technology (ICT) may influence the implementation of appropriate and pertinent techniques for online education (Pokharel & Chetri, 2021). Of course, taking into perspective that Computer Science teachers should have the relevant knowledge to learn and set up any Learning Management System (LMS) and be able to work within the environment. These reasons indicate that more factors are at play. Considering this, the researcher set out to investigate the factors that affect the implementation of E-learning at selected secondary schools in the Khomas Region, which has schools offering Computer Science in Grade 8.

1.3 The main research question for this study:

What are the factors affecting the implementation of E-learning in Computer Science in Grade 8 at the selected schools?

The specific research sub-questions for the study:

1. What challenges were identified by teachers and learners in the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process?
2. What are the teachers' self-efficacy regarding their ICT skills?
3. What benefits were identified by teachers and learners in the implementation of E-learning in Computer Science for Grade 8 in the teaching and learning process?

1.4 Definition of key concepts

E-learning: refers to the use of information communication technologies (ICTs) to enhance, support and deliver teaching and learning processes (Mässing, 2017).

TPACK (Technology Pedagogy Content Knowledge): it describes how teachers' understanding of educational technologies and TPCK interact with one another to produce effective teaching technology (Koehler & Mishra, 2009).

Computer Science: concentrate on fostering interest and raising confidence in the use of computing (Chelmer Valley High School, 2017).

1.5 Significance of the study

The study is envisaged to investigate ways of improving the implementation of E-learning in Computer Science, particularly in Grade 8. Moreover, the study will help the teachers, learners, parents, future researchers and the community as a whole to understand how E-

learning works as it is a paperless way of learning and teaching. With the use of a smartphone or a laptop, teachers may capture videos or text notes. Learners can use their smartphones or any other smart device to access these resources at any given time. Parents will learn about the aspects that influence E-learning implementation in their children's learning and teaching processes. Besides, researchers will utilise the variables influencing the deployment of E-learning to contribute to their publications. E-learning catches the attention of the learners, and they frequently use the Internet, mobile phones, and portable computers. Traditional classroom teaching requires a lot of paperwork. Whereas E-learning as a digital form of education uses no or few papers which reduces the use of papers in academics (Kharate & Zaware, 2021).

1.6 Limitations of the study

The study did not consider all the aspects that influence E-learning. It was restricted to elements that are affecting the implementation of E-learning regarding Computer Science at the Grade 8 level. Not all learners were allowed to participate but only the selected ones for the study. Although the researcher could have chosen several schools in the Khomas Region to participate in the study, not all of them had computers or were offered Computer Science as a school subject in the curriculum. This confined the study to six secondary schools in the Windhoek suburbs, which were appropriate participants since they were likely to have computers and/or offer Computer Science as a school subject.

1.7 Delimitation of the study

Given that more secondary schools provide computer courses in the Khomas Region, the study primarily concentrated on schools in this region. The study concentrated on the factors pertaining to the delivery of E-learning teaching in Grade 8 Computer Science. Thus, the findings will, therefore, not be generalised to the rest of the grades that offer Computer Science, and especially not to the rest of the country.

1.8 Thesis Outline

This thesis consists of five chapters. Chapter One is an overview of the study and discusses the background, problem statement and the research questions of the study. Chapter Two presents the theoretical framework and literature of the study. Chapter three focuses on the research methodology to answer the research questions, which include the description of the research design, population, as well as sampling techniques employed and the sample of respondents. It explains the research instruments employed and their results, the data collection procedures and data analysis, as well as the ethical considerations adhered to in this study. The research findings are presented in the fourth chapter, and the discussion of the findings, recommendations, and conclusions are addressed in the final chapter.

1.9 Chapter Summary

The researcher described the study's backdrop and problem statement in this section. The section also discussed the significance of the results and the primary objectives of the investigation. The limitations of the study were then explored. Keywords used in the research were defined at the end of each chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The literature review addresses the following: E-learning, Emergency Remote Teaching, ICT in education, factors of implementation of E-learning, challenges and benefits of implementation of E-learning, teacher self-efficacy, and the TPACK theories that guided the study.

This chapter discussed global and African E-learning and ICT implementation, as well provided a review of Namibia's E-learning and ICT activities in secondary education. Furthermore, the study aimed to explore the challenges and the benefits of implementing E-learning as well as the self-efficacy of teachers regarding their ICT skills. An attempt was also made in this chapter to answer the following questions. The main question: What are the factors affecting the implementation of E-learning in Computer Science of Grade 8 at the selected schools? and the sub-questions: 1. What challenges were identified by the teachers and learners during the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process? 2. What are the teachers' self-efficacy regarding their ICT skills? 3. What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

2.2 E-learning

The E-learning platforms are getting more popular at all levels of education from primary to university level of education (Kharate & Zaware, 2021). Bidry et al. (2024) describe E-

learning as the use of electronic technologies for delivering educational content and enabling remote learning. E-learning sources can be the Internet, networks, computers, Web-based learning, virtual classrooms, online tutorials, satellite TV, mobile telephony, audio and video, CD and DVD media, and other devices, Schulz (2023). The use of web-based technological tools in education, is a powerful tool for human development and self-development, offering lifelong education and knowledge acquisition regardless of financial status or life situation. Despite its disadvantages like isolation and lack of direct social contacts, e-learning provides opportunities for lifelong learning and updating knowledge. The pandemic has highlighted the need for a new teacher profile who understands the consequences of technology integration in teaching practices (Schulz, 2023).

The introduction of E-learning in Namibian schools has created great interest, although many schools do not know how to effectively use the tools. The study by Angula and Mutelo (2021) reveals that Namibian educational institutions face challenges in implementing e-learning due to a lack of ICT knowledge, causing teachers and learners to take time to familiarize themselves with the new technology.

To deliver E-learning, technologies that will support its implementation must be available and within reach. This includes storage, updates and retrieval, some of these technologies that make E-learning possible include CD-ROM, cell phones, Internet, intranet, audio, video, satellite broadcast and interactive TV (Shikongo & Ngada, 2016). During the COVID-19 pandemic, Namibian schools, including primary, secondary, and tertiary institutions, faced challenges in utilizing eLearning platforms to facilitate teaching and

learning among students and learners, as they had to adapt to the new online environment (January, 2022). Kaisara and Bwalya's (2021) paper highlights the numerous challenges that need to be addressed for e-learning to be successful, emphasizing the need for adaptability and improvement in the online environment.

2.3 Factors affecting the implementation of E-learning

Factors are typically considered as one of the issues that determine something to occur or as an aspect that contributes to a scenario or event. When it comes to integrating technology in the classroom, many instructors face the following challenge: they are computer illiterate. They find it difficult in engaging learners online; online learning requires a very high degree of self-motivation which is found to be lacking among our learners and teachers/trainers are seen as lacking the skills to apply E-learning and being hostile to the use of ICT for learning (Owuor, Kogeda, & Anele, 2013). According to Harrison (as cited in Kasse & Balunywa, 2013), Africa suffers from a typical infrastructure problem, namely, insufficient computers and funds, proper development of curricula for teaching E-learning skills, and a lack of teachers trained in terms of integrating E-learning in their teaching.

And factors that are referred to in this study, are factors that can hinder the implementation of E-learning which can be technological (lack of Internet connectivity and electronic devices) and pedagogical (teachers' and learners' lack of digital skills in implementing online pedagogy). Each factor is described in detail below.

a. Technological challenges

Technological challenges are related to the unreliability of Internet connections and many students lack the necessary electronic devices. Henceforth, this problem may increase inequalities through uneven access to the technology needed by students and teachers. According to Ferri et al. (2020), not all learners have access to the necessary technologies to take advantage of online education such as a fast Internet connection and a powerful computer. One problem observed in all countries (albeit to different extents) was insufficient bandwidth, producing delays or connection failures during lessons and video conferences. This is a technological issue, but it is also a challenge related to governance and policies related to 5G adoption in Europe and around the world. Some ICT companies have even provided free services to citizens and worked with the Ministry of Education to create completely free platforms for institutions to facilitate the organisation and transmission of teaching (Ferri et al., 2020).

Namibia has companies such as MTC and Telecom which support students and teachers to use the school platform at a cheaper rate. However, some obstacles are technological, such as the difficulty of accessing the network, the speed of data transmission, the quality of students' and teachers' ICT skills, the ability to manage time and knowledge of the best ways to interact online with other students i.e., to manage a feeling of the community (Ferri et al., 2020).

In order to venture into and develop the E-learning adoption, the students are required to gain the skills of handling the technology to ensure the success of the E-learning implementation. Even though the institution has been providing all the facilities, E-learning adoption effectiveness depends on the students' skills and readiness in using the

technology as this will prevent the facilities from being treated as an accessory in the computer laboratory (Anuar et al., 2016).

b. Pedagogical challenges

Pedagogy is a term that refers to the method by which teachers teach, in theory, and practice (Pedagogical Content Knowledge: Definition & Explanation, 2016). Pedagogy is the art and science of learning; it is the way how knowledge is delivered (Kharate & Zaware, 2021). In other words, it can be regarded as the way an educator derives the content of a particular subject to the learners. An educator can be an expert in the subject content, but they do not know how to teach it, then the learner will not get the content of the subject nor apply their prior knowledge of that subject. In 1986, Shulman, an educator and researcher, noticed that all students need a teacher who is more than knowledgeable about their subject. When a teacher is an expert in a subject and knows how to teach it properly, they have what is known as pedagogical content knowledge (Mazarin, 2016).

The pedagogical challenges are principally associated with teachers' and learners' lack of digital skills, the lack of structured content versus the abundance of online resources, learners' lack of interactivity and motivation and teachers' lack of social and cognitive presence (the ability to construct meaning through sustained communication within a community of inquiry) (Ferri et al., 2020). A teacher may be an expert in the subject content but if they cannot deliver that content online basically perhaps, they do not have the skills and knowledge about the platforms to use, which will affect the implementation of E-learning.

Ferri et al. (2020) continue to elaborate that first of all; to plan an adequate pedagogical course for remote teaching, it is necessary to increase the technological skills of all the actors involved. Teachers should be trained to increase digital and other specific skills for online education to adequately plan and implement an innovative pedagogical programme. Although students are usually very familiar with the use of digital devices, they may not be prepared to receive remote teaching and it is quite difficult to capture their attention.

c. Social challenges

Ferri et al. (2020) define social challenges as the lack of human interaction between teachers and students as well as among the latter, the lack of physical spaces at home to receive lessons and the lack of support from parents who are frequently working remotely in the same spaces. Human interaction is fundamental, especially for young students (secondary, and primary schools) that need to learn.

d. Learners' attitude toward E-learning

The learner's attitudes could have a significant effect on E-learning in which there is a self-explored, self-paced, and self-monitored learning system. An E-learning application might be rich in its system quality, service quality, and its content, but if the attitude of the learners is not right it might decrease the effectiveness of E-learning (Osman et al., 2018).

O'Donnell and Sharp (2011) discovers that students who had the attitude to willingly explore the content by themselves have higher engagement with the content, thus increasing their own mastery of the subject content. The implementation of E-learning

depends on the students' attitude toward adopting the technology. To ensure the fulfilment of E-learning implementation objectives, the institution has to consider student readiness. The E-learning adoption depends on content readiness which relates to the factor considered as the students' ability in interpreting the subject matter whether it is to be learned or taught and the goals of the instruction implemented (Anuar et al., 2016).

e. Resources to Access to Internet and Network

This was compounded by the fact that sometimes the E-learning system loads too slowly, leading to some students aborting their attempts to use it. The issue of costs has been identified as a major factor impeding successful E-learning implementation in developing countries (Kibuku et al., 2020), including Namibia (Ilonga et al., 2020). According to Kharate and Zaware (2021), one of the primary causes is the lower cost of the Internet and smart gadgets such as mobile phones, tablets, and laptop computers. E-learning provides learners with mobility and convenience that traditional education does not provide.

f. Home Environment

The challenges faced by E-learning users are not only technology related, but the social factors also had an impact on how they experienced E-learning. Some respondents indicated that their home environments were not conducive to learning (Pauli & Dawids, 2017).

2.4 Challenges of implementation of E-learning

Challenges also go under other terms such as obstacles and barriers (Mässing, 2017). Challenges, barriers and obstacles are all factors that can hinder the successful implementation and adoption of E-learning in teaching and learning. The sections will present the challenges of implementation of E-learning for learners and teachers.

Although there are numerous advantages to E-learning, many challenges must be overcome to improve its effectiveness. There is still a lack of awareness of the effectiveness of E-learning among the public. Active engagement of learners is one of the most important factors in determining the success of an online learning program. Online learning necessitates a high level of self-motivation, which is lacking among students (Owuor et al., 2013).

According to Agrawal (2015), many students and parents are unaware of the E-learning platform. There is no awareness of the effectiveness of E-learning, and many people continue to rely heavily on traditional methods, believing that mode to be superior.

There are several technological hurdles, such as a lack of literacy in utilising a computer and a smartphone, but time management has been crucial since, for example, Zoom can connect people online for 40 minutes at a time, but students take their time responding to the lecture due to technical difficulties (Alam, 2020). Quadri et al. (2017) shows that limited time to develop E-learning was the most significant factor that hinders E-learning implementation, while lack of students' ICT skills is the least significant factor.

According to the research of Basak et al. (2017) the application of E-learning in continuing education is limited by a lack of financial resources, staff technical

capabilities, and the expense of E-learning technology. E-learning should be evaluated not just in terms of its problems, but also in terms of its benefits. Alam (2020) states that there are some technical issues like poor literacy in handling computers and smartphones. Moreover, students and teachers must download some apps like Zoom, FoxFi, Audiobook, etc. Sometimes seem challenging due to not having prior experiences and these apps have limited time to be connected online.

When students join in the middle of the class, they have the chance to understand a little (Alam, 2020). Basak et al. (2017) reveal that a lack of financial resources, technical skills of staff, and the expense of E-learning technologies affect the adoption of E-learning in continuing education. E-learning should not be looked at from a negative point of view, but also from the benefits that come with it. Owuor et al. (2013) state that in E-learning, there is flexibility, accessibility and convenience. Additionally, learners can access the materials in their own time and study at their own pace. E-learning also promotes collaborative learning, thus resulting in more engaging and richer learning experiences.

Other issues that have been identified as impeding effective E-learning deployment include a lack of suitable computer skills among learners and instructors, an intermittent and unreliable Internet connection, and a lack of constant and affordable electricity, to name a few (Moakofhi et al., 2017). Not all parents own mobile phones or laptop computers, and Internet signals are weak, particularly in the suburbs. As a result, some students are unable to understand the teachings and face delays in completing assignments assigned by the teacher (Ferri et al., 2020).

2.5 Emergency Response Teaching (ERT)

Emergency remote teaching is one of the most significant worldwide developments that has resulted from the epidemic (Mutelo, 2022). According to Hodges et al. (2020) Emergency Remote Teaching (ERT) is a term that emerged during the COVID-19 pandemic and refers to a temporary shift of instructional delivery to an alternate mode due to crisis circumstances.

In Namibia, the Ministry of Education initially called for E-learning during the first lockdown period but soon realized it was not feasible. The focus shifted to ERT, aiming to salvage the educational calendar year and avoid setbacks. Challenges included limited telecommunication infrastructure and the need to adapt to a new national educational system (Boer & Asino, 2022). Key lessons learned from the crisis include availability of technology is necessary but not sufficient for effective remote learning; teacher training and ongoing professional development are critical; meaningful interaction between students and teachers should be facilitated and flexibility and understanding are essential during emergency transitions (Rodriguez et al., 2022; Khlaif et al., 2021).

2.6 ICT in Education

Over the past decade, countries have been investing in the use of Information Communication Technology (ICT) in education. ICTs at present are influencing every aspect of human life. When we are talking about ICT it refers to the use of computers, the Internet and other technological tools attached to the computer system. Tunmibi et al. (2015) define the uses of ICT in education, which includes accessing the enormous number of educational resources on the Internet and online libraries. For this study, ICT

integration means the use of computers, the Internet and related tools in the teaching and learning of subject content.

2.6.1 ICT Policy in Education

ICT policy for education is concerned with providing clear objectives and basic competencies for learners, students, and teachers to achieve key ICT knowledge and skills (Minister of Basic Education, 2007). As a matter of equity and quality, the ICT policy for education requires curricula to be maintained which indicate exactly what is expected of learners, students, and teachers concerning ICT in education (National Institute for Educational Development [NIED], 2015). It is important that each government develops its own ICT policy for the education system, according to the educational system or curriculum they are using.

Namibia is one of the largest countries with a small population in Southern Africa. Education is free from primary (0-7) to secondary school (grades 8-12). The country appears well ahead of its African counterparts in terms of ICT integration into education; its level of ICT infrastructure, and its commitment to ICT for teachers and students (Burns, 2006). Furthermore, the Ministry of Information and Communication Technology (2009) outlines that Government's Vision 2030 document stipulates that ICT must be the most important sector in the economic development of the country by 2030. Education is one of the sectors that is uplifting the growth of the economy and making a great contribution to the development of the national economy. A country without a good standard of education is poor.

Namibia has a well-developed ICT that has been carefully crafted in a consultative fashion by ICT and education stakeholders (Ratheeswari, 2018). The ICT policy was introduced in 1999 and the review of this policy took place in 2005, resulting in a new national ICT policy implementation (Ngololo et al., 2012). The development of the ICT policy and the recent initiatives of increasing investment in ICT facilities are proof that the Namibian government acknowledges the importance of ICT in education (Afunde, 2015). The Namibian Ministry of Education reserved funds for ICT in education in the national budget from 2006/ 2007 onwards (Ngololo et al., 2012).

The Ministry of Education (MoE) has implemented the ICT policy for education to enhance the use and development of ICT in the teaching and learning environment (MoE, 2005). The policy has five development levels with specific goals which are used to measure progress in the implementation of ICT in education. The policy stipulates that schools offering secondary education are expected to be at least at minimum Level 2 of the five levels of ICT development in the educational institutions.

The criteria for Level 2 expect secondary schools, among others, to:

- have computers accessible to all teaching staff and Internet connectivity.
- have teachers who are able to use the Internet, e-mail and word processors.
- enable learners to spend at least one hour every two weeks on the computer.
- have teachers who are able to download and create learning materials; and
- integrate the use of technology in the teaching and learning situation.

Several organisations have been supporting ICT development in education, such as School Net Namibia, a driving force in Namibia's ICT policy, Vendors such as Microsoft have provided hundreds of Namibian schools with ICT resources, computer laboratories and training (Burns, 2006). Additionally, the Embassy of Finland, via CECS Namibia has provided sufficient funding support to train all the lecturers at the colleges of education in the intermediate level ICT literacy certification by the end of 2017 (TECH/NA!, 2006).

2.6.2 The Support for Assisting Teachers in the Use of ICT for Teaching and Learning

The Ministry of Basic Education, Sport and Culture (MBESC) has set up local level supports for teachers to assist them with technology use and improving overall teaching skills and one of the centers that support teachers in the use of ICT is the Teacher's Resources Center (TRC) (Burns, 2006). TRCs are located in urban or semi-urban areas in all the regions of Namibia. Teachers may use this facility for free when doing school-related work and Internet use is offered at a low cost for teachers (Burns, 2006). Although teachers have this facility, most of them hardly make use of it.

Teachers play an important role in ensuring that the learners acquire the appropriate skills to use ICT effectively. However, the teachers will not be able to impart the necessary skills unless they receive intensive training. Effective use of ICTs in schools is most helpful for teachers and learners (Afunde, 2015).

As highlighted in the ICT policy for education, all pre-service and in-service teacher education initiatives delivering BETD, B. Ed, or other equivalent programmes should achieve ICT development level 5, which state that (TECH/NA! 2006):

- all teacher educators have an intermediate-level ICT literacy certificate.
- at least 50% of the teacher educators have an advanced level ICT literacy certificate or an ICT Diploma/degree or equivalent; and
- All graduating students have an intermediate-level ICT literacy certificate.

According to the ICT policy, Level 5 is attained if an institution can offer ICT-related courses. For instance, institutes like the University of Namibia have three ICT integration courses in its B. Ed program namely: Integrated Media Technology Education IMTE1, IMTE2 and Educational Technology Career Specialisation. These courses/modules aimed to give prospective educators the necessary pedagogical focus to integrate ICT and prepare and work in an E-learning environment (Boer et al., 2021). It is based on the above-mentioned ICT training opportunities that the Ministry of Education expects the teachers to integrate ICT into teaching and learning.

Furthermore, The Ministry of Education, in conjunction with the National Training Authority, developed a national ICT literacy certification, which includes foundation, intermediate and advanced levels. This ICT literacy certification is done by the Namibian Qualification Authority (Afunde, 2015). To this effect, the MoE agreed with institutions such as NAMCOL, which offered International Computer Driver's License (ICDL) training for teachers (NAMCOL, 2010). In a study conducted by Ngololo et al. (2012) on the evaluation of the implementation of ICT policy in Education in a rural junior secondary school in Namibia, it is recorded that 352 teachers obtained the ICDL certificates throughout these agreements. Furthermore, the Ministry of Basic Education, Arts and Culture in partnership with Telecom Namibia established XNET, which provides

affordable and reliable bandwidth Internet connectivity to all educational institutions in Namibia.

2.6.3 ICT Across Curricular

The Namibian government's Vision 2030 document stipulates that ICT must be the most important sector in the economic development of the county, the Ministry of Education integrate ICT education and training into the education and training system to achieve the objective of Vision 2030 (Ministry of Information and Communication Technology, 2009; National Institute for Educational Development, 2015).

Since ICT is part of the economic growth in the education sector, it is integrated into all subjects of the National Curriculum for Basic Education as a cross-curricular theme. All the subjects that are being offered in school blend in with ICT to enable learners to acquire computer skills at a young age, which is a very high priority for the government and the Ministry of Education (National Institute for Educational Development, 2015).

The new national ICT curriculum is structured as follows:

- ✓ In the junior primary phase (Grades 1-3), ICT is taught as a cross-curricular theme. Learners participate freely in ICT-related activities and use educational games, software and multimedia as appropriate to their purpose or task.
- ✓ In the senior primary phase (Grades 4-7), the subject Information and Communication (IC) is a compulsory subject. It is a combination of the two existing subjects, namely, ICT Literacy and Basic Information Science (BIS).

- ✓ In the secondary phase (Grades 8-12), the IC syllabus focuses on advanced word processing skills, presentation software (PowerPoint), spreadsheets, databases and web design.

Although ICT is a compulsory subject, it is hardly taught. The teachers mostly make use of these subjects to teach other subjects or the subject is given to the teacher who does not have knowledge about ICT and this time it is just to feel up the number of periods in the timetable and sometimes a teacher can have knowledge about ICT but, there are no resources such as textbooks, computers and other ICT tools to support the teachers and learners. Unfortunately, ICT is not a promotional subject, teachers/learners tend to see it as not important. Recent research in Turkey found that the main problem with implementing new ICT in education was the insufficient amount of in-service training for teachers, thus Özden (2007) and Toprakci (2006) conclude that limited teacher training in ICT use in Turkish schools is an obstacle.

2.6.4 ICT in Computer Science

The application of computers has become an integral part of present-day society, also in Namibia, to the extent that the skill to use a computer is a major requirement for many vocations and contributes to efficiency in many others. The NIED (2018) defines Computer Science as a dynamic, living cultural product involving conceptual structures, strategies of problem-solving and attitudes towards and appreciation of technology and with this intended to broaden the students' knowledge of the nature of information processing and how information and communication are used today. Further, Computer Science is taught as an elective subject. It is a highly specialised and theoretical subject.

Topics in the course include systems analysis, data paths, number systems (decimal, binary and hex), logic gates and the writing and interpreting of algorithms and computer programmes. For pedagogical reasons, a subject of this magnitude cannot be taught in the primary phase. Therefore, it is placed in the secondary school (NIED, 2015).

The Ministry of Education introduced a subject policy guide for computer study in 2009. This subject policy guide applies to Computer Science in the Junior Secondary and Senior Secondary phases in all government schools in Namibia (NIED, 2009). This document is the official subject policy guide for Computer Science. It makes provision for a well-organised and practically orientated programme in the teaching and management of Computer Science in the school and aims to (NIED, 2009):

- Provide guidelines for subject managers in controlling teaching and learning activities.
- Guide teachers in organising their administrative duties and in planning teaching and learning to meet the expectations of the national standards and performance indicators.

In addition to the subject policy guide for Computer Science, there is a syllabus, which guides the teachers, and it contains all the topics needed for each Grade.

Computer Science promotes the following aims in the curriculum (NIED, 2015):

- Prepare the learner to have a basic knowledge of computer technology and to be able to utilise it.
- Enable the learner to use computer technology effectively as an aid to his/her studies.

• Enable the learner who continues with Computer Science as a subject to have a sound foundation to build on.

• Broaden the horizon and insight of the learner and make him/her aware of the possibilities and limitations of computer technology.

• Give the learner a basic education in the methods of gathering and processing data by the use of modern technology.

• Develop the learner's knowledge of correct computer terminology.

2.6.5 ICT in E-learning

Harrandi (2015) discovers that computer literacy has a positive effect on students' motivation to use E-learning. Students with Basic Computer Skills will feel more interested and motivated to use E-learning, meanwhile, students with no Basic Computer Skills will feel more difficult to get engaged because they need to learn how to use the application first (Osman et al., 2018). ICT skills are fundamental to implementing E-learning.

E-learning refers to a broad combination of processes, content, and infrastructure to use computers and networks to scale and/or improve one or more significant parts of a learning value chain, including management and delivery (Aldrich, 2005). E-learning is a form of online education whereby Alam (2020) defines online education as a form of education where students use their home computers through the Internet staying away from academic institutions. In recent times, online teaching learning has become a buzz word in the field of education as finding no other alternatives to providing education to the students in the class.

Therefore, the introduction of E-learning in Namibian schools has created great interest, although many schools do not know how to effectively use technical tools. As such then, the University of Namibia has implemented three ICT integration courses in its B. Ed. Honours program, namely, Integrated Media and Technology Education (IMTE 1, IMTE 2) and Educational Technology Career Specialisation. These courses aimed to give prospective educators the necessary pedagogical focus to integrate ICT and prepare and work in an E-learning environment (Boer et al., 2021). In Kacelo's (2019) study, the scholar notes that ICT literacy training alone does not mean that teachers can do technology integration or put together E-learning courses. This is consistent with the observations made by Eke (2010), who notes that a lack of vision and implementation frameworks contributed to E-learning failure.

In Namibia, there have been concerted efforts by policymakers to make ICTs an integral teaching tool at all levels of education. The Namibian government's education ICT policy is aimed at capacitating learners, teachers and the community for the modern economy (Gunga & Ricketts, 2007; Paledi & Alexander, 2018). Woyo et al. (2020) confirm that while the Namibian government developed its ICT for education policy in 2005, research on the perceptions of higher education students regarding E-learning remains limited. They observe that the bulk of the extant literature in Namibia has focused on high schools, thus leaving a knowledge gap that is yet to be adequately addressed.

Currently, E-learning in the Namibian context seems to be more of an avocation than an integral part of disseminating educational information. This is not a unique situation, as Shurville et al. (2010) have established that in some instances, management may publicly show E-learning support, while privately resistant to any significant IT overhaul.

Although many works of literature forecast high school, no literature shows the achievement of E-learning in Namibia. Challenges such as resources to access the Internet, limited accessibility and network connection, a school with limited technical support and a lack of teachers' competency are yet to be addressed for the implementation of E-learning in high school to be successful.

2.7 Benefits in the implementation of E-learning in the teaching and learning process

Benefits are often considered as characteristics that are good and contribute to something positively. The sections will present the benefits of implementation of E-learning for learners and teachers.

2.7.1 Benefits of Implementation of E-learning for Learners

Some benefits of E-learning already exist in the world. Tunmibi et al. (2015). show that most students agreed that E-learning helps students to have access to unlimited sources of information; reveals the connection between subjects; promotes critical thinking; and encourages students' way of learning. If E-learning thinking is promoted it will increase their computer skills in the subject. Pardemean and Suparyanto (2014) add that computer skills had a strong correlation with their achievement. It is important for a learner to have computer skills to have a successful implementation of E-learning (Ali, 2013) online and web-based quizzes, with the implementation of E-learning, learners can be given online and web base quizzes, that they can do at their own pace. E-learning helps them to perform group activities through group projects in simulation labs on real-time problems which improve qualities such as analytical thinking, decision-making and resolving problems in a critical situation (Owuor et al., 2013). Kharate and Zaware (2021) further claim that by

combining theory with practical knowledge, the theoretical information would pique learners' attention and raise their thinking level, and the learners' creativity and imagination power will be enhanced in their practical approach.

For example, in his book review on E-learning strategies for delivering knowledge in the digital age, Marc's 2002 study (as cited in Arkorful & Abaidoo, 2015) notes that one of the advantages of E-learning in education is its focus on the needs of individual learners as an important factor in the process of education rather than on the e adoption of E-learning in education, obtained from review of literature includes the following: It is capable of facilitating relationships amongst learners through the usage of discussion forums-learning encourages students to communicate with one another while also exchanging and respecting different points of view, E-learning is cost-effective since it eliminates the need for students or learners to travel; it is also cost-effective in the sense that it provides learning opportunities to the greatest number of learners while not necessitating the construction of several structures.

This is one of the most significant advantages in times of outbreak, such as the COVID-19 epidemic, because the teacher may reach out to more than one class, as opposed to the typical classroom, when the teacher must teach more than one class at various times and lastly individual learners are usually considered in E-learning (Owuor et al., 2013).

2.7.2 Benefits of Implementation of E-learning for Teachers

A study by Tunmibi et al. (2015) states that the majority of the teachers agreed that E-learning is easier and more effective; helps to further develop teachers' computer skills; and brings out the best in students. Therefore, the scholars illustrated that E-learning helps

teachers and students to share accountability for learning and achievements. Teachers always must make sure that work is prepared on time for the learners.

It is efficient and time saving, teachers can pre-assign the work to students through email or the school web portal before even getting into class or a day before and students can view the assignments and class schedule in advance to prepare and complete the assigned work beforehand, making more efficient time-saving approach (Ali, 2013).

2.8 Teacher self-efficacy

According to Sharma and Sharma (2019), self-efficacy is a common subject of psychological studies and tends to be used as a shorthand for the beliefs that human beings have in their own ability and capacity to act and succeed. Furthermore, Sharma and Sharma (2019) add that there are three aspects of teacher "self-efficiency", namely, Teaching effectively: Learning abilities and Professional knowledge.

Computer self-efficacy can be used to predict teachers' desire to use computers (Beaudin, 1998). Because computers are a relatively new phenomenon in education, educators must understand the extent to which instructors' levels of computer self-efficacy influence their teaching. This information is significant because, if levels of computer self-efficacy have a significant impact on the implementation of computers into classroom teaching, then instruments that can measure computer self-efficacy could assist schools in developing technology implementation plans that specifically address the needs and abilities of their teachers (Beaudin, 1998).

A lack of teacher confidence, a lack of teacher competency, and teachers' negative attitudes and resistance to change are examples of teacher-level hurdles or issues. Further

research has demonstrated that many factors impacting teacher use of technology in a broader sense stem from the teacher's working environment (Gbemu et al., 2020).

Teachers who participate in in-service training activities may become aware of new teaching methods and techniques, as well as gain knowledge, skills, behavior, and positive attitudes specific to the field (Desimone, 2009; Koh et al., 2017) and integrate new knowledge and skills into the teaching-learning process. On the other hand, it is frequently stated in the literature that in-service training contributes to the development of teachers' self-confidence and assists them in communicating with individuals in the school and society (Gültekin & Çubukçu, 2008) where it improves teacher quality and positively contributes to the quality of all stakeholders in the school (Opfer & Pedder, 2011).

Teachers' inability to integrate ICTs into educational processes is attributed to a lack of self-efficacy and motivation, a negative attitude, and a lack of technological literacy (Ertmer et al., 2012; Koehler & Mishra, 2009; Player-Koro, 2012; Scherer, Tondeur, Siddiq & Baran, 2018). Teachers, as essential users who play an important part in the success of online learning, must be eager to offer online learning content and can integrate technology for successful E-learning (Nguyen et al., 2022).

2.9 Theoretical framework

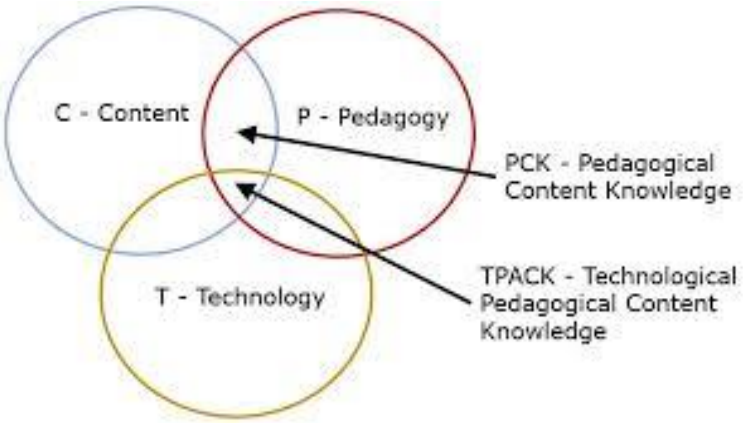
The literature review covered aspects of content and pedagogy knowledge, as well as technical knowledge. Mishra and Kohler (2006) state that to integrate technology into teaching, teachers need knowledge, which falls under three major domains, namely, Content Knowledge, Pedagogical Knowledge, and technological knowledge. Thus, a

framework is needed to assist the teachers in understanding the technology further to ensure the success of implementing E-learning in the teaching and learning process.

The TPACK framework explains the complex relationship between content, pedagogy and technology knowledge and how these knowledge domains intersect to create the new kinds of knowledge needed to support online teaching and learning (Ward & Benson, 2010). It emphasises how the connections among teachers' understanding of content, pedagogy, and technology interact with one another to produce effective teaching (Koehler et al., 2014).

Teachers need to understand the knowledge components in the TPACK framework to integrate or make use of technological tools in teaching and learning. The use of technological tools in their education and learning process will make it easy for them to successfully implement E-learning. Writer (2019) explains that the TPACK framework is an effective approach to the implementation of Educational Technology or E-learning practices. He further adds that TPACK outlines how content (what is taught) and pedagogy (how the educator communicates the content) should form the foundation for successful E-learning.

Figure 2. 1: Technological Pedagogical Content Knowledge (TPACK) framework



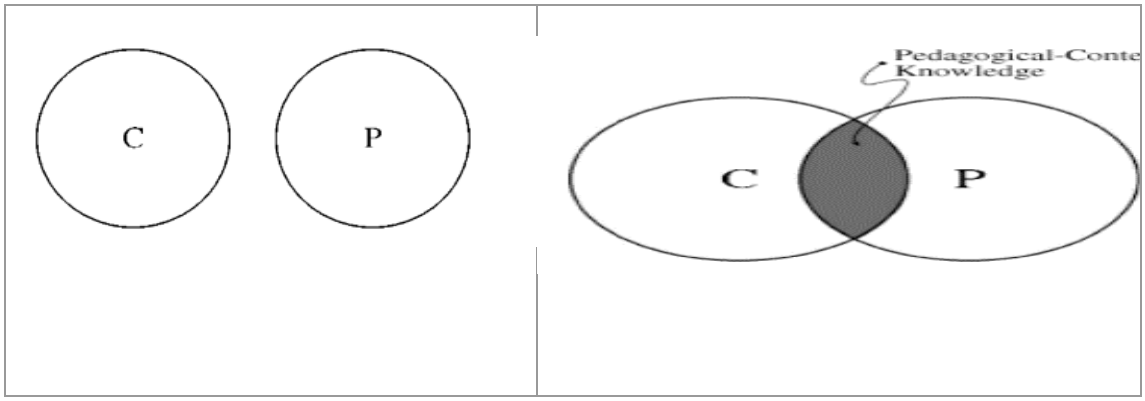
The TPACK framework has been discussed widely in various studies involving the integration of technology in teaching and learning (Shafie et al., 2019). Most researchers generated and developed self-reported TPACK measuring instruments based on the work of Koehler & Mishra (2009) to measure teachers' levels of TPACK. However, with the transformation in education revolving around 21st-century skills nowadays. It is then crucial to investigate whether teachers can apply TPACK while teaching 21st-century skills or not (Shafie et al., 2019).

2.9.1 Content and Pedagogy Knowledge

Mathew & Mishra (2009) define Content Knowledge as teachers' knowledge about the subject matter to be learned or taught while Santos and Castro (2021) regard Content Knowledge as the body of knowledge and information that teachers teach and that students are expected to learn in a given subject or content area. Pedagogical Knowledge is the teachers' deep knowledge about the process and practices or methods of teaching and learning. A teacher with deep Pedagogical Knowledge understands how students

construct knowledge and acquire skills and how they develop habits of mind and positive dispositions towards learning (Koehler et al., 2014).

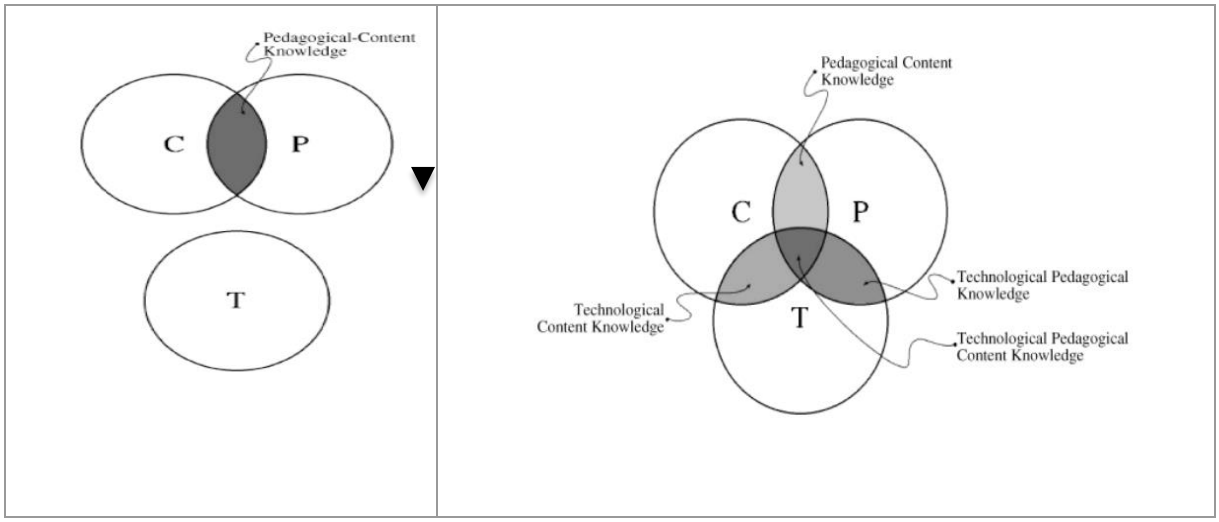
Figure 2. 2: The emphasis on teachers' subject knowledge and pedagogy were being treated as mutually exclusive domains in research concerned with these domains.



Shulman (1986) says that having knowledge of the subject matter and general teaching strategies was not sufficient for capturing the knowledge of good teachers. He proposed considering the necessary relationship between the two by introducing the notion of PCK. PCK interacts with one another to produce effective teaching with technology.

2.9.2 Content-Pedagogy and Technological Knowledge

Figure 2. 3: Content and Pedagogy Overlap to Form Pedagogical Content Knowledge while technology is seen as being a separate and independent knowledge domain.



The relationships between content (the actual subject matter that needs to be learned and taught), pedagogy (the process and practice of teaching and learning) and technology (both conventional like chalkboards and cutting-edge like digital computers) are complex and nuanced. It was shown that teachers frequently lack the skills necessary to successfully incorporate technology into their teaching and that most of their attempts are modest (Koehler et al., 2014).

2.9.3 Technological Pedagogical Content Knowledge

TPACK involves an understanding of the complexity of relationships among students, teachers, content, technologies, and practices (Archambault & Crippen, 2016). According to Koehler & Mishra (2005), "We view technology as a knowledge system that comes with its own biases, and affordances that make some technologies more applicable in some situations than others" (p. 132). Using Shulman's (1986) PCK framework and combining the relationships between Content Knowledge (subject matter that is to be taught), technological knowledge (computers, the internet, digital video, etc.) and

Pedagogical Knowledge (practices, processes, strategies, procedures, and methods of teaching and learning), Koehler and Mishra (2005) define TPACK as the connections and interactions between these three types of knowledge.

Although creating the concept of TPACK by adding the element of technology to Shulman's (1986) notion of PCK makes sense on the surface, it remains to be determined if knowledge in each of these domains truly exists and, if so, how can these elements be accurately measured (Gess-Newsome & Lederman, 1999).

2.9.4 TPACK in the Implementation of E-learning

The TPACK framework is used to assess the readiness of instructors and students to integrate technology into their educational processes. This framework is appropriate for use in educational settings as well because it was created with instructors' comprehension of using technology in the classroom in mind (Anuar et al., 2016).

The TPACK framework has a practical appeal, providing an analytical structure for researching what teachers should know and be able to do while also highlighting the importance of Content Knowledge when incorporating the use of technology. These are important elements, as currently a greater emphasis on the use of technology is needed as it pertains to the specific subject matter (Archambault & Crippen, 2016). However, Anuar et al. (2016) interpret that to achieve a high standard of E-learning implementation, the institution has to provide good facilities to perform the learning and teaching via E-learning. The E-learning style is fully dependent on the computer and the internet. Therefore, the software and the hardware including unlimited Internet access must be provided for the students to ensure E-learning is achieved.

2.10 Chapter Summary

This chapter discussed E-learning, ICT in education, factors for implementation of E-learning, benefits of implementation of E-learning, challenges with implementation of E-learning in the teaching and learning process, teacher self-efficacy, and finally the chapter discussed the TPACK theory, as the supporting theoretical framework in answering the research question concerning teacher's and learners' implementation challenges of e-learning in teaching computer science. The following methodology chapter discusses the data collection, analysis of the data and ethical consideration.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

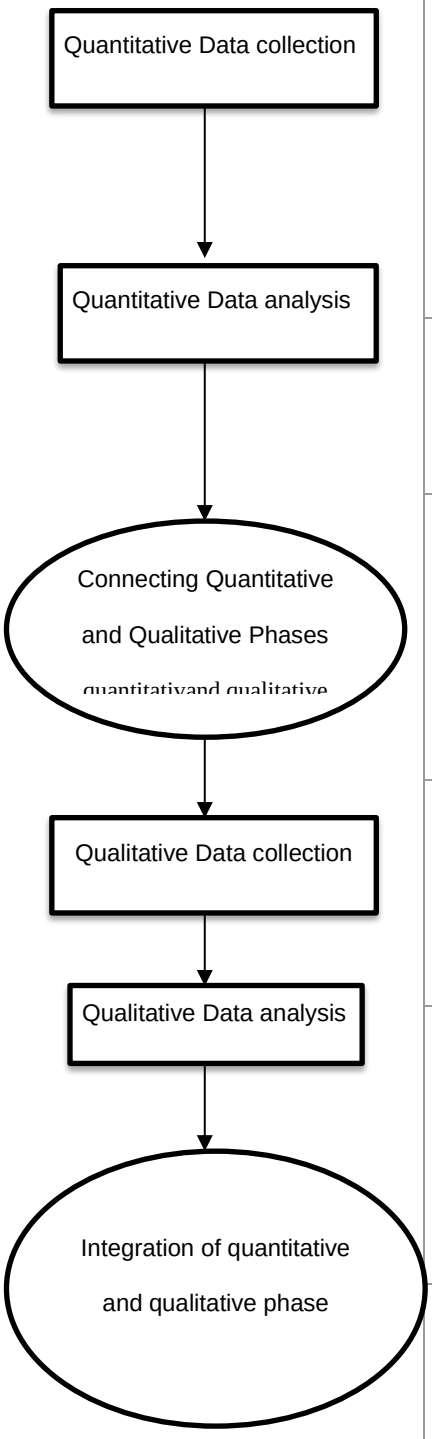
In the previous chapter, the researcher looked at existing literature related to this study. This chapter includes the research methods and the design that were employed to effectively complete this research. The chapter also includes descriptions of data-gathering strategies as well as data analysis procedures. The chapter then discusses the study's populations and samples, as well as the measures used to ensure reliability and validity, as well as the ethical issues that were put in place to ensure the study's successful undertaking and to answer the following questions: The main question: What are the factors affecting the implementation of E-learning in Computer Science of Grade 8 at the selected schools? and the sub-questions: 1. What challenges were identified by the teachers and learners during the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process? 2. What are the teachers' self-efficacy regarding their ICT skills? 3. What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

3.2 Research design

The purpose of this study is to explore the factors affecting the implementation of E-learning in the process of teaching and learning in Grade 8 Computer Science. The study follows an explanatory sequential mixed-methods design. The mixed-methods design is defined by Ivankova et al. (2006) as "a procedure for collecting, analysing, and integrating both quantitative and qualitative data at a certain stage of the research process within a

single study to gain a better understanding of the research problem" (p. 3). This method was used to obtain a clearer picture from the quantitative data, and then to use the qualitative data to provide a better understanding and explanation of the study in question (Creswell et al., 2007). The design consists of two phases of which emphasis is placed on the quantitative phase and the qualitative phase explains the quantitative phase (Subedi, 2016). The rationale for this approach is that the quantitative data and results provide a general picture of the research problem, more analysis, specifically through qualitative data collection is needed to refine, extend or explain the general picture. According to Creswell (2013) the mixed method aims to provide a better understanding of the research problem and questions rather than either method used by itself. The researcher targeted to conduct the study in one region of the country Khomas Region, Namibia. The researcher purposely selected the most relevant participants in the education sector who are in the best position to provide the breadth of information necessary in relation to the research question (Given, 2008), which in the process led to the successful completion of the study.

Table 3. 1: Visual display for the explanatory sequential study design procedure

Phase	Procedure	Outcome
	• Randomly • Sent out a self-administered survey to 12 Computer Science teachers and 90 Computer Science learners at six selected schools	N=102 Numeric data
	• Descriptive frequency, tables, graphs • SPSS software	Descriptive statistics
	• Purposively selecting two teachers from each school and five learners from each school, at six selected schools. • Developing interview questions	N =42 Interview protocol
	• Interview with individual participants. 12 Computer Science teachers and 30 Grade 8 Computer Science learners.	Interview transcripts and recorded
	• Coding and thematic analysis	Codes and themes
	• Interpretation and explanation of the quantitative and qualitative results.	Discussion Implication Future research

3.3 Study population

In the quantitative phase the population of this study consisted of all the Computer Science teachers and Grade 8 learners at the six selected schools, with a sample of twelve teachers (two teachers per school) and 90 learners (15 learners per school). As such, the sample is comprised of three schools from Windhoek, to allow for possible variations in the responses. Six secondary schools were purposively selected for the study. All the schools selected had reasonable access to computers, the Internet, and computer laboratory, and offered Computer Science as one of their subjects. This made the researcher believe that these were the most appropriate schools that could provide enough information on the state of computer technology in education. Therefore, the sample size was 102 participants.

3.4 Sample and Sampling procedures

Sampling is defined as the process of selecting units from a population that will be used to represent the entire population (Singh & Kultar, 2007). Since the study followed the explanatory sequential mixed-method approach, two methods of sampling were used to obtain samples for the quantitative phase and qualitative phase.

3.4.1 Quantitative Phase

Notably, in the quantitative phase, the sampling is random, whereby surveys were sent to the entire population of all 12 Grade 8 Computer Science teachers and ninety learners, at the six selected secondary schools in Khomas Region.

3.4.2 Qualitative Phase

While in the qualitative phase purposive sampling was used to select teachers who have the following criteria, teachers with Advanced Computer Skills the learners who had a computer as a subject in Grade 7. The qualitative phase is dependent on an analysis of the quantitative phase. Thus, this method allowed the researchers for more conversational interaction, permitting them for a greater amount of data to be gathered (Almaiah et al., 2020). One advantage of using the qualitative technique in this study is that it allows us to gather information from participants rather than simply listing numerical statistics. Furthermore, the qualitative technique allowed the researchers to gain a deeper understanding of the major factors influencing the adoption of E-learning teaching and learning processes in Computer Science, as well as the benefits and challenges that E-learning encounters. As a result, this may give sufficient information to answer the research questions.

3.5 Codes of participants

A code is a unique number or unique combination of letters, numbers and/or symbols used to identify a research participant. Codes are used in this study for confidentiality purposes. The selected schools were given the name codes S1-S6. The teachers were named TS1.1 to TS1.6, where the first letter represented the teacher (T), the second letter and number represented the school (S1), and the last number represented the individual teacher. (TS1.1). For example, TS3.2 means the second teacher at School S3. Similarly, the codes for the learners were LS1-LS1.15., whereby the first letter represented the Learner (L), the second letter and number represented the school (S1), and the last number represented

the individual learner. (LS1.1). For example, LS3.2 means the second learner at School S3.

Table 3. 2: Codes of participants

School codes	Teacher's codes	TOTAL	Learner's codes	TOTAL
S1	TS1.1-TS1.2	2	LS1.1-LS1.15	15
S2	TS2.1-TS2.2	2	LS2.1-LS2.15	15
S3	TS3.1-TS3.2	2	LS3.1-LS3.15	15
S4	TS4.1-TS4.2	2	LS4.1-LS4.15	15
S5	TS5.1-TS5.2	2	LS5.-LS5.15	15
S6	TS6.1-TS6.2	2	LS6.1-L6.15	15
		12		**90**

3.6 Research instruments

Surveys (for the quantitative phase) and interviews (for the qualitative phase) were employed. According to Zohrabi (2013) employing more than one instrument heightens the reliability and trustworthiness of the acquired data.

3.6.1 Quantitative

In the first phase of the study, a self-administered survey was used to collect data to test the propositions undergirding the Theoretical framework, TPACK framework is needed to assist the teachers in understanding the technology further to ensure the success of implementing E-learning in their teaching and learning process. A TPACK questionnaire

was used in the quantitative phase, consisting of a section of selection, Likert scale and open-ended questions and a sample of 102 participants. According to Mirahmadizadeh et al. (2022), the Likert scale is a collection of statements (items) presented for a real or hypothetical situation under investigation. On a metric scale, participants are asked to indicate their level of agreement (from strongly disagree to strongly agree) with the given statement (items).

3.6.2 Qualitative

In the qualitative phase, a semi-structured interview protocol was used to explain the quantitative results, which involved forty-two participants. The researcher conducted face-to-face and telephone interviews with the 12 Computer Science teachers and 15 Grade 8 Computer Science students. Individual interviews were useful because the researcher wanted to gain insights into the experiences and perspectives of individual teachers who demonstrated that they have Advanced Computer Skills in teaching Computer Science and learners who indicated that they had ICT subject in their previous Grade (Grade 7) by posing questions that actively seeks a deeper understanding of how the teachers and learners use technology for E-learning, including the benefits and challenges they face.

Matching the Quantitative and Qualitative instruments to the research questions As a reminder, the research questions addressed are:

The main research question for this study:

RQ: What are the factors affecting the implementation of E-learning in Computer Science Grade 8 at the selected schools?

The specific research sub-questions for the study:

RQ 1: What challenges were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

RQ 2: What is the teachers' self-efficacy regarding their ICT skills?

RQ 3: What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

Table 3. 3: Teachers

Sub-research questions	**QUANTITATIVE Questionnaire**	**QUALITATIVE Interviews**
RQ 1	**Section 1:** 6.7,8,9,10,12,13 **Section 2:** 1-37 **Section 3:** 2	3,5,6,9,10,11,12
RQ 2	**Section 2:** 3,4,5, 38-40	1,4,7,8,13,14
RQ 3	**Section 3:** 1, 2	2

Table 3. 4: Learners

Sub-research questions	**QUANTITATIVE Questionnaire**	**QUALITATIVE Interviews**
RQ 1	**Section 1:** 4-11 **Section 2:** 1-14 **Section 3:** 2	2,3,4,5
RQ 3	**Section 3:** 1,2	1

3.7 Data collection procedures

Quantitative data were analysed first, followed by qualitative data. Part of the information from surveys was used to identify participants for interviews. The quantitative data were collected through the administration of a survey questionnaire with the participants' sample of twelve teachers and 90 learners at the selected schools and collected after two weeks while qualitative data was collected through semi-structured interviews. Due to the nature of the sequential design of this study, the selection of the participants for the second, qualitative phase was based on the descriptive statistical analysis in the quantitative phase, participants were chosen that meet the criteria for semi-structured interviews whose data will then be transcribed or recorded using a phone device and the interview take 5-15 minutes per person. The quantitative data were analysed using SPSS software. The qualitative data were specifically collected to provide elaboration on trends that emerged from quantitative data (Ramaila & Molwele, 2022).

3.8 Reliability and Validity

According to Golafshani and Creswell (as cited by Nendongo, 2018), reliability is defined as the degree to which results are consistent throughout time and properly represent the population under investigation. The validity, on the other hand, relates to how well the study reflects the reality it claims to represent. First, the researcher used a variety of data collection methods, including a survey and face-to-face interviews, to ensure the data collected was reliable. The two methods and perspectives contributed to a more comprehensive set of results. Interviews were recorded so that the researcher could listen to them repeatedly and then transcribed into text to prevent results from being misinterpreted. In addition, surveys were sent to all teachers who teach Computer Science

and 60 Computer Science learners from six schools that are not significantly different from one another, and the survey questions are related to the study's research questions. For qualitative data, two teachers and five students were interviewed per school, allowing the researcher to get enough reliable information from each participant from various schools.

3.9 Data analysis

The data from the quantitative phase were analysed and represented in the form of descriptive statistics such as frequency, standard deviation, and means. In addition, the data were analysed by the SPSS version, software and presented in tables, graphs and diagrams. Furthermore, the qualitative data from the interviews were transcribed and analysed to reveal codes, labels and themes. Ivankova (2002) states that the steps in the qualitative analysis will include preliminary exploration of the data by reading the transcripts and writing memos; coding the data by segmenting and labelling the text; using codes to develop themes by aggregating similar codes together; connecting and interrelating themes. Finally, the researcher interpreted the two analysed data sets and presented the results of how the qualitative data explains the quantitative data.

3.10 Ethical considerations

The research process commenced after permissions were received from the University of Namibia's ethical committee. The ethical clearance was obtained from the Decentralized Ethics Committee (DEC). Permission was sought from the permanent secretary and regional directors to carry out the study in the senior secondary school offering Computer Science in Khomas Region. Moreover, consent was sought from principals of respective

schools, Computer Science teachers and Grade 8 learners and participation were voluntary, hence learners could withdraw from the study at any time during the study without any negative repercussions. Also, consent from parents/guardians was needed since the learners are under the age of eighteen and the participants were clearly informed of the purpose of the study; and the researcher asked for permission for voice recordings from the participants. Lastly, confidentiality was ensured by using pseudonyms for the participants. Collected data were stored in a password-protected file on a personal computer and will be deleted after five years or after graduation.

3.11 Chapter Summary

This chapter has described the research design employed in this study. It is an explanatory sequential mixed approach with two phases, quantitative and qualitative. The study used a sequential explanatory research methodology to collect data on the factor affecting E-learning implementation in Computer Science in Grade 8. This chapter covered the random and purposive criterion sampling process used to select schools and participants. Surveys (questionnaires) and interviews were employed as study instruments. The researcher considered the instrument's reliability, validity, and research ethics. The next section analyses the actual data obtained and its results.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The goal of this study was to explore the factors affecting the implementation of E-learning in the process of teaching and learning the Grade 8 Computer Science subject. This chapter answers the main research question, which is: What are the factors affecting the implementation of E-learning in Computer Science in Grade 8 at the selected schools? And the specific research sub-questions for the study are:

1. What challenges were identified by teachers and learners in the implementation of E-learning in Computer Science, in Grade 8 in the teaching and learning process?
2. What are the teachers' self-efficacy regarding their ICT skills?
3. What benefits were identified by teachers and learners in the implementation of E-learning in Computer Science, in Grade 8 in the teaching and learning process?

The study follows an explanatory sequential mixed methods design. This type of mixed methods design occurs in two distinct phases, starting with the collection and analysis of quantitative data, followed by the collection and analysis of qualitative data to expand on the quantitative results collected in the first phase (Creswell & Plano, 2018).

In the quantitative phase, the participants responded to the self-administered survey which was guided by TPACK instrument. TPACK is an integrative and progressive knowledge instrument which is required by teachers to blend ICT into classroom teaching efficiently (Singh & Malik, 2022). The TPACK instrument was used by the researcher to gather the first quantitative data for sub-research question one of the studies. The questions were

composed of close-ended questions testing different TPACK knowledge of the respondents spread across seven different components. The questions contained in the TPACK instrument covered the seven TPACK components. It included Pedagogical Knowledge (PK), Content Knowledge (CK), Pedagogical Content Knowledge (PCK), Technology Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and TPACK (Widyasari et al., 2022). The TPACK instrument is required to assist teachers in further understanding technology to ensure the success of implementing E-learning in their teaching and learning processes, and it emphasises how teachers' understanding of content, pedagogy, and technology interact with one another to achieve effective teaching (Koehler et al., 2014).

In the qualitative phase, the researcher constructed the questions based on the findings of the analysis of the quantitative data that was collected. Given the characteristics of a sequential explanation, the researcher found it appropriate to be used because it fits the purpose of the study, which was to explore the factors affecting the implementation of E-learning in the process of teaching and learning in Grade 8 Computer Science subject.

To answer the research questions, data were collected using surveys sent to all Computer Science teachers and all Grade 8 learners taking Computer Science, and by interviewing 12 Computer Science teachers with advanced knowledge and 30 Grade 8 Computer Science learners who indicated that they had Information Communication Technology in Grade 8. Out of the 102 questionnaires distributed, eighty-three were returned, of which six were from the Computer Science teachers out of 12 and 77 from the Computer Science

learners out of 90 (77/90). This represented 81% of the targeted population of both teachers and learners. The data were presented in the following order:

Firstly, teacher data are presented, followed by the learners' data and finally, the chapter summary.

The section below explains the codes of the participants used in the study. The purpose of the participant codes is to keep the identities of those who voluntarily agree to participate in the study private.

4.2 Codes of participants

A code is a unique number or unique combination of letters, numbers, and/or symbols used to identify a research participant. Codes are used in this study for confidentiality purposes. The selected schools were given the codes S1–S6. The teachers were named TS1.1 to TS1.6, where the first letter represented the teacher (T), the second letter and number represented the school (S1), and the last number represented the individual teacher (TS1.1). For example, TS3.2 means the second teacher at School S3. Similarly, the codes for the learners were LS1-LS1.15. where the first letter represented the learner (L), the second letter and number represented the school (S1), and the last number represented the individual learner. (LS1.1). For example, LS3.2 means the second learner at School S3.

The table below lists the codes of the participants and the schools, as well as the total number of teachers and learners at each participating school.

Table 4. 1: Codes of participants

School codes	Teacher's code	TOTAL	Learners' codes	TOTAL
S1	TS1.1	1	LS1.1-LS1.14	14
S2	TS2.1	1	LS2.1-LS2.13	13
S3	TS3.1	1	LS3.1-LS3.15	15
S4	TS4.1	1	LS4.1-LS4.15	15
S5	TS5.1	1	LS5.-LS5.5	5
S6	TS6.1	1	LS6.1-L6.15	15
		6		**77**

The next section discusses the findings of the study. First, the quantitative findings will be discussed, followed by the qualitative findings that will support the quantitative findings. The findings are presented concerning the sub-questions of the study.

4.3 Findings

To address the study questions, a subset of the survey data (Quantitative) and certain interview questions (Qualitative) were combined. Quantitative data were further supported by qualitative data. The researcher was guided in obtaining answers to the research questions by the matrix in tables 4.2 for the teachers and 4.3. for the learners. Quantitative and qualitative questions were employed to obtain responses to each sub-question.

The next section 4.4 presents the teachers' and learners quantitative and qualitative findings. The findings are discussed regarding the three sub-questions of the study.

4.4 Teachers' and learners' findings

The following section discusses the results from the questionnaire submitted to Computer Science teachers and learners. The matrix below shows which quantitative and qualitative questions were used to elicit answers to each specific research question. Table 4.2: Research question matrix.

Table 4. 2:Teachers' Research question matrix

Sub-research questions	**QUANTITATIVE** **Questionnaire**	**QUALITATIVE** **Interviews**
RQ 1	**Section 1:** 6.7,8,9,10,12,13 **Section 2:** 1-37 **Section 3:** 2	3,5,6,9,10,11,12
RQ 2	**Section 2:** = 3,4,5, 38-40	1,4,7,8,13,14
RQ 3	**Section 3:** 1, 2	2

Each sub-question in this section is guided by the teacher matrix table. The first two questions in the quantitative instruments focused on participants' biographical information in terms of gender and qualification.

Table 4. 3: Learners' research question matrix

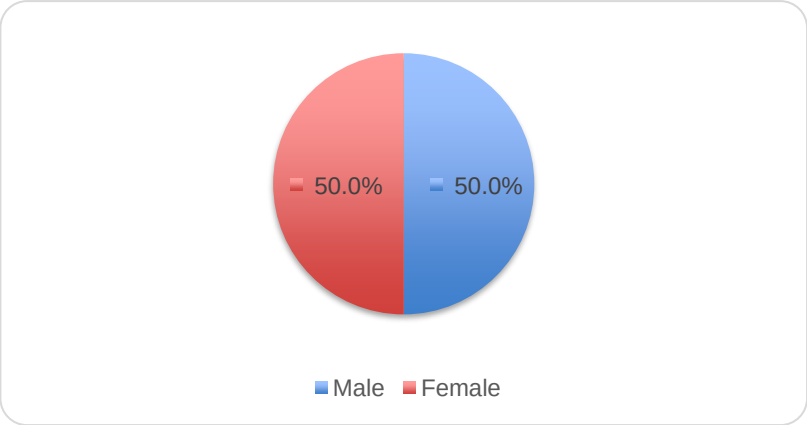
Sub-research questions	**Quantitative questionnaire**	**Qualitative interviews**
RQ 1	**Section 1:** 4-11 **Section 2:** 1-14 **Section 3:** 2	2,3,4,5
RQ 3	**Section 3:** 1,2	1

The learners' matrix table will guide each sub-question in this section. The first two questions on the quantitative instruments were about the gender, Grade, and age of the learners.

4.4.1 Biographical Data of Participating Computer Science Teachers

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

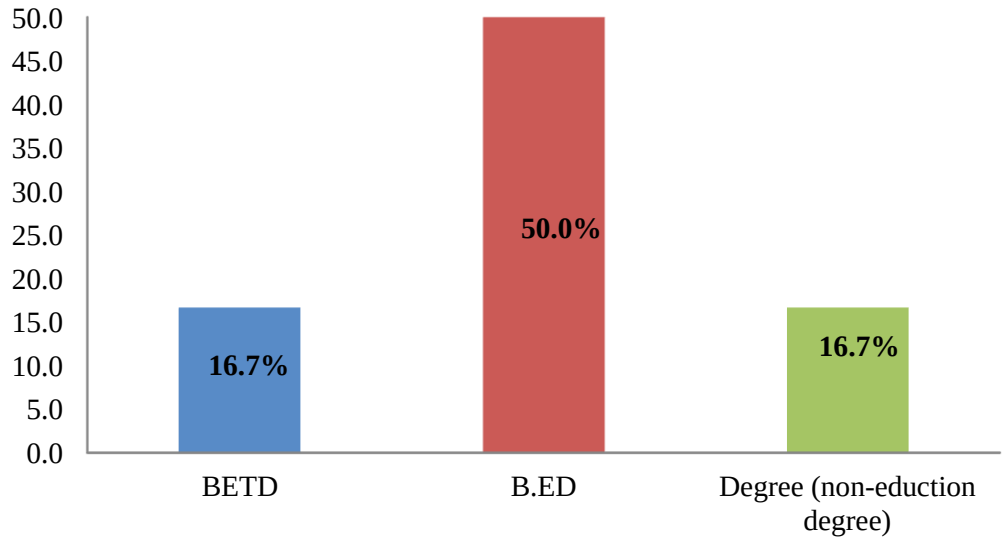
Figure 4. 1: Gender of teachers



Of the six respondents, 50% of the respondents indicated being females and the other 50% indicated being males.

Figure 4.2 represents the educational qualifications held by teachers, which are either a bachelor's degree in education or a Basic Education Teachers Certificate.

Figure 4. 2: Qualification of teachers

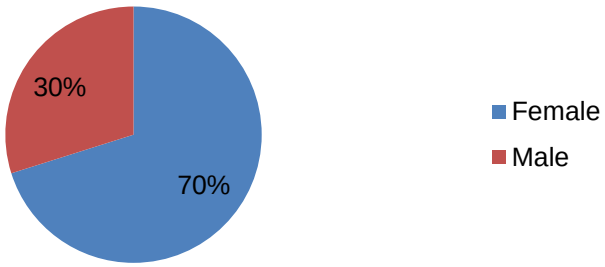


The teachers were asked about the qualifications they hold, and (50%) of the respondents indicated having obtained Bachelor in Education (B. ED), while the other (16.7%) indicated having obtained Basic Education Teachers' Diploma (BETD) and a non-education degree, respectively.

4.4.2 Biographical Data of Participating Computer Science Learners

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

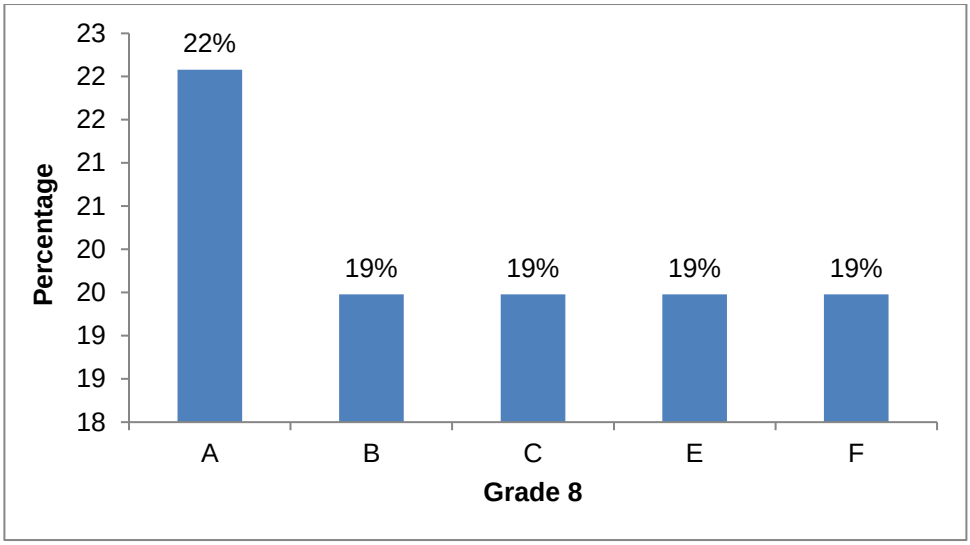
Figure 4. 3: Distribution of respondents by gender



Of the seventy-seven respondents, 70% were female and 30% were male.

The table below shows the Grade the learner is in.

Figure 4. 4: Distribution of respondents by Grade



Of the respondents, 22% are in Grade 8A, and 19% are in Grade 8B, C, E, and F, respectively. None of the learners was in 8D.

The table below shows the age of learners. The age range of the learners is 13 to 18 and 18 years, and the frequency indicates how many learners fall under each category. There are 62 learners, for instance, that are in the range of 13 to 18 years.

Table 4. 4: Distribution of respondents by age

	Frequency	Percent
13-17 years	62	81.0%
18 years	15	19.0%
Total	77	100

Of all the seventy-seven respondents, 81% are between the ages of 13-17 years old, and 19% of the respondents were 18 years old. This shows that many people who are in Grade 8 are between the ages of 13 and 18 years old.

The following section presents the findings of the teachers and learners from the quantitative and qualitative data for research sub-question 1: What challenges were identified by teachers and learners in the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process?

4.4.3 Research Sub-Question 1 (RQ1): What Challenges Were Identified by Teachers and Learners in the Implementation of E-learning of Computer Science in Grade 8?

Teachers

The data come mostly from the survey and clearly asked questions. Section 1, 1–37 in Section 2, and 2 in Section 3. Interview questions 3, 5, 6, 9, 10, 11, and 12 provide further information for this question. The first quantitative data collected to address Sub-question One of the study were the average class size, years of teaching experience, and the number of Computer Science classes taught per week.

The table below shows the average class size. The size ranges of the classes are 25 to 30, 31 to 35, and 36 or more, and the frequency indicates how many classes fall within each category. There are three classes, for instance, that have a range of 25 to 30.

Table 4. 5: Average size of the class

Size	Frequency	Percent
25-30	3	50.0
31-35	1	16.7
36 or more.	2	33.3
Total	**6**	**100**

Teachers were asked to indicate the total number of learners in their classes, and half of the respondents indicated having between 25 and 30 learners in the class, while 33.3% indicated having thirty-six and more learners in their class, and only 16.7% indicated having between 31 and 35 learners per class.

The table that follows shows the years of teaching experience of the Computer Science teacher. Years of teaching experience are classified into three categories: 10 years or more, 5 to 10 years, and 3 years, with the frequency indicating how many teachers fall into each category. There are two teachers, for example, who have ten or more years of teaching experience.

Table 4. 6: Years of teaching experience

Years of teaching experience	Frequency	Percent
10 years and more	2	33.3
5- 10 years	2	33.3
3 years	2	33.3
Total	**6**	**100**

Computer Science teachers were asked to select the range that best identifies how long they have been teaching the subject. Of the six respondents, 33.3% indicated they have taught the subject for 10 years and more; another 33.3% indicated that they taught the subject for 5–10 years; and lastly, the other 33.3% indicated they have only been teaching Computer Science for three years.

The table below shows how many Computer Science classes a teacher teaches per week and is divided into two categories: 2 to 7 times and 8 to 12 times. The frequency indicates how many teachers fall into each category.

Table 4. 7: How many classes per week do you teach for Grade 8 Computer Science

Size	Frequency	Percent
2-7 times	3	50.0
8-12 times	3	50.0
Total	**6**	**100**

Computer Science teachers were asked how many classes they offer per week for Grade 8 learners. Of the six respondents, half of them (50%) offer the subject 2-6 times per week, while the other half (50%) offers the subject 8-12 times per week. This table shows that learners were offered more than twelve computer lessons in a week, which is a good sign as it helps the learners know and improve their computer skills.

Table 4.8 shows whether Computer Science teachers are familiar with the E-learning environment. Closed-ended questions were used in this section, which answers the question with a "yes" or "no.

Table 4. 8: Computer Science teachers E-learning environments

Questions	Yes	No
Do you have access to a computer at home?	66.7%	33.3%
Are you familiar with the E-learning environment?	50.0%	50.0%
Do you know platforms that are flexible, free, affordable and easy to use for online classes?	50.0%	50.0%

The study found that 66.7% of the respondents had access to a computer at home, while 33.3% of the respondents did not have access to a computer at home. The study also discovered that 50% of the respondents are familiar with the E-learning environment, while the other 50% of the respondents are not familiar with the E-learning environment. Lastly, the study also found that half (50%) of the respondents know platforms that are flexible, free, affordable, and easy to use for online classes, while the other half do not.

The table below shows the types of E-learning platforms usually used by Computer Science teachers. The frequency indicates how many teachers make use of each E-learning platform indicated. There are two teachers, for instance, that make use of WhatsApp groups.

Table 4. 9: E-learning platforms usually used by the teacher.

	Frequency	Percent	Valid Percent	Cumulative Percent
WhatsApp group	2	33.3	33.3	33.3
Zoom	2	33.3	33.3	66.7
Other(Google classrom)	2	33.3	33.3	100.0
Total	6	100.0	100.0	

Teachers were asked about the E-learning platform they use for Computer Science. Of the six responding teachers, 33.3% created a WhatsApp group for the learners; 33.3% used Zoom; and 33.3% Google Classroom. During the interview (qualitative data), teachers were asked if they were using any E-learning platforms in their teaching and learning, and the qualitative data confirms that. Three teachers elaborate below:

TS1.1: "Making use of Zoom and WhatsApp."

TS5.5: "Yes, Google Classroom, and WhatsApp."

TS6.6: "Not yet, but we tried WhatsApp, which excluded some students."

The table below shows the communication method used by the teachers during the COVID-19 lockdown and the frequency indicates how many teachers make use of the method indicated in the table.

Table 4. 10: Communication method

	Frequency	Percent	Valid Percent	Cumulative Percent
Edupac	1	16.7	16.7	16.7
Via WhatsApp group	4	66.7	66.7	83.4
Other	1	16.7	16.7	100.0
Total	15	100.0	100.0	

Respondents were asked how they managed to communicate with their teachers during the COVID-19 lockdown. The majority (66.7%) indicated that they communicated with their teachers via a WhatsApp group, while the other respondents (16.7%) used Edupac and other methods.

Table 4.11 shows the statements on extra training for teachers on computer skills, and a TPACK questionnaire was used in the quantitative phase, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly 1=strongly disagree.

Table 4. 11: Statements on extra training in computer skills and the TPACK survey

Statements on extra training in computer skills	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The Ministry of Education provides in-service training/workshop for Computer Science Teachers.	50.0%	16.7%	16.7%	16.7%	0
I often attended all the workshops/in-service training offered by the Ministry of Education.	33.3%	33.3%	33.3%	0	0
The workshop covers all the topics indicated in the syllabus.	33.3%	16.7%	16.7%	33.3%	0
Teaching Computer Science is more practical than theory.	50.0%	0	16.7%	16.7%	16.7%
I believe that my learners have the required IT equipment to participate in E-learning.	16.7%	16.7%	16.7%	0	50.0%
I believe learners have the necessary IT skills and competency to participate in E-learning and online assessment.	0	0	66.7%	16.7%	16.7%
Do you think learners have proper Internet access to use E-learning successfully?	16.7%	0	16.7%	16.7%	50.0%
Do you believe that your school can make E-learning work?	16.7%	83.3%	0	0	0
Do you believe that the IT infrastructure at your school can support E-learning?	0	16.7%	33.3%	50.0%	0

Teachers were given different statements; they either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were recorded, indicating that the respondents strongly agreed with the statements. Half (50%) of the respondents strongly agreed that the Ministry of Education provides in-service training and workshops for Computer Science and that teaching Computer Science is more practice than theory. The minority (16.7%) of the respondents strongly agreed that they believe that the learners have the required IT equipment to participate in E-learning, they think learners have proper Internet access to use E-learning successfully, and they believe that the school can make E-learning work. A total of 83.3% was recorded as the majority number of teachers who agreed with the statement that they believe that the school can make E-learning work, followed by 33.3% of the respondents who agreed that they often attend all the workshops and in-service training offered by the Ministry of Education. The lowest number of respondents was 16.7%, which agreed with the statements stating that the Ministry of Education provides in-service training and Computer Science workshops. The teachers' workshop covers all the topics indicated in the syllabus. It is believed that the learners have the required IT equipment to participate in E-learning, and they believe the IT infrastructure at the school can support E-learning. No respondents agreed with the other statements. Followed by 66.7% of the respondents who indicated that they have a neutral view on the statement that stated that believe learners have the necessary IT skills and competency to participate in E-learning and online assessment and 33.3% on the statements that stated that teachers often attended all the workshop/in-service training offered by the Ministry of Education and they believe

the IT infrastructure at the school can support E-learning. About 16.7% of the respondents disagreed with the other statements.

Half (50%) of the respondents strongly disagreed with the statement that they believe that their learners have the required IT equipment to participate in E-learning and they think learners have proper Internet access to use E-learning successfully. Followed by 16.7% on the statements that stated that teaching Computer Science is more of practice than theory and they believe learners have the necessary IT skills and competency to participate in E-learning and online assessment. No respondents strongly disagreed with the other statements.

Although the majority disagrees that the government provides workshops for Computer Science teachers, during the interview, their response to whether the Ministry of Education organises workshops for Computer Science teachers was positive. The quantitative results are supported by the qualitative results below:

TS2.2*: "Yeah, they do, and it's like a yearling. There's always computer Workshop, but they only focus on the higher grades, not the lower grades. They've only focused on the syllabus of the higher grades, like grades 11 and 10, but currently, with their lower grades, they don't have it. Previously, it was done countrywide, but now it is done by region. it's like each region, not just one, like a combination of certain regions coming for a workshop at a certain time for a certain period."*

TS3.3: *"Yes, the NIED program. There are workshops that are done through that. The whole country. I think there are only limited teachers."*

They were also asked about how frequently the school computer is maintained by the Ministry of Education. Responses were as follows, according to TS1.1, TS3.3, and TS5.5:

TS1.1: *"One has to call them to come, but mostly they don't come when you call them. However, they do have a workshop where schools can take the computers for maintenance.*

TS3.3: *"I fix it, just by myself, yeah. Yes, software, hardware, everything. So, my additional double jobs"*

TS5.5: *"The school maintains the hardware and software of the computer lab.". They have someone who comes in to fix it."*

TPACK Survey

The questions contained in the TPACK instrument covered the seven TPACK components. It included TK, CK, PK, PCK, TCK, TPK, and TPACK (Widyasari et al., 2022).

The table below shows the statements on the TPACK questionnaire that were used in the quantitative phase, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly 1=strongly disagree.

Technology Knowledge

Technology Knowledge entails knowing the best form of technology that can be used to make learning and teaching more meaningful (Bwalya & Rutegwa, 2023). Teachers should be familiar with the technological tools that can be used to learn and teach Computer Science.

Table 4. 12: Statements on TK

Statements on TK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I know how to solve my own technical problems.	33.3%	0	50.0%	16.7%	0
I can easily learn technology.	66.7%	16.7%	0	16.7%	0
I keep up with important new technologies.	66.7%	16.7%	0	16.7%	0
I frequently play around the technology.	50.0%	16.7%	16.7%	0	16.7%
I know about a lot of different technologies.	50.0%	33.3%	0	16.7%	0
I have the technical skills I need to use technology.	50.0%	33.3%	0	16.7%	0

Teachers were given different statements. They either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were recorded, indicating that the respondents strongly agreed with the statements. The majority (66.7%) of the respondents strongly agreed that they can learn technology easily and that they keep up with important new technologies. Half (50%) of the respondents strongly agreed that they frequently play around with technology, they know about a lot of different technologies, and they have the technical skills they need to use technology. This was followed by 33.3% of the respondents who agreed that they know how to solve their own technical problems. The lowest number of respondents, 16.7%, was recorded to have agreed with the statements stating that they can learn technology easily, they can keep up with important new technologies, and they frequently play around with the technology.

Half of (50%) the respondents indicated that they have a neutral view on the statements that they know how to solve their own technical problems. No respondents disagreed with the statements that they frequently play around with the technology; and that they have sufficient knowledge about Computer Science. About 16.7% of the respondents disagreed with the other statements. A minority of 16.7% of respondents strongly disagreed with the statement that they frequently play around with technology. No respondents strongly disagreed with the other statements. The following section presents the findings of CK of Computer Science

CK of Computer Science

Santos and Castro (2021) refer to Content Knowledge as the body of knowledge and information that teachers teach and that students are expected to learn in each subject or content area.

Table 4. 13: Statements on CK

Statements on CK	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
I have sufficient knowledge of Computer Science.	83.3%	0	16.7%	0	0
I can use technological ways of thinking.	66.7%	16.7 %	0	16.7%	0
I have various ways and strategies for developing my understanding of Computer Science.	0	16.7 %	0	16.7%	66.7%

Teachers were given different statements. They either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were

recorded, indicating that the respondents strongly agreed with the statements. The majority (66.7%) of the respondents strongly agreed that they can use technological ways of thinking. The lowest number of respondents, 16.7%, was recorded to have agreed with the statements stating that they can use a technological way of thinking, and lastly, they have various ways and strategies of developing their understanding of Computer Science. No respondents agreed with the other statements. The minority, with 16.7% of respondents, had a neutral view on the statements that stated that they have sufficient knowledge about Computer Science. No respondents disagreed with the statements that states that they frequently play around with the technology and that they have sufficient knowledge about Computer Science. About 16.7% of the respondents disagreed with the other statements. The majority of 66.7% of respondents strongly disagreed with the statements that they have various ways and strategies of developing their understanding of Computer Science. No respondents strongly disagreed with the other statements.

PK (Pedagogical Knowledge)

Teachers need to know how to deliver Computer Science to learners in addition to the subject's content. Pedagogical Knowledge is the teachers' deep knowledge about the process and practices or methods of teaching and learning (Santos & Castro, 2021).

Table 4. 14: Statements on PK

Statements on PK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I know how to assess student performance in a classroom.	66.7%	16.7%	0	16.7%	0
I can adapt my teaching based on what students currently understand or do not understand.	66.7%	16.7%	0	0	16.7%
I can adapt my teaching style to different learners.	66.7%	16.7%	16.7%	0	0

I can assess student learning in multiple ways.	50.0%	16.7%	16.7%	16.7%	0
I can use a wide range of teaching approaches in a classroom setting.	66.7%	16.7%	16.7%	0	0
I am familiar with common student understandings and misconceptions.	66.7%	0	16.7%	16.7%	0
I know how to organise and maintain classroom management.	66.7%	16.7%	16.7%	0	0

The majority of 66.7% of the respondents strongly agreed with all the statements, with only 50% of the respondents strongly agreeing with the statements that teachers can assess student learning in multiple. Out of all the statements, none of the respondents agreed with the statement that they are familiar with common student understandings and misconceptions, while only 16.7% of the respondents agreed with all the other statements. About 16.7% of the respondents were recorded to have a neutral view on all the statements except for the statements that stated that respondents know how to assess student performance in a classroom and that they can adapt their teaching based on what students currently understand or do not understand.

Moreover, 16.7% of respondents disagreed with the statement that they know how to assess student performance in a classroom, they can assess student learning in multiple ways, and lastly, they are familiar with common student understandings and misconceptions, while no respondents disagreed with the other statements. Only one person strongly disagreed with the statement that she/he can adapt his or her teaching based on what students currently understand or do not understand, while no respondent strongly disagreed with the other statements.

After teachers have acquired both content and Pedagogical Knowledge of Computer Science, the next question is whether or not teachers can combine the two types of knowledge. The findings regarding the teachers' combination of content and Pedagogical Knowledge will be covered in more detail in the following section.

PCK (Pedagogical Content Knowledge)

PCK is a combination of parts (intersection) between knowledge of subject matter content (Content Knowledge/CK) with knowledge of pedagogy (Pedagogical Knowledge/PK). PCK is an idea that arises from the belief that teaching requires more than just imparting knowledge about the subject matter or content to students (Sa'adah & Yusup, 2023).

Table 4. 15: Statements on PCK

Statements on PCK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I know how to select effective teaching approaches to guide student thinking and learning in Computer Science.	50.0%	16.7%	16.7%	16.7%	0

Only 50% of the respondents strongly agreed with the statements that stated that teachers know how to select effective teaching approaches to guide student thinking and learning in Computer Science. While 16.7% of respondents agreed with the statements, 16.7% were recorded as having a neutral view. Furthermore, 16.7% of respondents disagreed with the statement, with no respondents strongly disagreeing. The results of pedagogical content knowledge in the section above were discussed. Additionally, the researcher is interested in learning whether the teacher knows how to choose the most appropriate

technological tools to present Computer Science content in the section that follows. The next section is the findings regarding the TCK.

TCK (Technological Content Knowledge)

TCK is the process of integrating content with the appropriate technology. The teacher must be familiar with the finest technological tools available for presenting specific subject-related knowledge (Abbitt, 2011a; Cetin-Berber & Erdem, 2018; Mishra & Koehler, 2006).

Table 4. 16: Statements on TCK

Statements on TCK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I know about technologies that I can use for understanding and doing Computer Science.	66.7%	16.7%	16.7%	0	0

The majority of the respondents (66.7%) strongly agreed with the statements that says teachers know about technologies that they can use for understanding and doing Computer Science, 16.7% agreed, and 16.7% responded neutrally. No one strongly disagreed.

The following is the section on technological pedagogical knowledge findings.

TPK (Technological Pedagogical Knowledge)

TPK is a series of understandings about how learning changes as a result of using technology to support active learning and can aid in and facilitate understanding of the subject matter's concepts. In this component, the teacher must not only comprehend how technology is used in learning but also comprehend how pedagogical competencies are applied when using technology to learn (Joko, 2023). In this context, the teacher should

be capable of thinking of the appropriate technological tools to use and techniques for presenting Computer Science content.

Table 4. 17: Statements on TPK

Statements on TPK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I can choose technologies that enhance the teaching approaches for a lesson.	33.3%	50.0%	0	16.7%	0
I can choose technologies that enhance students' learning for a lesson.	33.3%	50.0%	0	0	16.7%
My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.	66.7%	16.7%	16.7%	0	0
I am thinking critically about how to use technology in my classroom.	16.7%	50.0%	16.7%	0	0
I can adapt the use of the technologies that I am learning about to different teaching activities.	66.7%	16.7%	16.7%	0	0
I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	50.0%	33.3%	16.7%		0
I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.	33.3%	50.0%	16.7%	0	0
I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.	50.0%	16.7%	16.7%	16.7%	0
I can choose technologies that enhance the content of a lesson.	66.7%	16.7%	16.7%	0	0

The majority of 66.7% of respondents strongly agreed with the statements that the teacher's education program has caused them to think more deeply about how technology could influence the teaching approaches they use in the classroom; they can adapt the use of the technologies that they are learning about to different teaching activities; and they can choose technologies that enhance the content for a lesson, while the minority of 16.7% of the respondents strongly agreed with the statement that they are thinking critically about how to use technology in their classroom.

Of the six respondents, half (50%) agreed with the statements that they can choose technologies that enhance the teaching approaches for a lesson, they can choose technologies that enhance students' learning for a lesson, they are thinking critically about how to use technology in my classroom, and they can use strategies that combine content, technologies, and teaching approaches that they learned about in their coursework in my classroom. This was followed by 33.3% of the respondents who agreed with the statements that they can select technologies to use in their classroom that enhance what they teach, how they teach, and what their students learn. About 16.7% of the respondents agreed with the other statements.

Furthermore, 16.7% of the respondents indicated a neutral response to all the statements except for the ones that state that they can choose technologies that enhance students' learning for a lesson and they can choose technologies that enhance the teaching approaches for a lesson.

More so, 16.7% of the respondents disagreed with the statement that says that they can choose technologies that enhance the teaching approaches for a lesson; they can provide leadership in helping others coordinate the use of the content, technologies, and teaching approaches at my school and/or district, while no respondent disagreed with the other statements. Only one teacher (16.7%) strongly disagreed with the statement that says he or she can choose technologies that enhance students' learning for a lesson.

Lastly, in order to successfully implement E-learning with Computer Science learners, teachers must be able to combine technology, pedagogy, and Content Knowledge. The findings on TPACK are listed in the table below (Technology Pedagogy Content Knowledge).

TPACK (Technology Pedagogy and Content Knowledge)

TPACK involves an understanding of the complexity of relationships among students, teachers, content, technologies, and practices (Archambault & Crippen, 2016).

Table 4. 18: Statements on TPACK

Statements on TPACK	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I can teach lessons that appropriately combine Computer Science, technologies and teaching approaches.	50.0%	16.7%	16.7%	16.7%	0

Half (50.0%) of the respondents strongly agreed with the statements that they can teach lessons that appropriately combine Computer Science, technologies and teaching approaches. About 16.7% of the respondents agreed with the statement. Furthermore,

16.7% of the respondents were recorded as having a neutral response to all the statements. More so, 16.7% of the respondents disagreed with the statement that says that they can teach lessons that appropriately combine Computer Science, technologies, and teaching approaches, while no respondent showing strongly disagreed.

The following section presents quantitative data about teachers' perspectives on the challenges of implementing E-learning at their school and the quantitative data will be supported by the qualitative data.

Teachers' opinions on the challenges of E-learning being implemented in school

The study sought to find out the challenges of implementing E-learning in schools. As part of the challenges indicated, teachers noted that Namibia is a developing country and that many people are still suffering and have no access to mobile devices, while some people live in places with no electricity. Additionally, they highlighted that not all the learners are familiar with computers, so this will affect the slow learners in the event of no assistance. Another challenge was the poor concentration of learners during E-learning. Furthermore, teachers showed that E-learning will be a challenge as it requires self-motivation and proper time management skills, and some of the learners lack those.

The qualitative data below support the quantitative findings. During the interview, two of the teachers shared the following perspectives on the challenges with E-learning:

TS3.3: *"The challenges are that it's expensive and equipment is needed to properly set it." It is costly. Also, the use of Internet facilities is needed in most or some cases,*

depending on what type of E-learning we are doing. And all of this requires resources and funding, which government institutions like us are not capable of providing''.

TS4.4: *"The most challenging factor that we are experiencing is number one: the lack of hardware and software that is needed to incorporate E-learning. Because this requires mobile devices, be they smartphones, tablets, or computers, and not all kids can afford them. Given the economic forecast that we are in and the types of parents that we have, we find in our society. "Most of them are really not there from a poor background, so it's difficult to get the devices that are required and also include the Internet itself to access E-learning."*

LEARNERS

In response to Question 1 about challenges identified by teachers and learners in the implementation of E-learning, questions 4-11 in Section 1 of the survey and questions 1-14 in Section 2 of the interviews were used to elicit responses from learners about challenges identified in the implementation of E-learning in their learning, as reported below. The data come mostly from the survey and clearly asked questions. To address Sub-question 2 of the study, the first quantitative data obtained were the average class size, E-learning platforms, and communication methods used by learners to communicate with their teachers.

This table shows the average size of the classes. The size ranges of the classes are 25 to 30, 31 to 36, and 36 or more; and the frequency indicates how many learners fall under each category.

Table 4. 19: Distribution of respondents by average size of the classes

Learners	Frequency	Percent	Valid Percent	Cumulative Percent
25-30 learners	37	48.0	48.0	48.0
31-35 learners	29	38.0	86.0	86.0
36 learners and more	11	14.0	100.0	100.0
Total	14	100.0	100.0	

Asked about the number of learners in their classes, the majority (86.0%) indicated that they are 31 to 35 learners in one class, while the other 48.0% indicated that they are 25 to 30 learners in one class, and only 14.0% indicated that they have more than 36 in a class. The table below shows the platforms used by learners to communicate with their teachers, and the frequency indicates how many learners use the platforms indicated in the table.

Table 4. 20: E-learning platforms are usually used to communicate with teachers.

Platform	Frequency	Percentage	Valid Percentage	Cumulative Percentage
WhatsApp	40	52.0	52.0	52.0
Zoom	5	6.5	6.5	58.5
Other	17	22.0	22.0	80.5
None	15	19.5	19.5	100.0
Total	77	100.0	100.0	

Learners were asked about the E-learning platform they use to communicate with their teachers. However, 52.0% of the respondents said they use WhatsApp platform to

communicate with their teachers, while the remaining 22.0% said they use other E-learning platforms. About 19.5% of the respondents indicated that they do not use any platform to communicate with their teachers, and another 6.5% of the respondents use the Zoom platform.

The table below shows the platforms used by learners to communicate with the teachers during the COVID-19 lockdown. And the frequency indicates how many learners use the communication platforms indicated in the table.

Table 4. 21: Communication method

	Frequency	Percent
Via email	6	7.8
Via WhatsApp group	39	50.6
Zoom	7	9.0
Via Telephone	2	2.5
Other (Cell phone)	11	14.5
None	12	15.6
Total	77	100.0

Learners were also asked about how they used to communicate with their teachers during the COVID-19 lockdown. About 50.6% of the respondents indicated that they used WhatsApp to contact their teachers during the COVID-19 lockdown, and another 15.6% of the respondents indicated that they do not use any platform to communicate with their teachers. Only 14.5% of the respondents indicated cell phones. However, 9.0% of the learners used Zoom for ease of communication during the COVID-19 lockdown.

To conclude, E-learning implementation can be influenced by a variety of factors, including E-learning platforms, class size, and communication methods. Table 4.29

presents the learners' knowledge of information and communication technology (ICT) using a yes-or-no response option and a Likert scale.

The table below shows the statements on Information Communication Technology.

Table 4. 22: Statements on Information Communication Technology

Statements	Yes	No
Were you having ICT (Information Communication Technology) in Grade 7?	53.2%	46.8%
Do you have access to a computer at home?	54.5%	45.5%
Are you connected to the school's Internet?	35.1%	64.9%
Are you familiar with the E-learning environment?	59.8%	40.2%
Do you know platforms that are flexible, free, affordable and easy to use for online classes?	48.1%	51.9%

The study found that 46.8% of the respondents did not have Information Communication Technology in Grade 7, while 53.2% had it in Grade 7. The study also found that 54.5% of the learners have access to a computer at home, and 45.5% of them do not have access. About 54.5% of the respondents indicated that they are connected to the school Internet, and the other 45.5% said otherwise. The majority (59.8%) of the respondents noted that they are familiar with the E-learning environment, and 40.2% of them are not. Lastly, 48.1% of the respondents know the platforms that are flexible, free, affordable, and easy to use for online classes, and the other 51.9% do not.

The table below shows the statements on Information Communication Technology, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly, 1=strongly disagree.

Table 4. 23: Statements on ICT

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I make use of a computer during the Computer Science period, two to six times per week.	0	21.4 %	57.1%	14.3%	7.1%
Computer Science is practical.	21.4%	50.0 %	28.6%	0	0
I use technology tools (computer, smart board) in my learning 1-3 times per week.	35.7%	21.4 %	7.1%	14.3%	21.4%
I often receive assignments/tasks that require me to use a computer.	21.4%	14.3 %	21.4%	35.7%	7.1%
I consider technology important to use in my learning.	57.1%	14.3 %	0	21.4%	7.1%
I have Internet access and a laptop/desktop computer smartphone at home.	7.1%	26.6 %	0	21.4%	42.9%
I use the Internet for my learning.	0	7.1%	7.1%	21.4%	64.3%
I believe that I am ready for E-learning.	57.1%	7.1%	14.3%	14.3%	7.1%
I believe that I have the required IT equipment to participate in E-learning.	21.4%	7.1%	21.4%	28.6%	21.4%
I have the necessary IT skills and competency to participate in E-learning and online assessment.	42.9%	14.3 %	21.4%	14.3%	7.1%
I have proper Internet access to use E-learning successfully.	14.3%	42.9 %	14.3%	21.4%	7.1%
My school can make E-learning work.	21.4%	14.3 %	35.7%	14.3%	14.3%
My school can afford the budget for using E-learning in teaching and learning.	14.3%	21.4 %	0	0	64.3%
The IT infrastructure at my school can support E-learning.	7.1%	35.7 %	21.4%	0	35.7%

The majority (57.1%) of the respondents are neutral about whether they make use of computers during their Computer Science period (2–6 times per week), followed by 14.3% who disagree and 7.1% who strongly disagree. The other 21.4% agreed that they make use of a computer during a Computer Science period 2–6 times per week. About 21.4% of the respondents indicated that they strongly agree that Computer Science are more practical, while 50% agreed and the other 28.6% are neutral with the statement. Regarding the use of technological tools, 35.7% of the respondents strongly agreed, followed by 21.4% who agreed and strongly disagreed, respectively. Only 14.3% of the respondents disagreed that they use technology tools (computer, smart board) in their learning 1–3 times per week. About 35.7% of the respondents disagreed that they often receive assignments or tasks that require them to use a computer, while 21.4% strongly agreed and neutral, respectively. About 57.1% of the respondents strongly considered technology important to use in learning; 21.4% of the respondents disagreed, and only 7.1% strongly disagreed. With regards to having Internet access and a laptop, desktop computer, or smartphone at home, 42.9% strongly disagreed, followed by 26.6% of the respondents who agreed, and the remaining 21.4% disagreed. The other 7.1% strongly agreed that they have Internet access and a laptop, desktop computer, or smartphone at home. Moreover, 42.9% of the respondents strongly agreed that they have the necessary IT skills and competency to participate in E-learning and online assessment. About 21.4% were neutral, followed by 14.3% who disagreed. The study sought to find out if learners have proper Internet access for E-learning. A relative percentage of 42.9% and 14.3% of the respondents agreed and strongly agreed, while 21.4% disagreed. The other 35.7% of the respondents at the same school strongly disagreed, saying they agree that the IT

infrastructure at the school can support E-learning. And 21.4% of them are neutral, and 7.1% strongly agree.

The section that follows presents quantitative data on learners' points of view on the challenges of implementing E-learning at their school, supported by qualitative data.

The learners' opinion on the challenges of implementing E-learning in school

The study sought the challenges of implementing E-learning in schools. As part of the challenges indicated, learners noted that Namibia is a developing country and that many people are still suffering, have no access to mobile devices, and live in places with no electricity. Learners also indicated a challenge that not all of them are familiar with computers, so it will be hard for them to connect to E-learning unless they receive training. Another challenge was the poor concentration of learners during E-learning. Furthermore, learners showed that E-learning will be a challenge as it requires self-motivation and proper time management skills, and most learners will find it difficult because it mainly focuses on theory and is not practical.

The qualitative results listed below support the quantitative research. One of the participants remarked:

LS1.1: *"I wouldn't have that confidence because at school you might be encouraged by a friend to do your homework at school, but now you're alone at home with no one to help you."*

LS1.2, another participant, stated:

"It's to make the learners' work easier, like at the time of COVID-19, we're not supposed to go to school, but they brought up this big idea of learning from home, so it's just something simple for the learner."

Some also mentioned that not everyone has access to an Internet connection, while other respondents indicated that some people may have phones with problems or may not have their phones on them. In addition, they also noted that the learners can memorise answers from previous questions, while some expressed that there might not be Internet sometimes or that it can be slow during the time slot set for a certain program, subject, or assessment. Furthermore, respondents also indicated that it is very expensive, and some learners do not know how to use laptops. Bad weather was also indicated by some respondents, whereby, according to them, can affect the connection.

In addition, learner LS2:1 answered by saying*: "They may have those that students cannot afford, and parents may not be able to afford a computer or Internet access."*

While the second learners

LS2.5 added that: *"Learners may use other apps instead of learning."*

Learners are more concerned about learners that do not have access to or own computers and smartphones and the fact that not everyone knows how to use smartphones and computers. This will then make it hard for them to connect to E-learning unless they receive training on the use of such technology. Therefore, the possibility of some learners being left out should not be overlooked. Moreover, some people, especially those in remote areas and informal settings, some settlements have no access to electricity or Wi-Fi, while others cannot afford to buy all the necessary E-learning equipment. Additionally, learners highlighted a lack of concentration in noisy areas or locations as they have no control over those that make noise, for example, at bars and shebeens. Another challenge

for E-learning is less control of the learners by the teachers, where learners can intentionally disobey what the teacher is saying.

The qualitative findings stated below supported this. The following are three of the learners' responses to the challenges of E-learning:

LS3.1: *It's like some students will take advantage of this and play games and will not take their studies seriously if they do not have that motivation. Also, it is expensive to have a laptop or Internet connection.*

LS3.2: *The challenge of E-learning is laziness. E-learning can make you lazy because you will keep on postponing until you do get to do your work, and the other one is that it is easy to get distracted. You are supposed to concentrate on your work, but you are doing other things. It allows cheating when you write your test online because you have a book to look up the answer.*

LS3.3: *Some learners don't know how to use laptops, for example, so E-learning provides improvement. It gives you the experience of using a laptop.*

As part of the challenges indicated, learners noted that getting airtime is hard for some, and some parents do not have access to smartphones or other devices. Learners also indicated a challenge of not all of them being familiar with computers, so it will be hard for them to connect to E-learning unless they receive training. Another challenge was the poor concentration of learners during E-learning. Furthermore, learners showed that E-

learning will be a challenge as it requires self-motivation and proper time management skills, and most learners will find it difficult because it mainly focuses on theory and is not practical. Some learners also stated that there will not be much feedback from them as the learner-teacher interaction is limited.

During the interview (qualitative results), learner LS4.1 stated:

"Teaching someone through a computer is not the same as teaching in person; for example, you would not be able to explain properly through the computer; some children would not understand; some children would require special attention; and you would gain nothing." "I prefer going to school; I don't like E-learning."

Additionally, learners also indicated a challenge that not all of them are familiar with computers, so it will be hard for them to connect to E-learning unless they receive training. Another challenge was the poor concentration of learners during E-learning. Furthermore, learners showed that E-learning will be a challenge as it requires self-motivation and proper time management skills, and most learners will find it difficult because it mainly focuses on theory and not practice.

Some participants added, during the interview (qualitative results) that:

LS5.2: *"Some people will not have access to the Internet because they don't have a phone, or some people might have a phone, but they don't have access to the Internet."*

Furthermore, during the interview (qualitative results), participants explained in detail the challenges encountered in the implementation of E-learning.

LS6.2: *"Not all students can afford E-learning because it might be too expensive to pay for Wi-Fi and computers."*

LS6.3: *"Notifications from other apps, such as Instagram, WhatsApp, and TikTok, can distract you".*

LS6.5: *"Kids can copy, and they can search for answers online so that they can answer."*

The following two tables (4.31 and 4.32) present the qualitative findings for learners who use computers or the Internet at school and home.

Table 4. 24: The use of the computer and Internet at school

School	**Total number of participants per school**	**How many times do you make use of a computer? In a week at school**	**Do you use a laptop/desktop/smart phone?**	**Is the device connected to the Internet?**
S1	2	4	Laptop	Yes
S2	5	4	No computer	No
S3	3	3	Desktop	Yes
S4	3	4	Desktop	Yes
S5	2	3	Desktop	Yes
S6	5	4	Desktop	Yes

All two learners from S1 school responded that they use a computer four times per week at school. S2 school: four learners indicated that they do not make use of computers at school; LS2.2 stated that although they do not make use of computers at school, they have broken computers and a lab. S3 school: all three learners who took part responded that they use a computer four times per week at school. S4 school: all three learners who took part responded that they use a computer four times per week at school. S5 school: all two

learners who took part responded that they use a computer three times per week at school. S6 school: all five learners who took part responded that they make use of a computer four times per week. The majority of the learners from S3, S4, S5, and S6 schools indicated that they use a desktop computer at school and their devices are connected to the Internet. The S1 school indicated that they use laptops, and the devices are connected to the Internet, although S2 was the only school that indicated that they do not use any of the devices listed, meaning that they do not have any.

The table below shows the qualitative results of learners who make use of computers and the Internet at home.

Table 4. 25: The availability of Internet access or a computer at home.

Learners	**Do you have access to the Internet or a computer at home?**		
	If yes, do you use it often?	For what?	If not, why?
LS1.1			No, my parents cannot afford it, however, my parents have smartphones with no Internet.
LS1.2	Yes, both computers and the Internet.	Every day I use them for homework.	
LS2.1	Yes, both	Homework.	
LS2.2	Yes, every day.	To research information.	
LS2.3			No, my parents cannot afford it.
LS2.4	Yes, every day	For school work.	
LS2.5	Yes, every day.	School work	
LS3.1	Yes, three times a week.	School purpose, chatting with my classmate, teacher and my tutor.	

LS3.2	Yes, three times a week.	Research information.	
LS3.3	Yes, every day.	To learn and to get more knowledge.	
LS4.1	Yes, sometimes.	For projects.	
LS4.2	Yes, twice a week.	For schoolwork.	
LS4.3			No, but I use my parents' smartphone after work to do my homework.
LS5.1	Yes, four times a week,	Download app for Computer Science the, and homework for Computer Science.	
LS5.2	Yes, on a computer only that is not connected to the Internet, three times a day	to do Computer Science homework and watch movies.	
LS6.1	Yes, three times.	For E-learning and communication.	
LS6.2	Yes, every day.	Homework	
LS6.3			No, the parents cannot afford it.
LS6.4	Yes, every day.	To download the app and communicate with my club members via WhatsApp.	
LS6.5	Yes, twice a week.	To communicate with the teacher via WhatsApp and do homework.	

Learners were asked whether they have access to the Internet or a computer at home. The majority of them answered yes to the statement. Four of the learners indicated, no they do not have Internet or computers at home.

The table below presents the qualitative data on learners' readiness for E-learning.

Table 4. 26: Statement on the readiness of E-learning.

LEARNERS	YES/NO	REASON
LS1.1	**YES**	Because, I know how to use the computer and the Internet, and the teacher taught me how to go about E-learning.
LS1.2	**YES**	Since I was a child, I have been using computers.
LS2.1	**YES**	I have Internet access and a computer.
LS2.2	**YES**	I know how to use the computer.
LS2.3	**NO**	Internet access and applications are a problem for me.
LS2.4	**YES**	Because I have both a computer and Internet access, and I know how to use an app to connect me to E-learning.
LS2.5	**YES**	Because I have both a computer and the Internet.
LS3.1	**YES**	I have Internet access, and a computer, and I know some platforms to use, like WhatsApp.
LS3.2	**YES**	I had a computer since Grade 7.
LS3.3	**YES**	I have Internet access, and a computer.
LS4.1	**NO**	I'm still young. I need the teacher to explain it to me face-to-face, not through the computer.
LS4.2	**YES**	I have Internet access and a computer.
LS4.3	**YES**	I have Internet access and a smartphone.
LS5.1	**YES**	I have Internet access and a computer.
LS5.2	**YES**	I have Internet access and a computer.
LS6.1	**NO**	No reason
LS6.2	**YES**	I have Internet access and a computer.
LS6.3	**YES**	I don’t have the tools that I need for E-learning.
LS4.4	**YES**	I have Internet access and a computer.
LS6.5	**YES**	I have Internet access.

According to the statement, 18 of the learners believe they are ready for E-learning, except student LS2.2, who stated, *"Internet connectivity and applications are a difficulty for me."*

Furthermore, *"I am still young,"* says LS4.1. *"I need the teacher to explain it to me in person, not through the computer."*

The following section, 4.3.3, presents the findings of the teachers from the quantitative and qualitative data for sub-research question 2: What are the teachers' self-efficacy regarding their ICT skills?

4.4.4 Research Sub-question 2 (RQ 2): What are the teachers' self-efficacy regarding their ICT skills?

In addressing the question about teachers' self-efficacy regarding their ICT skills, questions 3,4,5,38–43 in section 2 of the survey and questions 1,4,7,8,13, and 14 of the interviews were used to elicit responses from teachers about their confidence in computer use, as reported below.

The first quantitative data collected to address sub-question 2 of the study (What are the teachers' self-efficacy regarding their ICT skills?) were ICT integration courses, which show subjects had by teachers in secondary school. They are discussed in more detail below. The table that follows shows the teachers' ICT integration courses and the frequency indicates how many teachers had ICT integration courses in B.Ed.

Table 4. 27: ICT integration courses in B.Ed. /Honours program.

	Frequency	Percent
Integrated Media and Technology Education (IMTE) 1, IMTE 2	2	33.3
Educational Technology Career Specialisation	3	50.0
None	1	16.7
Total	6	100.0

Respondents were asked to indicate the type of ICT integration courses they had in their B. Ed Honours program. The majority (50%) indicated "Technology career specialisation", followed by 33.3% of respondents who indicated having "Integrated media and Technology Education (IMTE) 1, IMTE 2 educational," while the minority (16.7%) of the respondents indicated that they had no ICT integration courses.

The next table shows subjects had by teachers in secondary school. The frequency indicates how many teachers had computer related subject in secondary school. For instance, three teachers had Computer Science as a subject in secondary school.

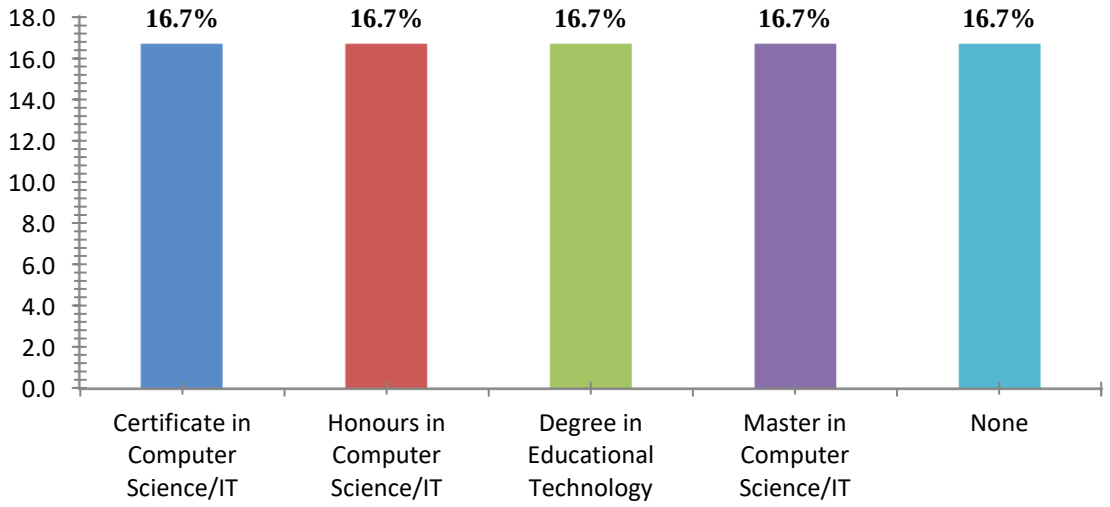
Table 4. 28: Subjects had by teachers in secondary school (Circle more than one option).

	Frequency	Percent
Computer Science	3	50.0
Computer Science	1	16.7
Keyboard and word-processing	1	16.7
Information Communication Technology (ICT)	1	16.7
None	1	16.7
Total	6	100.0

Respondents were asked about the type of computer-related subject they had at secondary school. Six respondents were recorded, and the highest number of the respondents (50%) indicated having done Computer Science at secondary school, while the rest of the respondents (16.7%) indicated having done Computer Science, Keyboard and processing. About 16.7% of the respondents indicated that they had none of the above. The researcher sought whether the teachers had computer-related subjects in secondary school. The aim was to find out about their computer skills and when their passion started as computer teachers. Out of the six respondents, only one respondent (16.7%) indicated having had Information Communication Technology at school.

Apart from the computer-related courses they had in high school, participants also indicated the qualifications they hold in the field of Information Technology or Computer Science. The section that follows provides additional details on their qualifications. Their qualification will determine whether they have the necessary computer skills needed to teach computer study.

Figure 4. 5: Qualification in the field of Computer Science/ Information Technology (IT)



Teachers were asked if they have any qualifications in the field of Computer Science or IT. An equal number of respondents indicated that they obtained a certificate in Computer Science or IT obtained honours in Computer Science or IT, have a degree in Educational Technology, and a master's degree in computer science or IT, including the same number of respondents who did not obtain any.

The table below shows how many units were taught online during the COVID-19 lockdown and the frequency indicates how many teachers taught online one or two units.

Table 4. 29: Teacher self-efficacy regarding their computer skills

	Frequency	Percent
1 Unit	2	33.3
2 Units	4	66.7
Total	6	100

Teachers were asked about how many topics or units they managed to cover while teaching online during the COVID-19 lockdown. Of the six respondents, 66.7% of them indicated that they managed to teach two units, while 33.3% of the respondents only managed to reach one unit.

The table below shows the Basic Computer Skills and Advanced Computer Skills of Computer Science teachers, consisting of a section of selections on the Likert scale.

Table 4. 30: BCS=Basic Computer Skill; ACS=Advance Computer Skill

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
BCS: transfer assignments and assessments (such as exams) used in face-to-face style units to online formats.	66.7%	16.7%	0	0	16.7%

BCS: use the Internet to search for information and resources	100.0%	0	0	0	0
ACS: feel confident learning advanced skills within a specific program (software)	83.3%	16.7 %	0	0	0
ACS: use conferencing Software (e.g., Zoom, Yahoo, IM, MSN Messenger, ICQ, and Skype) for collaboration purposes	66.7%	0	0	16.7%	16.7%

Teachers were given different statements. They either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The majority of the respondents' opinions indicated that they strongly agreed with the statements, with no respondents that had a neutral view of the statements. Of the six respondents, all (100%) respondents strongly agreed with the statement that BCS: uses the Internet to search for information and resources, followed by 83.3% of the respondents who strongly agreed that ACS: feel confident learning advanced skills within a specific program (software). A total of 66.7% of the respondents strongly agreed to the following statements: BCS: transfers assignments and assessments (such as exams) used in face-to-face style units to online formats; ACS: uses conferencing (e.g., Zoom, Yahoo, IM, MSN Messenger, ICQ, and Skype) for collaboration purposes.

About 16.7% of the respondents agreed and strongly disagreed with the statement that says, BCS: transfer assignments and assessments (such as exams) used in face-to-face style units to online formats. Another 16.7% of respondents agreed with the statement that states that ACS: feel confident learning advanced skills within a specific program (software). Lastly, 16.7% of the respondents were recorded to have disagreed and strongly

disagreed with the statement that states that ACS: use conferencing software (e.g., Zoom, Yahoo, IM, MSN Messenger, ICQ, and Skype) for collaboration purposes.

Since the study used a mixed method, the qualitative data explains the quantitative data. The next table presents the qualitative findings about teachers' knowledge, skills, and attitudes required for the subject (Computer Science).

The table below shows the teachers' types of knowledge, skills, and attitudes required for the subject (Computer Science) matter. Their responses were as follows:

Table 4. 31: Knowledge, skills, and attitudes

TEACHER	KNOWLEDGE	SKILLS	ATTITUDES
TS1.1	According to the knowledge obtained from the university, the general curriculum, particularly the programming portion of the curriculum, is the most difficult for teachers to teach.	You must be able to deliver and pass on knowledge to the learner.	You do not have to be in a hurry. According to the way technology is in our country, we are still learning and have a hunger for the subject.
TS2.2	You should know about computers.	You should know how to operate a computer practically.	You should know how to handle the computer.

TS3.3	Okay, first and foremost, the ability to read. Right spelling with understanding. I think that is important.	Your skills you should have in your basic agility. be able to move your fingers, hands, and posture correctly because of the different equipment that we are using.	Well, a never-give-up kind of attitude because most of the kids don't get it the first time, so we just keep trying until we get it, so that's the positive attitude towards learning new things.
TS4.4	Incorporating E-learning into the teaching stream, teaching and learning apart from having just the traditional teaching and learning methods.	So, I believe that Basic Computer Skills or basic technology skills are required. The teachers and the learners should both be familiar with electronic devices, such as computers and smartphones, and they should be able to use the different software or the different platforms that provide E-learning. Yes, that is basically it.	The attitude towards it should be a positive one because technology can be quite challenging, but the willingness to learn and the positive attitude, I believe, will help the teaching and E-learning process to be successful.
TS5.5	One should have Pedagogical Knowledge and Content Knowledge of Computer Science.	Should be able to know how to use technological tools and how to incorporate them into the teaching and learning process.	Patience is the key for Computer Science, especially when dealing with the low Grade. Some learners have never had or used a computer before. Be willing to adapt to changes. Technology is updated every year
TS6.6	Content of the subject and Pedagogical Knowledge	It is necessary to understand how to use technological tools and how to apply them in teaching and learning.	Must know how to interact with learners and always be positive about the subject. be able to motivate learners to do their best in the subject.

In addition to the qualitative findings of the teachers' knowledge, skills, and attitudes required for the subject (Computer Science), presented in the previous table, the teachers were asked to identify the factors limiting their ability to implement E-learning

successfully. Below is a table with their responses to the statement. The following table shows the response of Computer Science teachers regarding the factors limiting them from implementing E-learning with their Grade 8 learners who are doing Computer Science.

Table 4. 32: Factors limiting the implementation of E-learning

Teachers	Response
TS1.1 TS2.2 TS3.3 TS5.5	Resources, such as the Internet and computers. Although the Grade 8 learners have knowledge of the subject and know how to use E-learning, there are no necessary technological resources. Government schools are not well-equipped like private schools, which are well-equipped with resources. and there are parents who are unable to assist their children; when given work to do at home, the learners find it useless, and there is no motivation for both learners and teachers.
TS4.4	We already started a little bit a few years ago with Google Classroom. But the limiting factor was devices. Not all learners have devices. capable of accessing the E-learning platform as well. The rollout was not only to Computer Science, but to other subjects as well, because it doesn't help if you only have one subject that they are doing on E-learning, so getting the cooperation from other teachers to also embark on E-learning was a big problem. is still not.
TS6.6	The most crucial one is accessing resources. There is no access to the technology and hardware that are needed, and the second one would be a lack of Internet. Knowledge may come from the learner's side or sometimes also from the teacher's side. Not everyone is tech-savvy enough that they will be able to swiftly manage or incorporate this teaching and learning through E-learning.

To sum up, all four teachers (TS1.1, TS2.2, TS3.3, and TS5.5) from different schools find the lack of resources such as the Internet and computers to be the biggest factor affecting the implementation of E-learning in teaching and learning.

The following section presents the findings of the teachers and learners from the quantitative and qualitative data for research Question 3: What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

4.4.5 Research Sub-question 3 (RQ3): What Benefits Were Identified by Teachers and Learners in the Implementation of E-learning of Computer Science in Grade 8 in the Teaching and Learning Process?

The majority of the data comes from the survey and explicitly posed questions. 1 and 2 of Section 3. Interview Question 2 provided additional information for this question. To address sub-question three of the study, quantitative data on the benefits of E-learning for teachers and learners were presented first, followed by qualitative data that go into further detail.

TEACHERS

The table below shows the benefits of E-learning, and the frequency indicates how many teachers opt for the listed benefits.

Table 4. 33: Benefits of E-learning

Benefits	Frequency	Percent
Allow teachers to stay connected to their learners and with their parents.	4	66.7%
The flexibility of a variety of different resources such as videos, text, presentations and quizzes.	3	50.0%

The use of new technologies gives teachers the freedom to experiment in their teaching practice.	4	66.7%
Save time and no need for textbooks.	3	50.0
Creativity	1	16.7

Respondents were asked to indicate their personal benefits of E-learning. The majority (66.7%) indicated that the benefit of E-learning to them is that it allows them to stay connected to their learners and with their parents, and also that the use of new technologies gives them the freedom to experiment in their teaching practice, followed by half of the respondents who indicated that it is because of the flexibility of a variety of different resources, such as videos, text, presentations, and quizzes, and helps save time and no need for textbooks. A minority (16.7%) of the respondents regarded creativity as a benefit of implementing E-learning. Additional benefits of E-learning are discussed below.

The teachers' opinion on the benefits of E-learning being implemented in schools.

The researcher sought the respondents' opinions about the benefits of implementing E-learning in schools. Some teachers stated that with the implementation E-learning, learners can easily communicate with them anytime and anywhere because it is flexible and convenient 24/7. They also stated that the implementation can help some learners learn at different paces and that the learners will benefit if they have the required facilities. The implementation will be advantageous to learners as they will get to learn at their own pace while teachers will just be providing the study materials via the link. This was also a benefit to some teachers, as this will support the goal of the 4th Industrial Revolution. The qualitative findings support the quantitative findings. During the interviews, three of the teachers stated the following:

TS1.1: *"No stress; the learner will learn twice—by the teacher and by themselves."*

TS3.3: *"E-learning benefits" I would say it allows learners to learn at their own pace. We don't need to rush if they don't get something; they can always go through it. Uhm, it reduces the workload for teachers because some of the lesson planning and other things are already done. So, you just draw from it instead of having to reconstruct all of those things again. Yeah, I think I will just stop at that. Those two, for now.*

TS5.5: *"I can have more resources, such as videos, notes, and pictures, ready for my class at any time." Learners can revise their work on their own and at their own pace. Unlike if a learner does not understand in class, he or she cannot revert back to what the teacher said. and it is easy to teach a larger group."*

LEARNERS

The data come mostly from the survey and clearly asked questions 1 and 2 in Section 1. Additional information for this question was obtained from interview questions 1 and 2. To address research Sub-question 3, quantitative data on the benefits of E-learning for learners was presented first, followed by qualitative data that was explained in depth.

Benefits of E-learning

Below are the benefits of E-learning according to the participants in this study. Respondents were asked to choose four options; hence, the total frequency may not be equal to the total sample.

Table 4. 34: Benefits of E-learning

Benefits of E-learning	Frequency	Percentage
Save time and no need for textbooks.	43	55.8%
Creativity	22	28.6%
You can access content anywhere and anytime and you can learn on your own.	62	80.5%
Cater to individual needs.	10	12.9%
Video helps learners to engage with the subject of study, solving problems through a diverse range of methods.	44	57.1%
Easy to communicate with my teachers anytime and anywhere.	57	74.0%

Out of the total (77 learners) respondents, the majority (80.5%) chose “you can access content anywhere and anytime and you can learn on your own” as one of the benefits of E-learning to the learners, followed by 74.0% choosing “easy to communicate with my teachers anytime and anywhere." Moreover, the highest (57.1%) third option chosen by the respondents was that videos through E-learning help learners to engage with the subject of study, solving problems through a diverse range of methods. In addition, 55.8% of the respondents indicated that E-learning saves time and that not needing textbooks is a benefit to them. The other options, like creativity and catering to individual needs, were chosen by 28.6% and 12.9%, respectively, and they were the lowest among the other options. Additional benefits of E-learning are discussed below.

The Learners' Opinion on the Benefits of Implementing E-learning in School.

The researcher sought to find out the respondents' opinions about the benefits of implementing E-learning in schools. Some learners showed with the implementation of E-learning, they can get extra information; E-learning saves time, so textbooks will not be useful, especially now that they are scared at school. Some learners indicated that, with E-learning, one is free to ask questions and it is easier to complete school assignments.

Other respondents further indicated that E-learning is convenient and flexible in terms of time and place and provides a more comfortable learning environment. They also indicated that this will improve their technical skills and be low-cost since one does not have to travel to school. Learners indicated that some learners would benefit from it and that the government will not spend a lot of money on textbooks and that there will not be a lot of printing to make copies.

The quantitative results are supported by the qualitative results below. Learner LS2.3 further added during the interview by saying:

"You can use it anywhere." And learner LS2.5 continues saying, "It saves time because you don't have to use a textbook."

E-learning also creates a conducive environment for learners to do their schoolwork, assignments, and tests online during a pandemic, especially when lockdowns are enforced. The spread of diseases among learners will also be reduced. The quantitative results are supported by the qualitative below, Learner LS3.2 responded during the interview by saying: *"The advantages of E-learning are that you can learn in your own*

space; it is much easier to have access to the Internet because you can look for answers or conduct research; you have access to teachers' files, so you don't have to go to school and talk to the teacher; and you can interact with the teacher or any other learner at any time."

Lastly, some learners took the implementation of E-learning as a way for them to cut costs on transportation to school and on buying books as they could access all the materials they needed on E-learning yet have access to learning.

1.5 Chapter Summary

This chapter presented data gathered from respondents through questionnaires and interviews to answer the following research questions of the study: What challenges were identified by teachers and learners in the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process? What are the teachers' self-efficacy regarding their ICT skills? And What benefits were identified by teachers and learners in the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process? The quantitative data were analysed in SPSS and thematic analysis for qualitative data.

CHAPTER FIVE: DISCUSSION OF FINDINGS, RECOMMENDATIONS, AND CONCLUSIONS

5.1 Introduction

Chapter Five provides a discussion of the main findings from the research as a way of linking the literature to research questions.

5.2 Discussion of Teachers' and Learners' Findings

5.2.1 Research sub-question 1 (RQ1): What challenges were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

TEACHERS

The study in China by Chen et al. (2021) explored how K-12 teachers addressed challenges during the transition to online education due to the COVID-19 pandemic. Their results showed that teachers applied live video streaming on multiple social media platforms and repurposed different entertainment features to deliver online teaching for better student engagement. Students also developed a better sense of intimacy with their teachers after experiencing certain online interactions.

However, the situation in Namibia seems different. During the COVID-19 lockdown, about 67% of teachers at the six selected school that offer Computer Science as a subject, were using WhatsApp as their primary means of online platforms for teaching and learning. This highlights the importance of adapting to available tools and platforms based on local context and resources. Akinoso (2023) emphasises that teachers should improve

their ICT literacy and skills to make technology use easier. To master technology and use it effectively, teachers must be prepared to put in the necessary study time.

The majority (66.7%) indicated that the Ministry of Education has provided in-service training or workshops for Computer Science teachers, and they have benefited from it. Respondents have indicated that the NIED program through the Ministry is very helpful. A study by Agbo (2015) found that teachers are more likely to integrate ICT in their courses when professional training in the use of ICT provides them time to practice with the technology and to learn, share, and collaborate with colleagues. Chomunorwa and Mugobo (2023) recommend providing resources to poor communities and proper educator training for e-learning implementation.

About 66.7% of the respondents also indicated that they have attended all the workshops and in-service training offered by the Ministry of Education, and 50.0% believe that their learners have the required IT equipment to participate in E-learning. Although 66.7% of the teachers noted that learners do not have proper Internet access to use E-learning successfully, all (100.0%) of them believe that their schools can make E-learning work even though the IT infrastructure at the schools cannot fully support E-learning.

Regarding the knowledge of technology, only 33.3% of the teachers know how to solve their technical issues, although 66.7% frequently play around with technology. However, 66.7% think that they know more skills than they need to know. About 83.3% of the teachers indicated that they do know how to assess the performance of learners in class and that they can adapt their teaching based on what learners understand or do not

understand. Despite having pedagogical content knowledge, 66.7% of teachers are proficient in selecting effective teaching approaches for Computer Science learning. However, the adoption and implementation of e-learning face challenges due to a lack of ICT knowledge, as highlighted by Angula and Mutelo (2021), highlighting the need for improved ICT skills. Regarding technological content knowledge, 83.3% of teachers have designated they can choose technologies that enhance the teaching approaches for a lesson, and they are grateful to the education program for teachers, noting that it caused them to think more deeply about how technology could influence the teaching approaches they use in the classroom.

About 83.3% of the teachers use strategies that combine content, technologies, and teaching approaches that they learned about in their coursework in the classroom, and they provide leadership in helping others coordinate the use of content, technologies, and teaching approaches at schools and/or districts. A total of 66.7% of the teachers also informed the researcher that they teach lessons that appropriately combine Computer Science, technologies and teaching approaches. The challenges indicated by teachers are that it is expensive, and equipment is needed to properly set it. Basar's (2021) study suggests that a lack of robust online infrastructure, including network connectivity, hardware, and software, can hinder its effectiveness, affecting the efficiency of e-learning implementation.

Another challenge is the lack of hardware and software needed to incorporate E-learning. Mumtaz (2000); Muhammad & Kainat (2020) found that teachers often avoid using

technology in their classes due to lack of funds for necessary hardware and software, internet access issues, lack of interaction between teachers and students, and inadequate technological facilities.

The review of literature related to the challenges of the implementation of E-learning has revealed that several related studies have been carried out in other developing countries. For instance, Ssekakubo et al. (2011) point out that the majority of E-learning initiatives implemented in Sub-Saharan countries tend to fail, partially or totally due to various barriers to E-learning in developing countries. The absence and/or inadequacy of infrastructure is a barrier to access among students in developing countries.

LEARNERS

The majority of learners in the study used WhatsApp as the most frequently used E-learning platform, followed by cell phones. Only a small percentage used Zoom for E-learning. During the COVID-19 lockdown, learners primarily communicated with their teachers through WhatsApp groups and cell phones. However, some learners did not contact their teachers during this period.

Many learners have access to computers at home, but only a third have Internet access at school. About 73% of respondents use technology tools (computers, smart boards) in their learning 1-3 times per week. However, they rarely receive assignments or tasks that require them to use a computer. While 57.2% of learners have the necessary IT skills for E-learning, only 35.7% believe their school can make E-learning work.

According to Wargadinata et al. (2020), online learning is effective as it facilitates the use of various applications such as "WhatsApp," "Zoom," and "Google Classroom". Further,

Wargadinata et al. (2020) concurred that Internet access and Internet packages restrict the effectiveness of online learning. A study by Muhammad and Kainat (2020) found that Internet access problems, a lack of interaction between teachers and students, and a lack of technological facilities challenged the efficacy of online learning.

Regarding the study of the challenges of implementing E-learning learners highlighted several challenges: Some learners do not have Internet access or devices like laptops, desktop computers, or smartphones at home; not all Computer Science learners are familiar with computers, making it challenging for them to connect to E-learning without proper training; some learners struggle to maintain focus during online classes and finally lack of self-motivation and time management, E-learning requires self-motivation and proper time management skills. Comparison with other studies, the challenges faced by Namibian learners differ from those reported in other studies. For example: In Saudi Arabia, the quality of Internet access significantly influences the adoption and usage of E-learning (Al-Ghaith et al., (2010). Furthermore, Scholars have noted that challenges to accessing online learning are less when both learners and teachers are familiar with Educational Technology tools (Pellegrini et al., 2020).

The following section, presents the findings of the teachers from the quantitative and qualitative data for Sub-research question 2: What are the teachers' self-efficacy regarding their ICT skills?

5.2.2 Research for sub-question 2 (RQ 2): What are the teachers' self-efficacy regarding their ICT skills?

Teacher response to Question 2 on the teacher's self-efficacy regarding their ICT skills. The study sought the background knowledge of the respondents regarding Computer Science. Out of the six teachers interviewed, only one had Information Communication Technology (ICT) at a secondary school. Furthermore, the study found that the majority (50.0%) of the respondents had Educational Technology Career Specialisation and 33.3% had Integrated Media and Technology Education (IMTE). Despite the variation in knowledge from secondary school and integrated courses, five participants have indicated having a qualification in the field of Computer Science, ranging from a certificate to a master's in computer science, and only one teacher has no qualification in the field of Computer Science. According to Ghavifekr and Rosdy (2015), teachers need sufficient ICT skills to implement the technology and a high level of confidence level to use it in a classroom setting.

As a result of the COVID-19 lockdown, all schools were closed, and teachers were left with no option but to teach online. About 66.7% of the teachers had taught two units online during the lockdown, and only 33.3% taught one unit online during the COVID-19 outbreak. In agreement with the study that was contacted by Mutelo (2022) a few teachers said they had high ICT literacy skills and were ready to try E-learning, but they quickly discovered that resources were scarce, and that parents and learners had connectivity and access problems. Additionally, a study by Samioti (2021) indicates that secondary school teachers, during the first wave of the pandemic encountered problems in relation to their communication and interaction with the students, the infrastructure and

Internet connection, the students' participation, and their training (regarding online education).

The next section presents the findings of the teachers and learners from the quantitative and qualitative data for research Question 3: What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

5.2.3 Research Sub-question 3 (RQ 3): What benefits were identified by teachers and learners in the implementation of E-learning of Computer Science in Grade 8 in the teaching and learning process?

The study sought the benefits of E-learning for teachers. About 66.67% of the teachers showed that E-learning allows them to stay connected to their learners and their parents, and the use of new technologies gives them the freedom to experiment in their teaching practice. Moreover, 50.0% of the teachers highlighted the flexibility of a variety of different resources, such as videos, text, presentations and quizzes, as another benefit of E-learning. In conclusion to the teachers' interview, the researcher sought their views on the benefits of implementing E-learning in schools. Teachers opine that learners can easily communicate with them anytime and in their comfort zones.

The study, however, was not limited to the teachers' findings. the researcher analyses the quantitative and qualitative findings of the learners concerning the study's sub-questions as well. The researcher sought the respondents' opinions about the benefits of implementing E-learning in schools. Respondents further indicated that E-learning is convenient and flexible in terms of time and place and provides a more comfortable learning environment. The findings of the study are supported by Surjono et al. (2015),

who state that E-learning can produce a flexible and distributed learning system. Students will be able to choose the time and location in which they study because they are not required to attend a certain place at a specific time. Several studies supported the findings above that E-learning allows one to observe many flexible learning ways to go to classes with a much-reduced need for travel. Also, learners are allowed to get deeper insights into the information through activities that are carried out in the classroom through an interactive video facility (Gautam & Tiwari, 2016; Martínez-Caro et al., 2015).

5.3 Summary of the Findings

5.3.1 What challenges were identified by teachers and learners in the implementation of E-learning in Computer Science in Grade 8 in the teaching and learning process?

The challenges indicated by teachers are that E-learning is expensive and equipment is needed to properly set it up. There is a lack of hardware and software that is needed to incorporate E-learning.

Learners also indicated a challenge that not all of them are familiar with computers and the Internet although they have been taught Computer Science that can give them basic skills on how E-learning works, so it is hard for them to connect to E-learning unless they receive training. Another challenge was the poor concentration of learners during E-learning. Furthermore, learners showed that E-learning will be a challenge as it requires self-motivation and proper time management skills.

5.3.2 What are the Teachers' Self-efficacy Regarding Their ICT Skills?

According to current research, computer self-efficacy deals with the ability to plan assignments or perform activities that require the use of computers (Bunyamin & Sauda, 2019; Rahmadhani & Mariani, 2021). The respondents in both the quantitative and qualitative components of the study indicated that they use the Internet to search for information and resources. The quantitative findings of the study further confirm that 83.3% of the respondents strongly agreed that they have Advanced Computer Skills (ACS) and 66.7% strongly agreed that they have Basic Computer Skills (BCS). A lack of teacher confidence, lack of teacher competency, and teachers' negative attitudes and resistance to change are examples of teacher-level hurdles or issues. Further research has demonstrated that many factors impacting teacher use of technology in a broader sense stem from the teacher's working environment (Gbemu et al., 2020). Teachers from different schools find the lack of resources such as the Internet and computers to be the biggest factor affecting the implementation of E-learning in teaching and learning. On the other hand, it is frequently stated in the literature that in-service training contributes to the development of teachers' self-confidence and assists them in communicating with individuals in the school and society (Gültekin & Çubukçu, 2008) where it improves teacher quality, and positively contribute to the quality of all stakeholders in the school (Opfer & Pedder, 2011).

5.3.3 What Benefits Were Identified by Teachers and Learners in the Implementation of E-learning in Computer Science in Grade 8 in the Teaching and Learning Process?

It was revealed from the study that E-learning allows teachers to stay connected to their learners, and the use of new technologies gives teachers the freedom to experiment in their teaching practice. It was revealed that E-learning helps learners learn faster by improving their learning skills, that it creates a conducive environment for learners to do their schoolwork, assignments, and tests online during a pandemic, especially when lockdowns are enforced, and that the spread of diseases among learners will also be reduced.

5.4 Linking Findings to the Theoretical Framework

TPACK serves as a foundation for this research. The focus of the discussion is on whether the selected secondary school that offers Computer Science in Grade 8 can implement E-learning. Mishra and Koehler (2006) state that to integrate technology into teaching, teachers need knowledge, which falls under the three major domains, namely: Content Knowledge, Pedagogical Knowledge, and technology knowledge. Content knowledge refers to educators' understanding of their subject matter, which influences the integration of technology instruction. Pedagogical knowledge involves educators' understanding of instructional and learning processes, while technology knowledge includes proficiency in hardware and software, and staying updated on emerging technologies (Hava & Babayiğit, 2023).

Content Knowledge

The study revealed that Computer Science teachers at the selected secondary school, know how to select effective teaching approaches to guide learners' thinking and learning in Computer Science and have sufficient knowledge about Computer Science content. Even with Content Knowledge, understanding how to effectively deliver that content in an online environment requires additional skills and strategies.

Pedagogical Knowledge

The study revealed that teachers can adapt their teaching style to different learners, assess learners in multiple ways, and use a wide range of teaching approaches in a classroom setting. Shulman (1986) says that having knowledge of the subject matter and general teaching strategies is not sufficient for capturing the knowledge of a good teacher. He proposed considering the necessary relationships between the two by introducing the notion of PCK (Pedagogical Content Knowledge). Teaching online demands different pedagogical approaches. While teachers may excel in face-to-face instruction, they need to rethink their teaching methods for virtual classrooms.

Pedagogical Content Knowledge (PCK) involves understanding how to teach specific content effectively. In an E-learning context, this means translating subject matter expertise into engaging online experiences.

Technological Knowledge

Furthermore, it was indicated in the study that teachers have technical skills; they need to use technology and can choose technologies that enhance the teaching approach for a lesson. Having technical skills is essential, but it doesn't automatically guarantee effective E-learning. Joko (2023) says teachers must not only comprehend how technology is used

but pedagogical competencies are also applied when using technology to learn. Teachers needed to learn how to navigate various online platforms, troubleshoot technical issues, and create engaging digital content. Learners also faced challenges related to using unfamiliar tools and managing their technical difficulties.

TPACK

Although Computer Science teachers and learners have, the knowledge required to implement E-learning during the COVID-19 pandemic despite their knowledge of Computer Science content, pedagogy, and technology, the shift from traditional face-to-face teaching to online learning posed significant challenges. Teachers and learners had to adapt quickly to new platforms, tools, and teaching methods. Furthermore, the study indicated that not all schools have the resources required to implement E-learning. Anuar et al. (2016) interpret that to achieve a high standard of E-learning implementation, the institution must provide a good facility to perform learning and teaching via E-learning.

5.5 Limitations of the Study

The study focused only on specific aspects related to the implementation of E-learning in Grade 8 Computer Science, it did not consider all the factors that influence E-learning more broadly. Not all teachers and learners were included in the study; only a selected group participated. This selective approach may limit the applicability of the findings to a broader teacher and learner population. The study was primarily conducted in schools within the Khomas Region. While this region has a significant number of secondary schools offering computer courses, it may not accurately represent the situation in other regions of the country. furthermore, Since the study was limited to the Khomas Region,

it may not fully capture the challenges faced by rural schools in implementing E-learning. Factors affecting urban schools may differ from those affecting rural schools.

5.6 Recommendations

This study focused on research questions to explore the factors affecting the implementation of E-learning in Grade 8 Computer Science. During this study, the literature was reviewed, which aided in the formulation of recommendations. As a result of the findings and the literature review, the researcher recommends the following:

5.6.1 Training Teachers and Learners in the Use of E-learning for Teaching and Learning

Comprehensive training of teaching all Computer Science teachers as well as learners in the field of E-learning skills. Training on E-learning skills is considered a successful implementation of E-learning. While teachers had Content Knowledge, they needed professional development specific to E-learning. Training on effective online teaching practices, digital tools, and student engagement strategies was crucial. Learners also needed guidance on navigating online platforms and managing their learning independently. The government of Namibia should invest in online
platforms to assist Namibian educational institutions to successfully adopt and implement e-Learning

5.6.2 Pedagogical Challenges

Teachers must improve learners' experiences of online learning by utilising effective pedagogical methods and adopting a blended learning approach at the beginning of the implementation of full-scale E-learning. The Ministry of education should offer

Continuous Professional Development opportunities for teachers. Keep them informed about emerging technologies, best practices, and innovative approaches to E-learning. A well-prepared teaching workforce is key to overcoming pedagogical challenges in the digital era.

5.6.3 E-learning across Computer Science curricular

Introduce compulsory E-learning courses in the curricula for all learners, particularly in primary schools, to equip learners with E-learning skills as well as improve accessibility to E-learning. These courses should be accessible to all learners, with a special focus on primary schools. By equipping learners with E-learning skills, will empower them to navigate digital platforms effectively. Additionally, incorporating E-learning into the curriculum ensures that learners have equal opportunities to access educational resources, regardless of their geographical location or socioeconomic background. As technology continues to evolve, integrating E-learning into education becomes not just beneficial but imperative.

5.6.4 Resources to Access to Internet and Network

Parents should ensure that all learners have mobile phones or computers to use during the E-learning phases. Additionally, the lack of a robust online infrastructure may impede the effectiveness of online learning. Concurrently, the government must take responsibility and improve the existing online infrastructure, facilities, and schools in different areas of the country.

Nevertheless, support within school communities and among parents and school administrators is vital to ensuring the success of online learning. The successful implementation of E-learning in schools is likely to take on a new dimension, should all

the education stockholders be considered. Without such considerations, resources might continue to be wasted without any meaningful benefits being derived from the program. The starting point should be for everyone involved in the program to have a positive perception, to avoid internal sabotage of the program (enrolment of E-learning in school).

5.7 Future Research Recommendations

This study recommends the following studies to be carried out:

- To explore E-learning implementation across various Grade levels, consider a broader geographical sample.
- Investigate factors affecting both rural and urban schools. This would provide a more comprehensive understanding of E-learning challenges and opportunities.
- To examine teachers' perceptions about online challenges and affordances, as well as their suggestions for the improvement of online teaching.

5.8 Conclusion

Through the study findings, it has been identified that E-learning is beneficial to both teachers and learners in many ways. One of the most dominant characteristics of E-learning is that it ensures ease of communication between teachers and learners and contributes to the learners' skills. The study concluded that learners prefer to use E-learning since it provides chances to enhance their learning and increase their abilities. On the contrary, school-based E-learning support is insufficient to ensure the benefits of effective learning by allowing learners to socially interact with their teachers throughout the academic year. There is an actual need for a well-established E-learning environment, which learners and teachers can rely on.

The major challenges that both teachers and learners identified include limited Internet access, limited computer access, a lack of technical assistance and support, and a lack of motivation to engage in the E-learning platform. The implementation of E-learning at schools is facing many challenges, which include but are not limited to academic challenges, administrative challenges, and technical challenges. The study reveals that the major challenges encountered by learners in E-learning were technical issues. Some learners faced Internet connectivity problems, accessing classes, and access to computers and mobile devices. Further challenges could include technical issues, such as some students who are unable to learn individually. Therefore, they need direction from teachers.

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APPENDICES

1.1 Appendix: Ethical Clearance Certificate

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: SoE-DEC-W28/10/21/05

Date: 08 November 2021

This Ethical Clearance Certificate is issued by the University of Namibia Decentralized Ethics Committee (DEC) 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 **School of Education (Windhoek & Khomasdal Campuses) Decentralized Ethics Committee**.

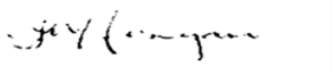
Title of Project: Factors affecting the implementation of e-learning teaching in grade 8 computer studies: A case study of six selected schools in Khomas Region, Namibia
Researcher: Martha Eliaser
Student number: 200841645

Take note of the following:

1. Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the ethics committee. An application to make amendments may be necessary.
2. Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the ethics committee
3. The Principal Researcher must report issues of ethical compliance to the ethics committee (through the Chairperson) at the end of the Project or as may be requested by the ethics committee
4. The ethics committee 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.

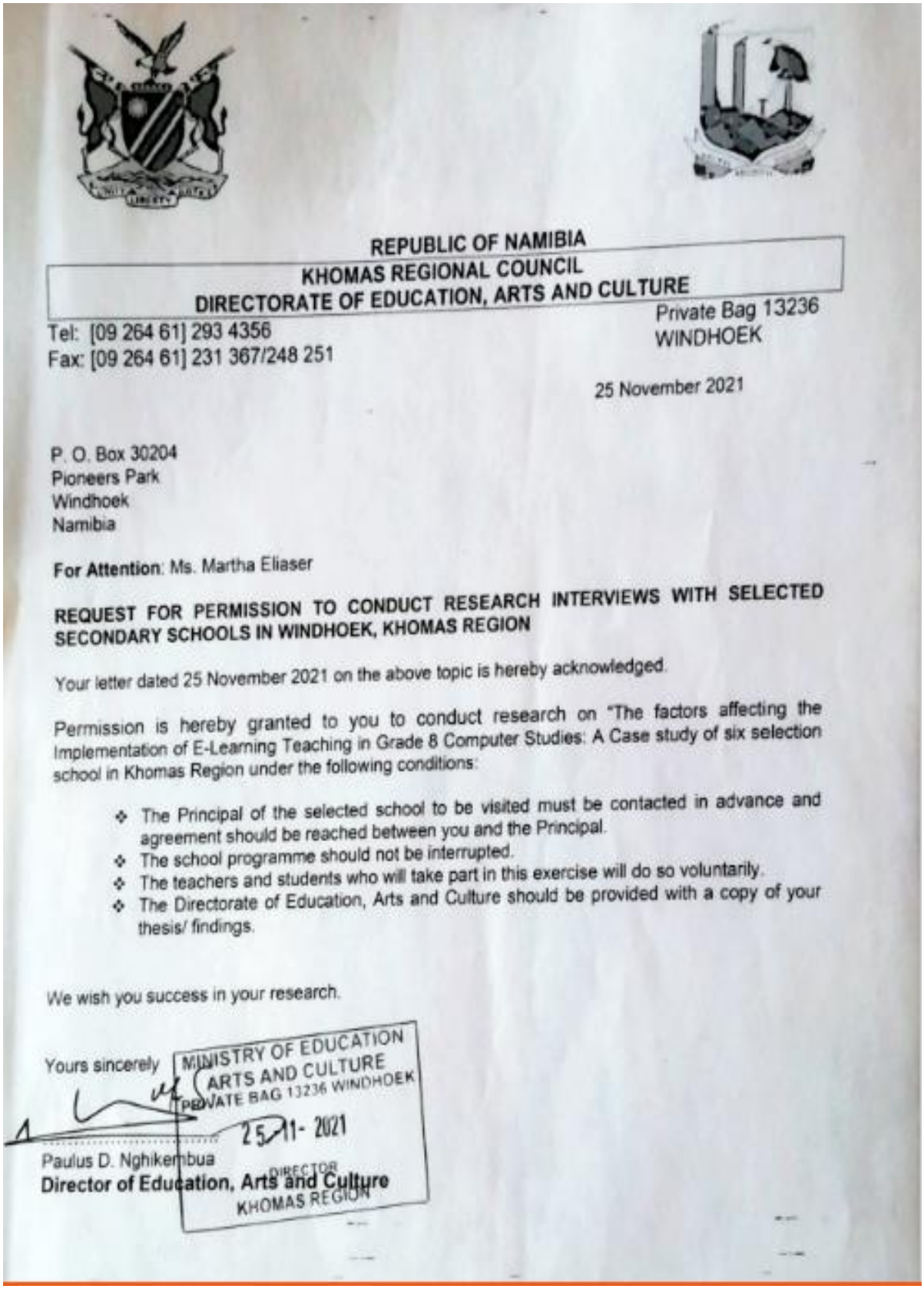
The ethics committee wishes you the best in your research.



Dr. Jbb U. Hengari (Chairperson, Windhoek & Khomasdal Campuses Decentralized Ethics Committee)

Prof. Davis Mumbengegwi
(Head, Multidisciplinary Research)

1.2 Appendix: Permission letter from Khomas Education Director



REPUBLIC OF NAMIBIA
KHOMAS REGIONAL COUNCIL
DIRECTORATE OF EDUCATION, ARTS AND CULTURE

Tel: [09 264 61] 293 4356
Fax: [09 264 61] 231 367/248 251

Private Bag 13236
WINDHOEK

25 November 2021

P. O. Box 30204
Pioneers Park
Windhoek
Namibia

For Attention: Ms. Martha Eliaser

REQUEST FOR PERMISSION TO CONDUCT RESEARCH INTERVIEWS WITH SELECTED SECONDARY SCHOOLS IN WINDHOEK, KHOMAS REGION

Your letter dated 25 November 2021 on the above topic is hereby acknowledged.

Permission is hereby granted to you to conduct research on "The factors affecting the Implementation of E-Learning Teaching in Grade 8 Computer Studies: A Case study of six selection school in Khomas Region under the following conditions:

- The Principal of the selected school to be visited must be contacted in advance and agreement should be reached between you and the Principal.
- The school programme should not be interrupted.
- The teachers and students who will take part in this exercise will do so voluntarily.
- The Directorate of Education, Arts and Culture should be provided with a copy of your thesis/ findings.

We wish you success in your research.

Yours sincerely

MINISTRY OF EDUCATION
ARTS AND CULTURE
PRIVATE BAG 13236 WINDHOEK
25-11-2021
DIRECTOR
KHOMAS REGION

Paulus D. Nghikembua
Director of Education, Arts and Culture

1.3 Appendix: Quantitative Questionnaire (TEACHERS)

The main purpose of this questionnaire is to study the key factors that affect the E-learning environment in Computer Science Grade 8. E-learning is the use of electronic technologies, applications, processes, and tools in the teaching and learning process. These key factors provide innovative opportunities to support the implementation of E-learning in education. In addition, this questionnaire aims at obtaining your feedback regarding the factors that influence E-learning. To that end, your careful completion of the questionnaire will definitely contribute to obtaining real data which are crucial for more accurate findings. Hence, please tick or circle your response, which best describes your actual teaching practices. The information will be kept confidential and will be used just for research purposes. Thank you very much in advance for your time and cooperation.

Questionnaire for Computer Science Teacher Date: ……/……/20…...

SECTION 1: BIOGRAPHICAL DATA

Mobile phone: ……. E-mail address:…….

Circle Your Answer

1. Gender: a. Male b. Female
2. The Qualifications you are holding?
    a. BETD.
    b. B. ED
    c. Degree(non-degree)please specify…….
3. I had ……ICT integration courses in my B.Ed. Honours program
    a. Integrated Media and Technology Education (IMTE) 1, IMTE 2
    b. Educational Technology Career Specialisation
    c. Other, please specify……...
4. I had ……. at secondary school (*Circle more than one option)*

a. Computer Science

b. Computer Science

c. Keyboard and word-processing

d. Information Communication Technology (ICT)

e. None

5. Any qualification in the field of Computer Science/ Information Technology (IT)? (*Circle more than one option*)

   a. Certificate in Computer Science/IT

   b. Diploma in Computer Science/IT

   c. Degree in Computer Science/IT

   d. Honours in Computer Science/IT

   e. Degree in Educational Technology

   f. Master in Computer Science/IT

   g. Workshop in Computer Science, etc.

   h. Other? please, specify…….

6. What is the average size of your class?

   a. 25 – 30 b. 31 -35 c. >36

7. Please select the range that best identifies how long you have been teaching Computer Science.

   a. 10+ years b. 5-10 years c. 3 years d. Less than 2 years

8. How many classes per week do you have for Grade 8 Computer Science?
   a. 0-2 b. 2-6 c. 8-12

9. Do you have access to a computer at home/school?

   a. Yes b. No

10. Are you familiar with the E-learning environment?

    a. Yes b. No

11. Do you know platforms that are flexible, free, affordable, and easy to use for online classes?

    a. Yes b. No

12. If the answer at 11 is yes: Which E-learning platform, do you usually use?

    a. WhatsApp b.Zoom c. Other……

13. How did you communicate with parents or learners during the COVID-19 lockdown?

    a. Via email group b. Via telephone c. Via WhatsApp

    d. Other …….? e. None

SECTION 2

The items in this survey are measured on a 5-point Likert scale. Respondents specify the level of agreement with each statement by ticking strongly disagree (1), disagree (2), neither agree nor disagree (Neutral) (3), agree (4), or strongly agree (5).

Survey Items Please answer all of the questions and if you are uncertain of or neutral about your response you may always select "Neither Agree nor Disagree"

1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly agree (SA)

	1	2	3	4	5
1. The Ministry of Education provides in-service training/workshop for Computer Science Teachers.					
2. I often attended all the workshops/in-service training offered by the Ministry of Education.					
3. The workshop covers all the topics indicated in the syllabus.					
4. Teaching Computer Science is more practical than theoretical.					

5. I believe that my learners have the required IT equipment to participate in E-learning.					
6. I believe learners have the necessary IT skills and competency to participate in e-learning and online assessment?					
7. Do you think learners have proper Internet access to use E-learning successfully?					
8. Do you believe that your school can make E-learning work?					
9. Do you believe the IT infrastructure at your school can support E-learning?					
TK (Technology Knowledge)					
10. I know how to solve my own technical problems.					
11. I can learn technology easily.					
12. I keep up with important new technologies.					
13. I frequently play around the technology.					
14. I know about a lot of different technologies.					
15. I have the technical skills I need to use technology.					
CK (Content Knowledge) Computer Science					
16. I have sufficient knowledge of Computer Science.					
17. I can use a technological way of thinking.					
18. I have various ways and strategies for developing my understanding of Computer Science.					

PK (Pedagogical Knowledge)					
19. I know how to assess student performance in a classroom.					
20. I can adapt my teaching based on what students currently understand or do not understand.					
21. I can adapt my teaching style to different learners.					
22. I can assess student learning in multiple ways.					
23. I can use a wide range of teaching approaches in a classroom setting.					
24. I am familiar with common student understandings and misconceptions.					
25. I know how to organise and maintain classroom management.					
PCK (Pedagogical Content Knowledge)					
26. I know how to select effective teaching approaches to guide student thinking and learning in Computer Science.					
TCK (Technological Content Knowledge)					
27. I know about technologies that I can use for understanding and doing Computer Science.					
TPK (Technological Pedagogical Knowledge)					
28. I can choose technologies that enhance the teaching approaches for a lesson.					
29. I can choose technologies that enhance students' learning for a lesson.					

30. My teacher education program has caused me to think more deeply about how technology, could influence the teaching approaches I use in my classroom.					
31. I think critically about how to use technology in my classroom.					
32. I can adapt the use of the technologies that I am learning about to different teaching activities.					
33. I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.					
34. I can use strategies that combine content, technologies, and teaching approaches that, I learned about, in my coursework in my classroom.					
35. I can provide leadership in helping others to coordinate the use of content, technologies,and teaching approaches at my school and/or district.					
36. I can choose technologies that enhance the content of a lesson.					
TPACK (Technology Pedagogy and Content Knowledge)					
37. I can teach lessons that appropriately combine Computer Science, technologies and teaching approaches.					

Teacher Self-efficacy computer skills

38. How many units have you taught online during the COVID-19 outbreak?	**Units:**				
39. I have IT skills and the competency to participate in E-learning and online assessment.	**Yes No**				
In the context of online units, I … / I can … **BCS=**Basic Computer Skill**; ACS=**Advance Computer Skill	**1**	**2**	**3**	**4**	**5**

40. **BCS:** transfer assignments and assessments (such as exams) used in a face-to-face style, units to online formats.					
41. **BCS:** use the Internet to search for information and resources					
42. **ACS:** feel confident learning advanced skills within a specific program (software)					
43. **ACS:** use conferencing Software (e.g., Zoom, Yahoo, IM, MSN Messenger, ICQ, and Skype) for collaboration purposes					

SECTION 3:

1. What are the benefits of E-learning to you? *tick 4 that is most important, in the column*

a) Allow teachers to stay connected to their learners and with their parents.	
b) The flexibility of a variety of different resources such as videos, text, presentations, and quizzes.	
c) The use of new technologies gives teachers the freedom to experiment in their teaching practice.	
d) Accessibility (allow teachers to develop and create their material according to their schedule and whenever they want to).	
e) Save time and no need for textbooks.	
f) Creativity.	
g) Lifelong learning.	

2. What is your opinion on E-learning being implemented in school?

Benefits……

Challenges……

1.4 Appendix: Quantitative Questionnaire (LEARNER)

Questionnaires for Computer Science Learner Date:……/……/20……

SECTION 1: BIOGRAPHICAL DATA

Parent mobile phone…….Parent's Signature…….

Circle Your Answers.

1. Gender (tick): a. Male…… b. Female……...
2. Grade 8:.....
3. What is your age range?
    a. 13-18
    b. 18 +
4. What is the average size of your class?
    a. 25 – 30
    b. 31 -35
    c. >36
5. Which E-learning platform do you usually use to communicate with your teachers?
    a. WhatsApp
    b. Zoom
    c. Other……...
    d. None
6. How did you communicate with your teacher during the COVID-19 lockdown? (Circle more than two answers)
    a. Via email
    b. Via telephone
    c. Via WhatsApp group
    d. Zoom

e. Google Classroom

f. Other …….?

g. None

7. Were you having ICT (Information Communication Technology) in Grade 7?

   a. Yes b. No

8. Do you have access to a computer at home?

   a. Yes b. No

9. Are you connected to the school's Internet?

   a. Yes b. No

10. Are you familiar with the E-learning environment?

    a. Yes b. No

11. Do you know platforms that are flexible, free, affordable, and easy to use for online classes?

    a. Yes b. No

SECTION 2: The items in this survey are measured on a 5-point Likert scale. Respondents specify the level of agreement with each statement by indicating strongly disagree (1), disagree (2), neither agree nor disagree (Neutral) (3), agree (4), or strongly agree (5). Survey Items Please answer all of the questions and if you are uncertain of or neutral about your response you may always select "Neither Agree nor Disagree".

1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly agree (SA)

	1	2	3	4	5
1. I make use of a computer during the Computer Science period 2 to 6 times per week.					
2. Computer Science is more practical.					
3. I use technology tools (computer, smartboard) in my learning 1 -3 times per week.					

4. I often receive assignments/tasks that require me to use a computer.					
5. I consider technology important to use in my learning.					
6. I have Internet access and a laptop/desktop computer smartphone at home.					
7. I use the Internet in my learning.					
8. I believe that I am ready for E-learning.					
9. I believe that I have the required IT equipment to participate in E-learning.					
10. I have the necessary IT skills and competency to participate in E-learning and online assessment.					
11. I have proper Internet access to use E-learning successfully.					
12. My school can make E-learning work.					
13. My school can afford the budget for using E-learning in teaching and learning.					
14. The IT infrastructure at my school can support E-learning.					

SECTION 3

1. What are the benefits of E-learning? ***tick 4 in the column***

a. Save time and no need for textbooks.	
b. Creativity.	
c. You can access content anywhere and anytime and you can learn on your own.	
d. Cater to individual needs.	
e. Video helps learners to engage with the subject of study, solving problems through a diverse range of methods and discussion forums.	
f. Easy to communicate with my teachers anytime and anywhere	

2. What is your opinion on E-learning being implemented in school?

Benefits……

Challenges……

1.5 Appendix : Semi-structured Interview Questions

Interview questions for teachers

1. What types of knowledge, skills, and attitudes are required for the subject matter?
2. What are the benefits of E-learning once it is incorporated into your teaching and learning?
3. What are the challenges of E-learning once it is incorporated into your teaching and learning?
4. What are the factors limiting you from implementing E-learning with your Grade 8, who are doing Computer Science?
5. How can you support your student learning at home by using technology?
6. Does the/Ministry of Education provide the Computer Science teacher with a personal computer? No, why? Yes? Is it a laptop or a desktop?
7. Does the Ministry of Education organise workshops for Computer Science teachers? How is the workshop organised? per region/ school?
8. Does your school provide the Computer Science teacher with a personal computer? No, why? Yes? It's a laptop or a desktop? Does the school send you for a computer course?
9. Was computer literacy part of your module in your tertiary studies?
10. Are you using any E-learning platforms in your teaching and learning?
11. How many times does the Ministry of Education maintain the school computers? Or updating the software? Who maintains it?
12. Do you believe that your colleagues understand what E-learning entails? Give a brief explanation. What are your keywords for defining E-learning?
13. Do you think you are ready for E-learning?
14. What is your qualification in teaching Computer Science

1.6 Appendix : Semi-structured Interview Questions (Interview questions for learners)

1 What are the benefits of E-learning in your learning?

2 What are the challenges you encounter when using E-learning?

3 How many times do you make use of a computer? In a week? At school.

4 Do you use a laptop/desktop/smartphone?

5 Is the device connected to the Internet?

6 Do you have access to the Internet or a computer at home?

6.4 If yes, do you use it often?

6.5 For what?

6.6 If not, why?

7 Do you think you are ready for E-learning?

8 Did you learn how to use the computer at school or on your own?