THE ROLE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) IN JUNIOR PRIMARY PHASE: A CASE STUDY OF ENVIRONMENTAL STUDIES IN SELECTED GRADE TWO RURAL CLASSROOMS

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ABSTRACT

This study aimed to explore the role of Information and Communication Technology (ICT) in the Junior Primary phase in the Omusati region of Namibia. The study targeted Grade Two teachers from the Omusati Region, mainly those in rural schools responsible for teaching Environmental Studies. A case-study-based qualitative research method was used. The study used purposive and convenience sampling to select ten teachers and four schools. Ten Grade 2 Etayi Circuit teachers were observed and interviewed. The study highlighted several ICT roles in Environmental Studies instruction. ICT enhances learners' attention and memory, making abstract subjects easier to teach. With ICT, teachers can personalise learning. ICT use in Junior Primary was hindered by many factors. These included a lack of projectors, computers, internet connectivity, teacher ICT training, communication challenges, and instructional time for ICT integration. The study suggests many ways the Ministry of Education, Arts, and Culture (MoEAC) can address these concerns and increase ICT integration: Support ICT integration with equipment and training. Develop ICT-focused in-service professionals. Strategy and collaboration can overcome ICT integration barriers in rural Junior Primary schools to improve teaching and learning.

Keywords: Teachers, learners, roles, ICT, Junior Primary

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LIST OF ABREVIATION AND ACRONYMS

JP: Junior Primary

ECD: Early Childhood Development

ECE: Early Childhood Education

ICT: Information and Communications Technology

OHP: Overhead Projector

OMAS: Organisations, Ministries and other stakeholders

MoE: Ministry of Education

NIED: National Institute for Educational Development

HoD: Head of the Department

MBESC: Ministry of Basic Education, Sport and Culture

MoEAC: Ministry of Education Arts and Culture

MHETI: Ministry of Higher Education, Training and Innovation

UNAM: University of Namibia

UNESCO: United Nations Education, Scientific and Cultural Organization

TPACK: Technological Pedagogical Content knowledge

TCK: Technological Content Knowledge

TPK: Technological Pedagogical Knowledge

CK: Content Knowledge

PK: Pedagogical Knowledge

PCK:Pedagogical Content Knowledge

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DEDICATION

I dedicate this thesis to my parents and siblings for their unwavering support and encouragement throughout my academic journey.

Lastly, I dedicate this thesis to my colleagues and friends who encouraged and supported me throughout my studies.

DECLARATION

I, Emma A Kashweka, 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.

Emma A. Kashweka		October 2024
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Name of Student	**Signature**	**Date**

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CHAPTER ONE

INTRODUCTION OF THE STUDY

1.1 Introduction

Ertmer & Ottenbreit-Leftwich (2020) widely acknowledge the crucial role of Information Communication Technology in enhancing teaching practices through its use. Information and communications technologies (ICT) also cover a wide range of devices and platforms, including the internet, wireless networks, mobile phones, computers, video conferencing, and social networking (Ertmer & Ottenbreit-Leftwich, 2020). The present study focuses on the implementation of ICT in a specific domain of Junior Primary education, namely Environmental Studies, within a select number of rural second-grade (2nd grade) classrooms. This chapter provides an overview of the study, encompassing the contextual background, problem statement, significance of the study, research questions, limitations, and delimitations. Furthermore, it offers explicit definitions of the key terms employed throughout the study.

1.2 Background of the Study

The significance of information and communications technology (ICT) in the early years of fundamental education is extremely important within the current dynamic educational environment. Ertmer and Ottenbreit-Leftwich (2020) argue that information and communication technology (ICT) comprises a diverse range of digital tools and platforms, such as the Internet, wireless networks, computers, video conferencing, and social networking. The application of these technologies possesses the capacity to augment learner engagement, redefine pedagogical approaches, and equip younger learners for the digital age (Lim and Oakley 2018).

The Junior Primary phase, which typically encompasses grades one through three, assumes a crucial role in establishing the fundamental basis for children's educational trajectories. During this particular phase, learners engage in the development of fundamental skills in literacy, numeracy, and cognitive capacities, which play a crucial role in establishing a solid basis for their future academic achievements. The incorporation of information and communication technology (ICT) in the Junior Primary phase offers distinct possibilities for involving young learners and cultivating their digital literacy, problem-solving aptitude, critical thinking capacity, and creativity (Gonzalez-Sanmmed, 2021).

Researchers have extensively researched the integration of information and communication technology (ICT) in the classroom, revealing a multitude of advantages. Information and communication technology (ICT) equips educators with many resources to facilitate instructional delivery, material creation, and learner progress analysis. This empowers teachers to customise learning experiences in order to cater to the unique requirements of their learners. In addition, it provides opportunities for professional development and teacher cooperation, cultivating an environment that promotes ongoing enhancement (Mireku, 2019). Learners can access a diverse range of knowledge, engage in authentic learning experiences, and cultivate essential digital competencies for their future academic and vocational endeavors through the use of interactive multimedia resources, instructional software, and online platforms (Bal and Brysiewicz, 2019).

The authors, Hasin and Nasir (2021), emphasise the manifold advantages that arise from the integration of information and communication technology (ICT) inside educational settings, yielding positive outcomes for both educators and learners. According to Trust and Hurd (2019), Junior Primary schools that place emphasis on information and communication technology (ICT) offer learners valuable opportunities to get practical experiences and acquire the necessary knowledge for achieving success in the contemporary, technologically-driven global market.

Namibia's basic education structure is: Junior Primary (pre-primary, Grades 1-3), Senior Primary (Grades 4–7), and Junior Secondary (Grades 8–9), and Senior Secondary (10–12) (National Institute for Educational Development (NIED), 2015). The Ministry of Education (MoE) and the National Institute for Educational Development (NIED) acknowledge the significant importance attributed to the initial four years of formal education in providing a strong basis for learners' subsequent academic and vocational endeavours (MoE and NIED, 2014). The Junior Primary level is a fundamental component of Namibia's primary and secondary education systems.

The junior Junior Primary phase exposes learners to computer technology, enhancing their understanding of information and communication technology (ICT) as an instructional tool (Ministry of Education, Arts, and Culture, 2015). According to Valcke (2021), providing specialized approaches and knowledge is essential in Junior Primary education in order to effectively address the unique needs of young learners.

In the Vision 2030 document, the Namibian government talks about how important it is to use information and communication technology (ICT) to help learners use what they've learned in their future projects. They also say that ICT helps build a society that is based on knowledge (Ministry of Education, Arts, and Culture, 2017; Waigandjo, 2021). In pursuit of this objective, the Ministry of Education implemented the ICT Policy for Education, recognising the benefits of using ICT across all levels of education (Ministry of Education, Arts, and Culture, 2014). The aim of this study is to investigate the role of information and communication technology (ICT) in the early years of primary education. This research aims to contribute to the existing academic literature on the effective use of ICT to improve young learners' instructional and learning experiences by examining roles and challenges.

1.3 Statement of the problem

The study by Sumardi et al. (2020) highlighted the lack of 21st-century learning integration in primary school teachers' teaching and learning processes. The predominant use of teacher-centred methods and traditional instructional approaches limits the development of high-order thinking skills among learners. In today's rapidly advancing technological landscape, there is a growing demand for the application of technology across various sectors, including education. To adapt to these changes, the educational system must incorporate technology into instructional practices.

Willis et al. (2018) emphasised the potential for integrating technology and media in Environmental Studies to encourage children to explore, problem-solve, investigate, and demonstrate their understanding of the world beyond the classroom. ICT (ICT) not only provides access to new information but also enhances communication, processing, and problem-solving capabilities for both teachers and learners (Mireku,

However, the researcher, as an early childhood teacher educator, has observed that teachers in the Junior Primary phase have not fully embraced the use of ICT in their teaching methods. Many teachers still rely on traditional approaches, often referred to as "chalk and talk," and make minimal use of ICT tools. This observation raises concerns about the slow integration of ICT in Namibian rural Junior Primary schools.

Furthermore, there is limited knowledge about the role of ICT in the Junior Primary phase in Namibia, particularly in the context of the Environmental Studies subject (Waigandjo, 2021). Understanding how teachers utilise ICT to teach subject content and the potential benefits it holds for learners is essential. Therefore, the researcher aims to explore the role of ICT in the Junior Primary phase, specifically focusing on the Environmental Studies subject.

By investigating the current usage and impact of ICT in teaching and learning processes at the Junior Primary level, this study seeks to shed light on the importance of ICT integration and its potential to enhance 21st century learning skills among learners. The findings will contribute to a broader understanding of how ICT can support the development of expertise and improve educational outcomes in Namibia, aligning with the country's goals for Environmental Education.

1.4 Significance of the Study

Language policy makers will benefit from the study's results regarding the use of ICT in Junior Primary education, especially in the context of the Junior Primary Phase, which teaches and learns Environmental Studies. The results will also provide stakeholders with empirical data on the current state of ICT adoption in rural schools. Furthermore, this

study aims to fill a noticeable gap in the current knowledge regarding the impact of information and communication technology (ICT) in rural educational institutions. Additionally, the study will contribute to our understanding of the role of ICTs in the Namibian education system's Junior Primary Phase and encourage teachers to use ICT in teaching and learning.

1.5 Research questions

The following research questions guided this study:

1. What is the role of ICT in the teaching and learning of Environmental Studies in the Junior Primary Phase?
2. What challenges do rural, Junior Primary teachers experience in integrating ICT in Environmental Studies subject?
3. What strategies can be used to enhance the integration of ICT in Environmental Studies in Junior Primary rural schools?

1.6 Limitations of the Study

The study only looked at four (4) government combined and primary schools in the Etayi circuit of the Omusati region. Therefore, the study findings cannot be generalised to other circuits and regions. However, we can draw lessons from the findings and apply them to other rural schools in Namibia.

Another limitation was the refusal of some teachers in the chosen schools to participate in interviews and recordings. Therefore, the researcher replaced them with those who were willing to participate. The study may have lacked meaningful findings due to the perception that those who declined to participate were information-rich. Given the

researcher's role as a Lecturer of Early Childhood and Care at a higher education institution, there is a possibility that participants will view her more as an evaluator than a researcher. To address this, the researcher made it clear that, rather than assessing their ICT skills, her goal was to learn about their knowledge and understanding of the educational situations they experience.

1.7 Delimitation of the study

According to Miles (2019), this study's delimitations define the boundaries set by the research to achieve its specific objectives. To ensure the acquisition of robust and reliable information, the study exclusively incorporated a subset of schools from the Etavi circuit within the Omusati region, specifically limiting the scope to four rural combined and primary schools, despite the existence of numerous other schools in the area. Additionally, Environmental Studies was chosen as the central subject of this research because it is a crucial subject for second-grade learners. The relevance and significance of the themes and topics covered in Environmental Studies extend across the entire curriculum, thereby justifying this choice.

1.8 Definition of terms

Environmental Studies: is an interdisciplinary subject that studies how people and the environment interact. It entails investigating numerous environmental facets from the viewpoints of the physical, biological, and social sciences (Pooley & O'Connor, 2020)

Medium of instruction: Refers to the means of conveying information to learners (Ejim, 2023)

Traditional teaching methods: teacher-directed, where learners are taught in a manner that is conducive to sitting and listening (Tularam & Patrick, 2018).

Rural school: schools in the outskirts of the country. Some use the concept synonymously with the concept farm school or small school (Plessis, 2019). Rural schools are defined as schools that are located in rural areas, such as villages, and these places are commonly considered to be left behind in terms of technology, infrastructure, quality of life, and so on (Hasin & Nasir, 2021).

Information and Communications Technology Integration: The use of technology in the teaching and learning process, such as computers, software programs, and the internet, is referred to as ICT integration in education. This integration attempts to improve and assist a number of areas of education, including teaching strategies, dialog, teamwork, and information access (Trust & Hurd, 2019).

Junior Primary phase: The Phase of formal education that covers the first four years of Primary education (Minisrty of Education (MoE) and National Institute for Educational Development (NIED), 2014). This phase covers Pre-Primary and Grades 1-3 with children from the age of 6 to 9 years. Children in this phase are by Namibian definition still in their late early childhood years.

Benchmarking: refers to structured comparison between entities in order to emphasise their similarities and differences which can then be used as a basis for improving aspects of the phenomenon under investigation (Givan, 2023).

Digital divide: is a term that refers to the gap between demographics and regions that have access to modern information and communications technology (ICT), and those that don't or have restricted access (Trust & Hurd, 2019).

1.9 Chapter summary

This chapter examines the study's background, with a focus on Junior Primary education's use of information and communications technology (ICT). By examining the current use of and effects of ICT in teaching and learning processes at the Junior Primary level, this study seeks to shed light on the significance of integrating ICT and its potential to enhance learners' 21st-century learning skills. The findings of this study, in keeping with Namibia's goals for environmental education, will deepen knowledge of how ICT may encourage the development of expertise and improve educational outcomes in Namibia. This study was conducted at four government schools in the Etayi circuit of the Omusati district. This constrains the generalisation of the results to other circuits and locations. However, the outcomes offer insightful lessons that Namibia's other remote schools can apply. This chapter also presents the difficulties and limitations of the study.The following chapter, which summarises and examines the study's literature review and theoretical framework, provides a complete overview of the body of knowledge and theoretical foundations related to the research topic.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter showcases pertinent research from other scholars concerning the integration of ICT in Junior Primary education. The section begins with a discussion of the theoretical framework, followed by a review of literature on the role of ICT in the teaching and learning of Environmental Studies in the Junior Primary phase. It deliberates on the challenges that Junior Primary teachers experience in integrating ICT in Environmental Studies subject and the strategies that can be used to enhance the integration of ICT in Environmental Studies Grade 2 rural classrooms.

2.2 Theoretical framework

This study used Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge model as its theoretical framework. The acronym TPACK stands for Technological Pedagogical Content Knowledge. The development of this theory aims to elucidate the knowledge required by teachers to effectively teach a subject, utilize technology, and teach effectively.

The TPACK model explains the set of knowledge teachers need to teach their learners about the subject matter with the help of technology. Mishra and Koehler (2006) created the TPACK model because there was no other adequate theory to explain or guide the effective integration of technology in the classroom. The Technological Pedagogical Content Knowledge (TPACK) framework offers a comprehensive approach to understanding the complex relationship between technology, pedagogy, and content knowledge in the context of education (Mishra & Koehler, 2006). In this case study,

explore the role of ICT in Junior Primary phase classrooms, specifically focusing on its impact on Environmental Studies in selected Grade Two rural classrooms.

The TPACK model emphasizes how the connection between the three domains can enhance the use of ICT in teaching and learning. The combination of PK and CK forms Pedagogical Content Knowledge (PCK). This refers to teachers who know how to deliver their subject effectively in order to help learners understand it clearly. CK and TK form Technological Content Knowledge (TCK), which enables the use of technology to promote subject matter teaching. TK and PK form Technological Pedagogical Knowledge (TPK), which helps teachers choose the appropriate and available technology tools to deliver the content, plan the lesson, and manage the learners. A combination of TK, CK, and PK forms TPACK, which enables teachers to deliver their subject content to the learners using the most appropriate available technology with suitable pedagogy (Mishra & Koehler, 2006).

Teachers' technological knowledge (TK) refers to their understanding and proficiency in using various ICT tools and devices in this study. They should be familiar with educational software, multimedia resources, interactive applications, and hardware relevant to teaching Environmental Studies concepts (Sandholtz et al., 2019).

Pedagogical Knowledge (PK) refers to effective teaching strategies and methods. In this context, it involves understanding how to create engaging and developmentally appropriate lessons for Grade Two learners to explore environmental topics using ICT tools. This may include interactive presentations and digital storytelling (Angeli & Valanides, 2020).

Content Knowledge (CK): In this case, Environmental Studies, content knowledge represents a teacher's deep understanding of the subject matter (Koehler & Mishra, 2009). For effective ICT integration, teachers must have a solid grasp of the specific content areas and learning objectives related to the Grade Two curriculum. The TPACK framework recognises that these three components do not function in isolation but interact in complex ways. Effective technology integration requires a balance and synergy between all three types of knowledge (Mishra & Koehler, 2006).

Technological Pedagogical Knowledge (TPK) refers to the combination of technology and pedagogy. This knowledge pertains to the effective use of technology in teaching. Understanding how technology can facilitate learning, support various instructional strategies, and meet diverse learning needs is essential. It involves knowing how to leverage ICT tools to deliver content effectively, address learners' needs, and facilitate active learning experiences in Environmental Studies. This knowledge guarantees the appropriate and meaningful use of technology in the classroom (Koehler & Mishra, 2009).

Technological Content Knowledge (TCK): TCK centres on comprehending how technology can effectively represent and communicate specific content. It involves knowing how to use technological tools and resources that are appropriate for teaching a particular subject matter. For the Grade Two Environmental Studies classrooms, teachers need to know which ICT resources align best with the subject matter and are suitable for the learners' age and learning level (Koehler & Mishra, 2009).

Technological Pedagogical Content Knowledge (TPACK): TPACK represents the integration of all three knowledge domains—technology, pedagogy, and content (Koehler

& Mishra, 2009). This study focuses on how teachers can effectively use ICT tools to teach Environmental Studies concepts to Grade Two learners in rural classrooms. TPACK encourages a thoughtful and balanced approach to incorporating technology to enhance learning outcomes (Bingimlas, 2018).

2.3 The Role of ICT in Environmental Studies Subject

ICT has reportedly transformed teaching and learning processes, according to Gupta and Kumar's (2018) research. ICT integration in the classroom has a number of advantages and opportunities for both teachers and learners. Teachers can prepare their learners for the real world by integrating media and technology into Environmental Studies through projects that encourage curiosity, innovation, problem solving, communication, collaboration, documentation, investigation, and demonstration of knowledge gained from experiences in the natural environment (Wang & Wu 2020).

The emphasis on Environmental Studies in Namibia's Junior Primary education curriculum spans a variety of subjects, including social interaction, personal safety, dietary habits, and the environment. Learners can make connections between people and their surroundings thanks to the social environment concept's inclusion in this curriculum. Additionally, the instruction on nutrition, safety, and health equips learners with priceless lifelong perspectives and abilities. These include the capacity to establish and uphold friendships, control one's emotions, recover from illnesses, assume one's own responsibilities in potentially hazardous circumstances, adjust to physical changes, and stay safe.

The curriculum emphasises the significance of comprehending and appreciating the natural world. Learners gain awareness of how to take care of the environment and make environmentally responsible changes by developing a better respect for the biological and physical components of the world they live in (Ministry of Education, 2015). In this regard, integrating information and communication technology (ICT) can significantly improve learners' understanding of the material. This section examines the role of ICT in teaching and learning.

2.3.1 The Role of ICT in Helping Teachers to Teach topics that are Abstract or Distant to the Learners

ICT helps learners establish connections between abstract topics and real-world applications. Teachers can use online resources and interactive simulations to demonstrate how abstract concepts are relevant in everyday life or different fields of study (Kirschner, 2019). The same author further added that by linking abstract ideas to practical examples and real-world contexts, ICT enhances learners' understanding and motivation to learn. Video presentations have demonstrated the ability to maintain learners' interest and involvement, as noted by (Brown, 2022). The author also mentions that using videos is a wonderful way to bring the real world into the classroom, allowing teachers to more easily design engaging, interactive, and intriguing courses for their learners. According to Brown (2022), learners can grasp complicated concepts like how to dramatise the reading of a news broadcast on TV by watching a video that explains the concept. The above findings are in line with Wang and Wu's (2020) assertion that ICT tools allow teachers to present abstract concepts in a visual and interactive manner. Through multimedia resources, such as videos, animations, and simulations, teachers can make abstract topics more tangible

and relatable to learners. Furthermore, visual representations help learners grasp complex ideas by providing concrete examples and enhancing their understanding.

2.3.2 The use of ICT raises learner engagement

According to Al-Saqri et al. (2021), the need for ICT in education is to create a learning environment that focuses on learners. ICT tools address the gap between teacher- and learner-centred environments. Furthermore, ICT meets all learners' unique educational requirements by providing access to a wide range of information. Researchers Bal and Brysiewicz (2019) have widely acknowledged the positive effects of ICT use in the classroom on learner motivation and active learning. By effectively utilising ICT tools, teachers can enhance the educational experience by engaging learners in interactive and dynamic activities. Furthermore, ICT has the potential to make learning more engaging and enjoyable, capturing learners' interest and motivating them to actively explore and interact with the content (Bal & Brysiewicz, 2019).

Dunn (2018) also noted that the visual and interactive nature of ICT promotes active learning by stimulating children's curiosity and fostering their engagement. Furthermore, studies have demonstrated that integrating ICT into the classroom enhances learner motivation and prioritises active learning more successfully than traditional teacher-led classes. The use of ICT tools in educational settings tends to increase learners' engagement, motivation, and active involvement in their learning process (Kong et al., 2021).

2.3.3 The use of ICT enhances learners focus

Fidalgo et al. (2021) have demonstrated that the use of ICT (ICT) enhances learners' focus and engagement in educational settings. ICT tools, such as multimedia presentations, virtual reality simulations, and interactive learning platforms, provide learners with engaging and interactive learning experiences that can capture and sustain their attention (Lai & Hwang, 2020).

Studies have indicated that the incorporation of ICT in classrooms can increase learners' motivation and concentration levels (Fidalgo & Onyango, 2021). For example, Lai and Hwang (2020) conducted a study involving secondary school learners and found that the use of ICT-based instruction significantly improved their focus during the learning process. The researchers attributed this improvement to the multimodal nature of ICT tools, which can stimulate multiple senses and enhance learners' cognitive engagement.

Furthermore, Fidelis and Onyango (2021) investigated the impact of ICT on attention and focus in a higher education context. Their findings revealed that learners who participated in ICT-based activities demonstrated higher levels of concentration compared to those engaged in traditional classroom instruction. The researchers suggested that the interactive and immersive nature of ICT tools helped maintain learners' attention and fostered deeper engagement with the learning materials.

2.3.4 Incorporate individualised learning into Classrooms

Hasin and Nasir (2021) assert that supplementing instruction with opportunities for independent exploration, as opposed to lectures, increases learner engagement. In active

learning, the teacher must believe in the learners' ability to learn independently and provide them with materials, situations, and opportunities to make their own discoveries.

We can personalize educational software and apps to meet the diverse needs and learning styles of Junior Primary learners (Laridon et al., 2020). According to Kong et al. (2021), teachers can create and share educational resources, assignments, and assessments, allowing for individualised instruction and supporting learners' unique needs and pace of learning. This promotes a learner-centred approach and supports inclusive education practices.

In addition to reading and hearing, ICT can benefit over 87% of learners who learn better through visual and tactile modalities by allowing them to "feel" the knowledge (Shabiralyani, 2020). Furthermore, Shabiralyani (2020) emphasized that using visual aids to teach Environmental Mental Education topics can enhance the learning experience by making it more real, accurate, and dynamic. Studies have demonstrated that the use of ICT can help learners engage in their studies and progress at a pace that best suits their individual needs (Kong et al., 2021).

2.3.5 Learning is facilitated by ICT and learners retain more of what they learn

Zweekhorst and Maas (2018) posited that using ICT tools can improve and expand learners' opportunities for collaboration and dialogue with one another and with their teachers. Silva (2021) argues that ICT has the potential to rapidly and easily alter the physical configuration of classrooms, hence increasing learners' levels of comfort, connection, and engagement.

When compared to traditional teaching methods, ICT allows learners to benefit greatly from the subject at hand. According to Chen, Lee, and Chen (2021), ICT has undoubtedly played a significant role in facilitating learning and has the potential to enhance knowledge retention. The same authors further added that ICTs like OHPs enable teachers to present complex or detailed information from various sources, such as textbooks, posters, and diagrams. This allows learners to visualise intricate concepts, enhancing their understanding and retention of the subject matter.

According to Alkamel and Chouthaiwale (2018), when learners watch videos, they are more engaged, learn more, and retain what they learn. These authors added that instead of teachers just lecturing about a topic, teaching the same thing on a computer or tablet can encourage more active engagement in the learning process, which might be difficult to achieve with more traditional approaches. Incorporating technology into Junior Primary classrooms has piqued learners' interest in learning.

The can better understand concepts and content related to the natural environment thanks to the use of information and communication technology (ICT) in education. ICT tools and resources facilitate the investigation and comprehension of environmental topics in a more engaging and meaningful way. Learners can participate in interactive and immersive learning experiences. Learners can access a variety of multimedia resources, interactive simulations, and online platforms through the use of ICT, all of which help them better comprehend environmental issues and create a stronger bond with the natural world (Gupta & Kumar, 2018).

2.4 Challenges teachers encounter in ICT integration in the Environmental Studies subject

According to a study, teachers using ICT in the classroom face many problems. Namibian schools struggle to adopt ICT. Iiyambo (2022) notes that teachers and learners resist technology, which hinders ICT integration. Despite having access to ICT resources, teachers tend to lack pedagogical training on how to successfully integrate ICT into their education. Teachers also face infrastructure constraints, financial constraints, insufficient skilled personnel, cultural and bureaucratic barriers, outdated computers, theft, limited accessibility, and inadequate technical support when implementing ICT in the classroom (Hodgson et al., 2018).

2.4.1 Inadequate training and professional development opportunities for teachers

Despite having access to ICT tools, Iiyambo (2022) notes that teachers appear to have received little pedagogical training on how to successfully integrate ICTs into their classes. According to He et al. (2019), teachers in the junior Junior Primary phase might not have the necessary training or expertise to use ICT tools and incorporate them into their teaching methods. Furthermore, the lack of professional development options available to teachers to advance their digital skills and pedagogical knowledge may impact their capacity to successfully integrate ICT in the classroom. Ndlovu et al. (2019) also noted that teachers frequently lack the ICT expertise and abilities essential to successfully incorporating technology into their instruction. The same authors also mentioned that many teachers may not have had sufficient training in using ICT tools, making it difficult for them to effortlessly integrate technology into their teaching methods.

Hodgson et al. (2018) discovered that many teachers lacked computer abilities and did not want to incorporate extra learning into their teaching techniques. Teachers' lack of technological proficiency is a major impediment to ICT adoption in developing countries (Afreen, 2019). In Africa, teachers' technological incompetence is the biggest obstacle (Brantley-Dias and Ertmer, 2018). Furthermore, Brantley-Dias and Ertmer (2018) found that teachers who do not use computers in classrooms say they lack the abilities to use ICT for teaching. Hatlevik and Arnseth (2019) discovered that Junior Primary and secondary school teachers' lack of knowledge and abilities hinders ICT use.

2.4.2 Teachers' worldviews and philosophies

According to Kereluik et al. (2019), teachers' beliefs, experiences, and professional growth influence their views towards the integration of information and communication technology (ICT) in education. Furthermore, it can be challenging to categorize individual teachers' attitudes and ideas into a single group, and they may change over time.

Ertmer and Ottenbreit-Leftwich (2020) attribute the considerable variation in teachers' worldviews and philosophies regarding information and communication technology (ICT) to their individual beliefs, experiences, training, and the specific educational environment in which they operate. Here are some common teacher perspectives on ICT in education:

Technocentrism: refers to a perspective that places excessive emphasis on technology as the primary driver. According to Ertmer and Ottenbreit-Leftwich (2020), technocentric educators perceive technology as an essential component of the educational process. The individuals have the belief that information and communication technology (ICT) possesses the capacity to enhance the educational process across many academic

disciplines. Teachers who adopt a technocentric perspective often perceive technology as an essential instrument for effectively involving learners, improving their digital skills, and equipping them for the demands of contemporary society.

According to Voogt and Roblin (2021), educators who adopt a pragmatic perspective approach the practical use of information and communication technology (ICT). Individuals evaluate the advantages and disadvantages of technology in various educational settings and make well-informed decisions about its inclusion and implementation. Pragmatic teachers emphasize the integration of technology that aligns with their instructional objectives and enhances learners' academic achievements.

Constructivism: According to Ertmer and Ottenbreit-Leftwich (2020), educators who adhere to the constructivist approach perceive information and communication technology (ICT) as a tool that may effectively support the implementation of learner-centered learning. Constructivist educators perceive information and communication technology (ICT) as a tool that has the potential to facilitate the implementation of constructivist instructional approaches. Researchers widely believe that technology can facilitate and enhance active engagement, collaborative efforts, and idea sharing.

Traditionalism: Certain educators may hold a more traditionalist view about the use of information and communication technology (ICT). There are also educators who exhibit a preference for conventional teaching methods and display reluctance to integrate information and communication technology (ICT) into their instructional practices. Some educators may exhibit a preference for traditional teaching methods and perceive technology as superfluous or harmful to the learning process (Davis et al. 2019).

Hughes and Sachariah (2019) suggest that educators' perspectives and ideologies on the use of information and communication technology (ICT) in instructional practices may undergo transformation as they accumulate more expertise and familiarity with technology within the educational context. Professional development, ongoing training, and peer collaboration can influence the attitudes and strategies for effectively integrating ICT into teaching practices. Ultimately, the perspectives and belief systems held by educators have a significant impact on their utilization of information and communication technology (ICT) tools, resources, and instructional methods in order to enhance the educational experiences of their learners. Teachers are currently facing a significant workload, and they are now confronted with the additional responsibility of incorporating information and communication technology (ICT) into their teaching practices (Hughes & Sachariah 2019).

2.4.3 Lack of connectivity and ease of access

The lack of readily available equipment, such as computers, remains a major obstacle to teaching with technology (Amadhila & Shikalepo, 2020). He et al. (2019) pointed out that many Junior Primary schools, especially those in remote or economically disadvantaged areas, face limited access to ICT resources. These include the lack of computers, tablets, internet connectivity, and other necessary devices, which can prevent teachers and learners from fully benefiting from ICT-enhanced learning experiences. According to Chirimbana et al. (2022), another challenge is that there is no electricity in schools. The examination revealed that some schools lacked connection to the national grid. They were unable to experience the advantages of the rural electrification program, which may have spared them from having to use conventional methods of instruction. A recent study in

Afghanistan discovered that schools without electricity lack access to the internet and valuable online resources, essential for effective teaching and learning (Becta & Abbott, 2021).

Laridon et al. (2020) cited inadequate infrastructure as one of the barriers. These include insufficient technological infrastructure, such as outdated computer labs, slow internet connections, and inadequate power supply, which can hinder the integration of ICT in the Junior Primary phase. These infrastructure limitations can limit the availability and effectiveness of ICT tools and resources.

Abi-Abdallah (2020) points out that one of the challenges is a lack of technological infrastructure and resources in schools. In many educational institutions, there may be limited access to computers, internet connectivity, or software necessary to effectively utilize ICT tools in teaching Environmental Studies (Abi-Abdallah, 2020).

Hatlevik & Arnseth (2019) noted that low computer numbers, obsolete or slow ICT systems, and a lack of educational software in primary schools hindered ICT implementation. According to Afreen (2019), schools' lack of internet connection and hardware prevented technology integration. ICT access hurdles are many. According to Ghavifek and Sufean (2020), inadequate infrastructure and material resources were identified as barriers. Ghavifek and Sufean (2020) also noted that access to ICT resources does not guarantee their successful implementation in teaching, not only due to a lack of ICT infrastructure but also due to other barriers like a lack of high-quality hardware, suitable educational software, and ICT resources.

2.4.4 Time constraint

Amadhila and Shikalepo's (2020) study of schools in the Omusati Educational Region indicated that teachers there faced numerous barriers to using ICT in their pedagogical practices due to a lack of time for lesson planning and the incorporation of technology. Similarly, Ndlovu et al. (2019) also revealed that teachers often have a packed curriculum and limited class time, leaving little room for additional activities involving technology. Moreover, integrating ICT effectively requires careful planning, preparation, and implementation, which can be time-consuming. Teachers need to search for appropriate digital resources, design lessons that incorporate technology, and provide guidance and support to learners as they navigate ICT tools. All these activities require dedicated time within the already tight schedule (Ndlovu et al., 2019).

The Trust and Hurd (2019) study indicated that integrating ICT activities may require additional planning, preparation, and instructional time. Therefore, teachers need to balance the use of ICT with other essential aspects of the curriculum, which can be challenging. Additionally, technical issues and troubleshooting can consume valuable class time. If there are problems with internet connectivity, equipment malfunctions, or software glitches, it can disrupt the flow of the lesson and consume precious instructional minutes (Trust & Hurd, 2019). Ertmer and Ottenbreit-Leftwich (2020) revealed that teachers have little time to study new technologies. Furthermore, planning, accessing digital resources, and designing interesting instructional activities take time when integrating ICT. Chen et al. (2019) mentioned that creating content for technology integration, such as taking pictures, editing, creating voiceovers, streaming, or designing apps, is more time-consuming than creating traditional content.

2.4.5 Instructional Medium for Junior Primary Grades

According to the Ministry of Education, Arts, and Culture (2016), the medium of learning in pre-primary and grades 1–3 should be the learner's mother tongue. Charlton (2018) elaborates that when it comes to accessing and utilizing ICT resources, teaching in the mother tongue has the potential to create language hurdles. Major international languages, such as English, primarily offer a variety of internet tools and information. Additionally, if a learner's or teacher's mother tongue is not the same as one of these languages, they may have difficulty accessing appropriate digital content or navigating technology platforms that are not available in their native language; this linguistic barrier can hinder effective ICT integration in the classroom (Charlton, 2018).

However, the policy for the national curriculum for basic education indicated that learners should be exposed to computer technology, gaining a first appreciation of ICT (ICT) as a tool for learning, learning to recognize the functions and uses of ICT in their lives, and getting a basic understanding of how a computer works and how to use it in learning processes (Ministry of Education, Arts, and Culture, 2016). Consequently, most Junior Primary rural school curricula do not use English as a medium of instruction, opting instead to teach subjects in their mother tongue or the most prevalent local language.

According to Zaugg et al. (2022), the availability of digital information in the mother tongue may be limited when compared to resources in major international languages. Although the mother tongue may provide some localized information, it may not offer the same range and diversity of digital resources as languages with a larger user base. The

impact of this constraint on the range and quality of ICT materials in classes could potentially diminish the depth and efficacy of ICT integration.

2.5 Mitigating strategies to enhance the use of ICT in Environmental Studies subject

Mitigation methods are any actions performed or planned to lessen the impact of a potential threat, as the name implies. Here are some of the mitigating strategies that can enhance the use of ICT in teaching and learning.

2.5.1 Offering training to use ICT effectively in the classroom

Conduct training programmes for teachers to familiarise them with the ICT infrastructure and software tools. It is crucial to offer professional development opportunities that will enhance their technological skills and pedagogical approaches, enabling them to effectively integrate ICT into their lessons (Chen et al., 2019).

He et al. (2019) stated that technology is constantly evolving, and new tools and platforms emerge regularly. Teachers need to stay updated with the latest advancements to provide their learners with relevant and meaningful learning experiences. Furthermore, receiving training allows teachers to learn about new technologies, understand their potential applications in education, and effectively incorporate them into their teaching methods (He et al., 2019). According to Abi-Abdallah (2020), introducing technology in schools can present various challenges, such as technical issues, access disparities, and resistance to change. Adequate training can help teachers navigate these challenges effectively. Similarly, Bal and Brysiewicz (2019) stated that professional training equips teachers with the knowledge and skills needed to effectively incorporate digital technology tools into their teaching practices. Furthermore, school management can help teachers understand

the pedagogical benefits of technology integration, learn how to select appropriate tools, and develop strategies to integrate them seamlessly into the curriculum. This ensures that the implementation of digital tools is purposeful and aligned with educational goals. Angula et al.'s (2019) findings revealed that the majority of the teachers were digital immigrants who went to school and grew up before the widespread adoption of digital technologies like computers and the internet. Therefore, ICT training is essential for them.

2.5.2 Availability of IT equipment

Schools, teachers, and learners in different parts of the world do not have access to the same quality of education because of the digital divide (Powers et al., 2020). These findings align with the findings of Angula et al. (2019), who noted that a significant number of teachers have limited or no access to digital technology resources within their institutions; hence, there is a need to enhance the accessibility of digital technology for schools, learners, and teachers.

Chetty and Fang (2018) stated that school administrators should ensure that the necessary infrastructure and resources are in place to support the effective use of digital tools. This includes providing reliable internet connectivity, access to appropriate devices and software, and technical support for teachers. Furthermore, administrators should allocate a sufficient budget for acquiring and maintaining technology resources, as well as stay up to date on emerging technologies and trends in educational technology (Chetty & Fang 2018). These concepts concur with Chen et al.'s (2021) claims, which emphasise the need for infrastructure development to enable the use of technology in educational contexts. The provision of necessary hardware and software resources, as well as the establishment of specialised computer laboratories or IT resource centres, are all crucial components of

improving ICT infrastructure. In order to successfully integrate ICT into educational practices, it is crucial to invest in infrastructure development.

High-quality digital material is another aspect of enhanced ICT facilities. Access to high-quality digital resources is essential, including educational websites, digital textbooks, and multimedia resources (Kong et al., 2021).

2.5.3 Soliciting inputs from a wide range of interested parties

In order to successfully implement and manage information and communication technology (ICT) in schools, administrators must possess a clear vision for technology, as emphasised by Bal and Brysiewicz (2019). The authors argue that collaborative decision-making processes contribute to improving both individual and collective decision-making. To enhance relationships with the public, private, and non-profit sectors, leaders should actively engage in fundraising efforts and acquire knowledge about ICT. Furthermore, visionary leaders should explore diverse avenues for acquiring essential resources to improve learners' access to and equity in using ICT (Bal & Brysiewicz, 2019).

Akhtar (2022) mentioned that school stakeholders have sought government subsidies, involved parents in purchasing ICT devices, offered professional development workshops, and improved stakeholder cooperation and collaboration. Furthermore, the involvement of teachers is particularly vital, as they play a central role in implementing ICT in the classroom. Their experiences, challenges, and recommendations can offer valuable

insights into effective integration strategies, necessary support systems, and professional development requirements (Akhtar, 2022).

As a result, it is crucial to involve several parties in education technology, as this often spans multiple industries and incurs substantial financial and technical organisational challenges. In addition to the Ministry of Education, Arts, and Culture, other foreign and local organisations, such as NGOs and the commercial sector, could make significant contributions (Dinechin & Boutard, 2021). Furthermore, involving ICT in education decisions necessitates the participation of a variety of stakeholders. Teachers, administrators, politicians, parents, technology experts, industry representatives, and community members can create effective and inclusive ICT integration policies by considering different views (Dinechin & Boutard, 2021).

The government, through the Rural Electrification Programme, should accelerate the distribution of electricity in rural areas so that schools have access to electricity, a major factor in the effective integration of ICT (Fidelis & Onyango, 2021). Iiyambo's (2022) investigation of the ICT integration strategies used by Junior Primary teachers in teaching phonemes in the Oshana region suggested that the government should supply schools with electricity to prevent the disruption of the internet system and the use of diverse ICT tools and devices. A continual supply of electricity is the remedy to achieve sustainable ICT policy integration in schools. Furthermore, the study found that the majority of ICT gadgets rely on electricity for operation, making them unusable without reliable sources of power. The study revealed that the provision of electricity could subsequently improve the implementation of ICT in the teaching of Junior Primary grades.

2.5.4 Developing a Community of Practice (CoP)

Principals play a crucial role in facilitating the professional development of teachers by promoting creative thinking within the classroom, organising high-quality professional development opportunities, and implementing targeted initiatives, such as integrating information and communication technology (ICT), tailored to the unique needs of individual learners (Ellis & Moore, 2019). Ellis and Moore (2019) advocate for principals, heads of departments, and experienced teachers to assist less experienced colleagues in effectively utilising ICT in the classroom. Furthermore, collaborative efforts among teachers and the cultivation of strong interpersonal relationships help to alleviate ICT-related challenges. Engaging in group-based learning not only allows teachers to refine their ICT skills but also enables them to establish networks with peers and gain exposure to diverse perspectives from individuals with various cultural, intellectual, and professional backgrounds (Ellis & Moore, 2019).

Piki (2018) noted that collaborative work among teachers promotes an environment where individuals feel comfortable acknowledging their own areas for improvement and are more inclined to generate innovative solutions. Working in teams also facilitates the development of novel approaches to learning. Piki (2018) further emphasised that the sharing of knowledge regarding the incorporation of ICT into classroom activities from a learner-centred perspective is particularly beneficial for teachers in supporting learners' learning. Consequently, it is crucial for teachers to leverage ICT effectively in order to create engaging and rewarding classroom experiences as well as facilitate more efficient teaching practices (Piki, 2018).

In addition, collaborative learning activities foster information sharing among teachers, enabling them to identify and address challenges associated with integrating technology into their instructional practices. By collectively exploring potential solutions, sharing insights, and gaining a deeper understanding of how to overcome these obstacles, teachers develop a sense of camaraderie and experience professional growth (Abi-Abdallah, 2020). Participation in collaborative learning activities focused on technology also provides teachers with opportunities to stay abreast of the latest tools, trends, and best practices in educational technology. This continuous learning ensures that teachers remain competent in effectively integrating technology into their teaching, thereby enhancing their own knowledge and skills (Bayne, 2018).

2.5.5 Benchmarking

Benchmarking is an integral component of the total quality management process, which emphasises the integration of information and communication technology (ICT). It entails the sharing of information and practices among peer institutions, as well as the willingness to adapt to new circumstances and adopt best practices in ICT utilization (Piki, 2018). Principals can engage in benchmarking to network with other educational leaders and exchange knowledge and best practices regarding the integration of ICT in the classroom. Schools with a strong track record of effectively implementing and utilising ICT can serve as benchmarks for others, providing valuable insights into innovative approaches to ICT integration (Akhtar, 2022). Such benchmarking efforts promote exposure to new perspectives and strategies for ICT implementation in classrooms.

Through benchmarking, principals gain opportunities to learn from other schools in similar contexts, enabling them to better support their teachers in using ICT for teaching and learning (Ellis & Moore, 2019). Establishing connections with peer schools through benchmarking fosters collaboration and knowledge exchange among teachers. By engaging in dialogue and interaction with counterparts from other schools, teachers can learn from each other's experiences, challenges, and successes, leading to a broader understanding of effective ICT integration and fostering creativity in instructional practices.

Furthermore, benchmarking allows schools to establish criteria for excellent ICT integration in the classroom (Ellis & Moore, 2019). Evaluating the extent of ICT's use to enhance instructional delivery, promote learner engagement, and support personalised learning experiences is crucial during the benchmarking process. Moreover, comparative analysis of instructional practices and strategies across schools helps identify effective approaches to ICT integration, enabling teachers to learn from successful implementations in order to enhance their own practices (Ellis & Moore, 2019).

Chen and Jones (2018) Benchmarking refers to the process of comparing an organisation's performance, practices, or outcomes against those of other similar organisations or industry standards. In the context of ICT in schools, benchmarking involves assessing and comparing the use and effectiveness of ICT in educational institutions. This process helps identify best practices, areas for improvement, and opportunities for innovation.

2.6 Chapter summary

ICT plays a crucial role in teaching and learning by enhancing access to educational resources, supporting interactive teaching methods, facilitating personalised learning experiences, promoting communication and collaboration, and streamlining assessment processes. The integration of ICT in education has the potential to enhance learner engagement, improve learning outcomes, and prepare learners for a digitally driven world.

However, despite the availability of ICT resources, several challenges hinder its effective integration into the classroom. Teachers often lack pedagogical training on how to successfully incorporate ICTs into their teaching practices. Additionally, infrastructure constraints, financial limitations, insufficient skilled personnel, cultural and bureaucratic barriers, outdated computers, theft, limited accessibility, and inadequate technical support pose obstacles to implementing ICT in the educational context.

To address these issues, collaborative efforts among teachers are essential. Sharing resources and best practices can enhance their ability to integrate ICT effectively. Furthermore, support from school officials, including administrators and policymakers, is crucial for providing the necessary infrastructure and technical assistance. Access to professional development opportunities is vital for teachers to acquire the knowledge and skills required for meaningful ICT integration.

By addressing these barriers and challenges, the successful integration of ICT can significantly improve the teaching and learning process in Environmental Studies. It is imperative to foster a supportive environment that encourages collaboration, provides necessary resources, and promotes ongoing professional development for teachers. Such

efforts will help to harness the full potential of ICT in education and reap its benefits in Environmental Studies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes and presents the research methods used in this study. It describes the study's research design, population, and sampling procedures. In addition, the data collection methods, data analysis, and data verification methods and strategies used, as well as the pilot study and ethical procedures employed, form the last part of this chapter.

3.2 Research design

The purpose of this study was to examine the role of information and communication technology (ICT) in rural Grade 2 classrooms in the Omusati educational region using a qualitative research approach and a case study research design. According to Yin (2018), the use of a case study technique enabled thorough and in-depth analyses of complicated topics within their actual contexts. In this study, the researcher used the case study technique to better understand the function of ICT in the Junior Primary educational environment. The researcher used this methodology to investigate the target audience and the underlying factors influencing their behaviour. Additionally, the researcher was able to understand the worldviews of the teacher by using a qualitative technique to investigate their viewpoints on the use of ICT in Environmental Studies in rural Junior Primary schools.

According to Baxter and Jack (2020), case studies are a qualitative research methodology that concentrates on the investigation of a single unit of study or a confined system, such as an individual, a small group, an organisation, or a particular programme.

The researcher admits that knowledge is based on lived experiences and interpretations, is vulnerable to cultural influence, and is subjective (Blackwell, 2018, p. 9). This awareness led to the use of the interpretivist philosophy in this work. The interpretivist philosophy recognises that the researcher's personal worldview necessarily influences the gathering, comprehension, and interpretation of data. Similarly, the researcher in this study about Grade 2 Environmental Studies lessons in rural schools was aware of her own worldview and made an effort to limit its impact on the findings. By acknowledging biases and practicing self-reflection, the researcher tried to be objective and ensure that the data collection and analysis were as impartial as possible.

3.3 Population and Sampling procedures

Sampling refers to the process of selecting a subgroup from the available population in order to accurately represent the characteristics of the entire population, as defined by Creswell and Creswell (2018). A population, according to Momoh (2022), encompasses the total number of individuals who share a particular defining attribute. In this research, the focus was on combined schools and Junior Primary schools within the Etayi Circuit, Omusati Region.

The study area encompasses 24 combined and primary schools, employing a total of 34 grade Two teachers. For this study, the researcher selected a sample of ten (10) Junior Primary teachers from the Etayi Circuit in the Omusati Educational Region. The researcher specifically selected these teachers based on their minimum requirement of three years of experience in teaching Environmental Studies. By ensuring that the sample consisted of teachers with a certain level of expertise and familiarity with the subject matter, the researcher aimed to obtain valuable insights into the research topic.

To achieve this, the researcher employed the purposive sampling technique. Purposive sampling, as described by Creswell and Creswell (2018), is a qualitative sampling method where researchers intentionally choose individuals and settings to comprehend the key phenomenon under study.

The researcher sampled the schools using a technique known as convenience sampling. Creswell and Creswell (2018) define convenience sampling as a non-probability sampling technique that selects subjects based on their convenient accessibility and proximity to the researcher. The schools were chosen based on how easy they are to access. The inclusion of specific schools in the sample was deemed appropriate because they provided access to suitable ICT resources, which was essential for meeting the goals of the study. Furthermore, the researcher's prior experience teaching within the circuit contributed to her familiarity with the surrounding neighbourhood.

3.4 Research Instruments

This study employed two methods of data collection, namely non-participant observation and interviews. In this study, the researcher observed classes from the side-lines. Teachers' responses were gathered through individual, semi-structured interviews. The researcher conducted the observations before the interviews to avoid any potential influence from the interview questions.

3.4.1 Non-participant observation

The researcher conducted non-participant observations of Environmental Studies classes at the Junior Primary level to understand the role of ICT in these classes. According to Creswell and Creswell (2018), observation allows the researcher to obtain information about the physical setting, the interactional setting, and the programme setting.

According to Creswell & Creswell (2018), observation is the methodical description of events, actions, and artefacts in a social context. Three ICT-mediated lessons were observed per participant in this study. The study involved thirty (30) independent classroom observations of Environmental Studies classes. The observation lasted forty minutes, and it was the same time allocated to Environmental Studies according to class timetables. The researcher's goal for the 40-minute observation session was to understand the function of ICT throughout the entire lesson, from introduction to presentation to reinforcement and conclusion. These observations provided in-depth understanding of the Grade 2 Junior Primary classroom's use of ICT. The researcher conducted a systematic observation using an observation schedule, as detailed in Appendix 6.

3.4.2 Individual Semi-Structured Interviews

Esterberg (2018) defines individual interviews as any research technique that facilitates two-way communication between the researcher and the study participants. Teachers of Environmental Studies in Grade 2 from the four rural schools were interviewed using semi-structured interviews to learn more about the impact of ICT on the Junior Primary phase. The researcher chose semi-structured interviews due to their adaptability, which allowed for a full understanding of the responses from the Junior Primary teachers. This method allowed the researcher to ask in-depth questions of the study's participants (the teachers) to understand their perspectives on the use of ICTs in Environmental Studies. During interviews, the researcher used a semi-structured interview guide (see Appendix 5). With the participants' consent, the researcher used a tape recorder to record their responses. The researcher transcribed them for analysis.

Each participant underwent a face-to-face interview for 30 minutes on the final day of data collection. There was a total of ten interview sessions, with one interview per participant. By conducting interviews after observing classes (on the last day of data collection), the researcher was able to build discussion points for the interviews around specific occurrences, including the implementation of ICT at various points in the classes she observed.

3.6 The Pilot Study

Baxter and Jack (2020) define a pilot study as preliminary work done to gauge the feasibility of a larger research effort. Furthermore, the authors stated that researchers can verify the accuracy and precision of their findings by subjecting their instruments to rigorous testing. The pilot study's purpose was to test the instruments to make sure they were appropriate for the research objectives, the relevant literature, and the intended participants (Baxter & Jack, 2020).

A rural school in the Oshana Educational Region served as a pilot site for the research instruments. The conditions at the pilot school were similar to those at the Omusati region schools. The pilot study included one teacher in its sample. The teacher who participated in the pilot study fulfilled the requirements laid out by the study's sample strategy. The following day, a semi-structured interview took place after a 40-minute period of observation. The researcher found that the teacher did not employ ICTs during the lesson's assessment and conclusion phases through the use of an observation schedule. Consequently, the interview guide incorporated the following inquiry to understand the

teachers' perspectives on integrating ICTs at different stages of their lessons: “In what *phase of the lesson do you find that ICTs are most useful? Explain*.”

During the interview, the participant raised numerous concerns about the use of ICT in Environmental Studies. Therefore, the researcher included the following inquiry in the final interview guidelines: “D*escribe any challenges you have faced while integrating ICTs in Environmental Studies and how you overcame them*.” The researcher included this to observe how teachers handle and address challenges associated with ICT integration in the classroom. The participant encountered no further problems when answering the questions, and the majority of responses were relevant to the primary study topic. The researcher found the pilot study valuable in shaping the final research tools.

3.7 Data Collection Procedures

The researcher provided a designated schedule of dates and times for observation and semi-structured interviews with participants from each school. The data collection process spanned a duration of two weeks, with a limit of five interviews per week. The study classified teachers into ten distinct colours: green, yellow, blue, white, maroon, violet, black, pink, orange, and red.

Participants assigned to the colours green, white, maroon, violet, and yellow underwent observation and interview sessions during the week of April 4th to April 8th, 2022. Subsequently, in the week of April 11th to April 14th, 2022, participants identified as blue, black, pink, orange, and red underwent the same observation and interview process.

The researcher employed an unstructured interview guide to collect data from the teachers. The interviews were recorded using a tape recorder to ensure accurate capture of the information shared. The collected data were subsequently organised into three primary themes, each of which included sub-themes. The purpose of these themes and sub-themes was to address the research questions outlined in the study.

3.8. Data Analysis

The researcher employed interpretive analytic approaches to thoroughly examine the data. Baxter and Jack (2020) define interpretational data analysis as the process of examining participants' narratives in order to get insight into their individual experiences. Commencing the study, the researcher diligently examined thorough field notes documenting classroom activities and personal thoughts (Creswell & Creswell, 2018). The researcher carefully and repeatedly listened to each participant's responses before recording any information. The researcher then carefully examined the transcribed material to uncover patterns and themes. The notes were organised into bigger topics, and subthemes were identified based on underlying notions.

The researcher then performed a thematic analysis, comparing data from interviews and observations to identify commonalities and disparities. Baxter and Jack (2020) describe thematic analysis as a technique that scrutinises qualitative data to identify recurring patterns and extract significant themes. Consistently identifying repeating statements made data analysis easier. The researcher allocated pseudonyms using colours such as Teacher Green, White, Maroon, Violet, Yellow, Blue, Black, Pink, Orange, and Red to

maintain the anonymity of the participants. The colours were selected based on their familiarity with Junior Primary learners, and some of them also resemble the colours seen in the national flag, which correspond to the topics studied in Environmental Studies.

3.9 Data verification

According to Santu (2018), there are five standards for assessing the trustworthiness of qualitative research, such as credibility, dependability, conformability, consistency, and transferability.

3.9.1. Dependability

Dependability is a method qualitative researchers use to show the consistency of their findings (Tracy, 2019). To show the dependability of the study, the researcher provided a thick description, as well as a full description of the details related to the research methods and techniques used to carry out the study.

3.9.2. Conformability

Qualitative researchers use conformability as a method to establish trustworthiness (Tracy, 2019). Furthermore, conformability includes an audit trail that includes raw data, such as electronically recorded materials, written field notes, documents, and records of trustworthiness (Tracy, 2019). Another researcher employs this method to confirm the study's accuracy using identical data. The researcher observed and achieved conformity in this study by taking findings from the participants, which established the accuracy of the analysis and ensured the findings were based on the participants' accounts, not the researcher's biases and subjective assumptions.

3.9.3. Transferability

Qualitative researchers also employ this method to establish trustworthiness. In qualitative studies, transferability means applying research results to other contexts and settings in order to get generalizability (Babbie, 2018). To demonstrate the study's dependability, the researcher conducted a pilot to assess the feasibility and potential transferability of the research methods and instruments before conducting a full-scale study.

3.9.4 Neutrality

Research neutrality refers to the extent to which study findings remain unbiased and detached from the researcher's personal perspectives, background, position, or conditioning circumstances. Smith and Lee (2023) advocate that in qualitative research, the focus should be on achieving the neutrality of the data rather than that of the researcher. This suggests that the researcher employs conformability as a strategy to achieve neutrality. To uphold neutrality, the researcher refrained from expressing personal opinions while the participants addressed the research questions. Also, Smith and Lee's (2023) view agree with this idea. They say that neutrality is how much the research results come from the informants and the research conditions alone, without any other motivations, biases, or points of view.

3.9.5 Truth-value

The researcher asks for truth value to gauge their confidence in the veracity of the findings, taking into account the research design, informants, and study context (Jenkin et al., 2018). Furthermore, it is concerned with whether the study's findings are a true reflection of the participants' experiences. The strategy of credibility establishes truth-value, and the researcher used the following criteria for this research: Interviewing techniques. During

the interview, the researcher employed a variety of interviewing techniques such as probing, verbal and non-verbal expressions, restating, and summarising to bolster the study's credibility.

3.9.6 Applicability

Babbie (2018) characterises applicability as the degree to which one can generalise and apply research findings to diverse contexts, settings, or different groups that extend beyond the original study's scope. The transferability strategy's implementation establishes its applicability. To achieve transferability, the researcher presents a comprehensive and detailed description of the research methodology employed in the study.

3.9.7 Consistency

Consistency of data refers to whether the findings would be consistent if the inquiry were replicated with the same subjects or in a similar context (Babbie & Mouton, 2019). Using an independent coder ensures consistency through the strategy of dependability. The researcher and the independent coder independently coded the data, and she then had consensus discussions with the supervisor on the themes and concepts presented as research findings. Consistency is about the logical alignment of the title, purpose, problem, and research question (Flick, 2018). This process begins when a researcher clearly identifies the concepts or constructs of interest and focuses on these constructs while reading literature to help formulate the topic, problem, and purpose of the work (Babbie & Mouton, 2019).

3.10. Ethical considerations

Callahan & Hobbs (2019) state that there are several ethical issues that need to be considered when designing research that uses human beings as participants. The researcher's primary concern should be the safety of the research participants. The researcher accomplishes this by carefully considering the risk-benefit ratio, using all available information to make an appropriate assessment, and continuously monitoring the research as it proceeds. The researcher conducted a thorough evaluation of the prospective risks and benefits associated with participating in this study. This comprehensive assessment encompassed an examination of both physical and psychological hazards, with particular attention given to ensuring that the potential advantages would surpass any possible harm incurred by the participants.

On the other hand, research ethics focus on what is morally acceptable or unacceptable when interacting with research participants or accessing archival data (Bryman, 2021). For this reason, the researcher adhered to ethical research standards by maintaining a high level of privacy, confidentiality in handling information, and informed consent, while protecting the privacy of research participants by all possible means. The researcher implemented the following aspects of ethical research:

3.10.1 Ethical Clearance

The Decentralised Ethical Committee and the Research Ethics Committee (REC) of the University of Namibia (DEC) approved the study (see Appendix 4). In order to conduct research in Etayi Circuit, approval from the Omusati Regional Council's Regional Director of Education, Arts, and Culture was required (see Appendix 3). The researcher also sought permission from the Omusati Regional Education Office to access the selected

schools (see Appendix 2). The researcher recruited all participants at their respective schools after receiving ethical approval and authorization to conduct the study. The researcher advised them that their participation was entirely optional, allowing them to stop at any point if they felt uncomfortable. Before the study began, all of the participants who decided to take part, filled and signed a consent form (see Appendix 1).

3.10.2 Informed consent

The researcher presented herself to the participants, explaining the study's educational purpose, the planned conduct date, and the data collection instruments. The researcher further explained the typical roles of the participants and obtained their informed consent using a signed and returned consent letter (see Appendix 4). The researcher excused participants who did not give their consent.

3.10.3 Voluntary participation

Participants in this process consent to participate in a research project after learning about its procedures and benefits (Sture, 2019). The researcher informed the participants that their involvement in this study was entirely voluntary. The researcher informed participants that they could quit the study if they were unhappy. The researcher did not force anyone to participate; she informed the participants that they could withdraw at any time and allowed them to choose not to answer any specific questions.

3.10.4 Confidentiality and anonymity

The researcher ensured confidentiality by promising not to use the participant's names or present the information in a way that would reveal their identity.

3.10.5 Honesty and trust

The researcher will store and safeguard the gathered data by securing it in a home filing cabinet that only the researcher can access. The researcher will store soft copy information on her personal computer, secured by a password. The researcher will retain the data for a minimum of five years before discarding it.

3.11 Chapter summary

This chapter provides a comprehensive account of the key research method, which is a qualitative research approach, accompanied by an outline of the pertinent research instrument employed in the study. The chapter places a strong emphasis on selecting and justifying the most appropriate instrument for data collection. Furthermore, the researcher carefully considered the philosophical underpinnings, research strategies, and sampling method for this investigation.

The chapter also entails a comprehensive examination of data analysis as well as an evaluation of the research instrument's validity and reliability. Moreover, it acknowledges the limitations inherent in the study. Additionally, the chapter delves into the measures taken to mitigate biases and elucidates the ethical considerations undertaken throughout the research.

The forthcoming chapter will centre on the presentation and discussions of the research findings. It will encompass a meticulous analysis of the data, delving into the identification and discussion of the prominent themes and sub-themes that have emerged from the study.

CHAPTER 4

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents and discusses the study on ICT's role in the Junior Primary Phase of Environmental Studies in the Omusati educational region. This chapter's primary emphasis is on the presentation of data pertaining to the participants' biographical information. The chapter then conducts a thorough examination of several themes, including the role of information and communication technology (ICT) in teaching Environmental Studies at the Junior Primary phase level. Additionally, the researcher discusses the challenges teachers face in integrating ICT into the Environmental Studies subject, along with strategies to mitigate these challenges and enhance the utilisation of ICT in Environmental Studies, as derived from the study's data. These themes are presented in Table 4.2.

4.2 Biographical information of participants

There were a total of ten (10) participants in this study. These participants were Junior Primary teachers who taught Environmental Studies in grade two. We coded the participants using ten (10) colours, namely Teacher Green, Teacher White, Teacher Maroon, Teacher Violet, Teacher Yellow, Teacher Blue, Teacher Orange, Teacher Black, Teacher Pink, and Teacher Red, to protect the confidentiality of the data and adhere to anonymity ethics. The participants' use of colours as pseudonyms is also consistent with

early childhood education practices. The figure below shows biographical information about the teachers who participated in the study.

Table 4.1: Biographical Data of the participants

Participants	**School**	**Gender**	**Age**	**Qualification**	**Name of institution**	**Teaching experience**	**Professional Development Courses in ICT attended**
1. Green	1	Male	40	BETD, ACE	OCE, NWU	10	None
2. White	1	Male	30	BED	UNAM	8	None
3. Maroon	1	Male	29	BED	UNAM	8	None
4. Violet	2	Female	30	BED	UNAM	8	None
5.Yellow	2	Female	34	BETD, ACE	OCE, NWU	11	None
6. Blue	3	Female	27	Diploma	UNAM	4	None
7. Orange	3	Female	35	BETD, ACE	UNAM	10	None
8. Black	4	Female	30	BED	UNAM	5	None
9. Pink	4	Female	31	BED	UNAM	8	None
10. Red	4	Female	26	BED	UNAM	4	None

4.2.1 Age

The teachers who participated in the study were aged 26, 27, 29, 30, 31, 34, 35, and 40.

4.2.2 Gender

The study comprises three male teachers and seven female teachers who participated in the study.

4.2.3 Qualifications

The table shows that the qualifications of the teachers who participated in the study ranged from a diploma in education to diplomas with an Advanced Certificate in Learner Support Education and Bachelor of Education degrees.

4.2.4 Institutions at which the qualification is obtained.

The table shows that the teachers possessed qualifications from different higher education institutions, such as Ongwediva College of Education (OCE), the University of Namibia (UNAM), and North West University (NWU).

4.2.5 Teaching Experience

The teachers who participated in the study had between four (4) and 11 years of teaching experience.

4.2.6 Professional Development Courses in ICT attended.

None of the teachers have attended professional development courses on ICT.

4.3 Data collected and analysed from the observation and individual interview.

The researcher simultaneously analysed the data from the observation schedule and interview guide because they both share qualitative characteristics and aim to address the study's research questions. The themes mentioned align with the study's research questions, whereas the sub-themes comprise the responses that provide further clarification on these questions. To provide a comprehensive understanding of the teachers and contextual factors under study, the concept of data presentation involves the systematic organisation and interpretation of collected data. The researcher organises the qualitative data from the observation and interview research instruments into thematic categories. Direct quotations from the respondents' transcripts support and reinforce these categories. This approach helps to validate and strengthen the identified conclusions.

Table 4.2 presents the themes and sub-themes identified from the collected, transcribed, and analysed data.

Table 4.2: Themes and subthemes

THEMES	subthemes
Theme 1: The role of ICT in teaching and learning Environmental Studies in Junior Primary Phase	**Subtheme 1.1**Help teachers to teach topics that are abstract or distant from learners' everyday lives
	Subtheme1.2: Increases learners' involvement
	Subtheme1.3: Increases learners' concentration
	Subtheme1.4: Make personalized instruction possible
	Subtheme1.5: ICT in education promotes learner's engagement and knowledge retention
	Subtheme 1.6: Timely and better access to information
	Subtheme 1.7: ICT enhance social relations in the lesson
Theme 2: Challenges experienced by teachers in integrating ICT in Environmental Studies subject	**Sub theme 2.1**: Lack of technical training for Junior Primary teachers
	Subtheme 2.2: Limited accessibility and network connection
	Subtheme 2.3: Classroom size
	Sub theme 2.4: Lack of time
	Sub theme 2.5: Medium of instructions and Junior Primary Level
Theme 3: Mitigating strategies to enhance the use of ICT in Environmental Studies	**Sub theme 3.1:** Provision of professional development opportunities to teachers.
	Sub theme 3.2: Ministry of Education, Arts and Culture's provision of digital technology gadgets.
	Sub theme 3.3: Collaborating with the providers of infrastructural amenities e.g., organisations, ministries and other stakeholders (OMAS).
	Subtheme 3.4: Reducing the classroom size.
	Subtheme 3.5: Local content development

4.4. Theme 1: The role of ICT in teaching and learning Environmental Studies in the Junior Primary Phase

This theme arose from question 1 of this study. Participants, who are teachers, have identified the role of ICT in Environmental Studies. ICT helps teachers teach topics that are abstract or distant from learners' everyday lives; ICT increases learners' involvement; ICT improves learners' concentration; ICT makes personalised instruction possible; ICT in education promotes learners' engagement and knowledge retention; ICT is a more convenient, efficient, and inexpensive means of gaining access to relevant information at the right time; and ICT enhances social relations in the classroom. The researcher will discuss each of these roles in more detail below.

4.4.1. Subtheme 1.1: ICT helps teachers teach topics that are abstract or distant from learners' everyday lives.

The study's findings demonstrated that learners benefited from ICT because it exposed them to information not available in their immediate surroundings. Teachers reported being able to present more materials than they could before exposure to ICT. The study's participating teachers also indicated that ICT enables them to teach and present topics that are non-concrete to the learners and difficult to understand using a chalk and chalkboard method.

Teacher Green said, "*With the help of ICT, I can easily present topics that are far-off from learners, e.g., wild animals and their sounds, and they can grasp it better than when I am using posters and other materials and making the sounds myself*." This finding is consistent with Teacher Blue's, who stated, "Some of the environmental topics, like those under the "natural environment" theme, can be very difficult for our Junior Primary

learners to understand, but with the help of ICT, I can present them to my learners better and they can relate better."

"ICTs do play a role, especially in our rural schools; learners learn a lot and better through the use of ICTs, and they explore more things that interest them," Teacher Black said.

With the aid of ICT (video), Teacher Blue explains the different types of transport and their uses exceptionally well, based on observation. This teacher used ICT (the laptop and the projector) to explain different uses of local transport. With the help of these ICTs, learners demonstrated a good level of understanding of the two types of transport (water and air transport), which are not locally available. Teacher Green, who taught about multiple seasons with an emphasis on winter, provided an example of how showing learners videos about weather events is more effective than simply explaining the concept and providing visuals like snowflakes.

Teachers can employ online resources and interactive simulations as pedagogical tools to effectively illustrate the practical applications of abstract concepts in both real-world scenarios and many academic disciplines (Kirschner, 2019). According to the same author, using ICT in education not only facilitates the connection between abstract concepts and concrete illustrations, but also fosters learners' comprehension and motivation to engage in the learning process. Brown (2022) agrees that videos effectively engage and deeply involve learners. The use of videos enables the integration of real-world experiences within the educational setting, thereby facilitating the creation of captivating, pertinent, and stimulating instructional modules that learners will retain in their memory long after the course's conclusion. According to the author, the inclusion of

films in educational settings facilitates learners' comprehension of intricate ideas and concepts. When learners enact the reading of a television news broadcast, the video framework facilitates their comprehension.

The findings align with the argument made by Wang and Wu (2020) that the utilisation of ICT resources enables teachers to visually and interactively explain abstract topics. By utilising multimedia tools, such as motion pictures, animations, and simulations, teachers can enhance the comprehensibility and relevance of abstract concepts for learners. Furthermore, the use of visual representations facilitates learners' comprehension of intricate concepts by providing them with tangible illustrations and augmenting their cognitive grasp.

The Content Knowledge (CK) component of Technological Pedagogical Content Knowledge (TPACK) intricately links to this role. To effectively employ information and communication technology (ICT) tools for teaching abstract concepts, it is imperative for teachers to possess a profound comprehension of the subject matter (Smith, 2020). This understanding enables teachers to enhance the accessibility and relatability of these concepts to learners (Smith, 2020).

4.4.2 Subtheme1.2: Increases learners' involvement

The teachers have indicated that learners' participation varies depending on how and what type of ICT they are using. Through interviews, the participating teachers revealed a difference in learners' participation between teaching without ICT and using it. When they use ICT in the lesson, learners participate more effectively than when they use other teaching and learning methods.

Teacher White said, "*There is always high participation from learners whenever I am using ICT; everyone wants to say something."* Additionally, when I use an overhead projector, the participants are highly engaged because they can clearly see the images in the videos or pictures. *ICT fosters their curiosity and teaches them about the various functions of ICT.*

"*Learners' participation differs when I use ICT; my learners will participate even if only one is taking that day, especially if I make them watch a video and ask them questions later*," said Teacher Orange.

Observational evidence can corroborate these findings. The researchers have seen variations in learner participation across different lessons. The researcher has additionally documented the methods employed by teachers to foster and inspire learners to engage in idea-sharing activities pertaining to the content they have viewed. Video replays are also used by the teachers to facilitate learners' recollection and sharing of their views. Teacher Red and Teacher Blue presented instructional videos to the learners about personal hygiene. After viewing these videos, the learners engaged in discussions and actively exchanged their thoughts and perspectives, drawing from the content they had just observed. During the observation process, Teacher Blue presented a video showcasing various modes of transportation. The learners exhibited a sense of curiosity and a desire to comprehend the reasons behind the significant size of water transport vessels and their ability to remain buoyant in water.

The present study's findings are consistent with Al Saqri, Alias, and Othman's (2021) research, which emphasized the importance of integrating information and

communication technology (ICT) in the field of education. Their study highlighted the importance of using ICT to create a conducive learning environment that prioritizes learners' needs and requirements. Information and Communication Technology (ICT) tools serve to bridge the divide between teacher-centered and learner-centered educational environments. Through the efficient utilisation of information and communication technology (ICT) technologies, teachers can enrich the educational experience by actively involving learners in interactive and dynamic learning activities. Moreover, the field of Information and Communication Technology (ICT) possesses the capability to enhance the educational experience by fostering increased engagement and enjoyment among learners. We achieve this by capturing their interest and inspiring them to actively participate in the process of exploring and interacting with the educational content (Bal & Brysiewicz, 2019).

The successful integration of Pedagogical Knowledge (PK) and Technological Pedagogical Knowledge (TPK) leads to enhanced learner engagement. Teachers with a solid foundation of pedagogical knowledge (PK) and technology pedagogical knowledge (TPK) have the ability to effectively include learners by utilizing suitable technological resources, thereby augmenting their comprehensive educational encounter (Koehler, 2010).

4.4.3 Subtheme1.3: Improves learners' concentration

The participant teachers indicated that they have noticed a high concentration of learners when they are using ICT compared to traditional methods of teaching.

Teacher Yellow stated, "Learners are always excited when he uses ICT in the lesson." *Learners typically become withdrawn and sleepy during normal lessons, especially if the*

lesson is after a break compared to an ICT-led lesson." The same respondent added, "*One reason for this could be that learners only got to see these types of facilities at school during some lessons, and they are not available at home."* Similarly, Teacher Blue said, "*Learners participate highly when I am using ICT compared to when I am using posters and other teaching and learning aids."* The teacher also pointed out that *"our environmental lessons are mostly after break, but you will hardly find these learners sleeping in class; they will all want to sit in front, closer to the presentation."*

Teacher Red mentioned, *"Learners mostly concentrate in class, especially if you are showing them a video or listening to an audio."* "*They pay more attention when they are listening to the audio compared to when they are listening to me lecturing,*" she added. "Our environmental lessons take place after a break, and often, these learners are tired and find it difficult to concentrate. However, when they use ICT, they are able to concentrate because ICTs capture their attention," she continued. Fidelis and Onyango's (2021) study, which found that integrating ICT tools and equipment into the classroom keeps learners engaged and curious about the subject matter, reduces the likelihood of boredom or disengagement, aligns with these findings.

Empirical observations revealed that a significant proportion of learners demonstrated enhanced concentration during sessions incorporating information and communication technology (ICT). The dynamic and visually stimulating characteristics of digital learning tools appeared to contribute to learners' attention being maintained towards the subject matter. The learners exhibited a higher level of concentration towards the instructional material, resulting in a decrease in off-task behavior.

These findings are consistent with Lai and Hwang (2020), who found that the use of ICT tools, such as multimedia presentations, virtual reality simulations, and interactive learning platforms, can offer learners stimulating and interactive learning experiences that effectively capture and maintain their attention. According to Fidelis and Onyango (2021), the utilisation of information and communication technology (ICT) facilitated the delivery of dynamic content, such as interactive simulations, films, animations, and virtual reality experiences.

According to Koehler's (2010) findings, the integration of both pedagogical knowledge (PK) and technological knowledge (TK) is necessary to improve learners' attentiveness through the use of Information and Communication Technology (ICT). Furthermore, Koehler (2010) emphasises that teachers must possess the necessary knowledge and skills to select and employ technological resources that effectively engage learners and maintain their focus on the taught content.

4.4.4 Subtheme1.4: Make personalized instruction possible

Integrating ICT in teaching helps the teacher incorporate different learning styles at once. Participants have this to say about this subtheme.

Teacher Maroon said, "*Using ICT is more beneficial than teaching without integrating ICT." "ICT integration caters for all the principles of learner-centered teaching where learners are all more involved in lessons." "ICT provides deeper learning to the learner and a chance to learn through hearing and seeing which makes lessons more fun".* Correspondingly, Teacher Violet said, "*It is through ICT that we are able to incorporate the sense of seeing and hearing in our teaching and also the different learning styles that*

our learners possess." "*The use of ICT also improves classroom instruction by offering more options for personalized learning through its active and interactive content such showing them a video and discussing about it."*

Teacher Blue said*, "Using ICT to show learners a video gives all leaners a chance to interpret the video different. Videos also explain the content better no matter how complex the topic can be to the learners".* Teacher Pink said*, "Teaching through videos enable all learners to enjoy the lesson. They hardly forget the events in the video. Videos engage all the senses though sometimes I muted them and instruct my leaners to focus on the actions".* The results align with the findings of Laridon, et al. (2020), who posited that information and communication technology (ICT) can be customized to accommodate the various needs and cognitive preferences of young learners in the early stages of their education. According to Kong, Tian, and Qi (2021), teachers can generate and distribute instructional materials, exercises, and evaluations, hence facilitating personalized instruction and accommodating the varied needs and learning rates of learners. This method fosters a learner-centered paradigm and facilitates the implementation of inclusive education strategies.

Teachers adapt their instructional strategies and curriculum to accommodate the unique learning requirements, inclinations, and capacities of individual learners, as evidenced by empirical observations. In order to accommodate the varied tastes of learners, teachers include a variety of content forms into their instructional presentations. Visual learners greatly benefit from the utilization of graphical representations, drawings, and diagrams that effectively clarify intricate topics. Conversely, auditory learners faced difficulties in specific sessions when teachers chose to silence audio aids or directed learners to

concentrate exclusively on visual elements. Auditory learners often depend on verbal explanations and audio components to comprehend topics efficiently. Consequently, this instructional preference may impede their learning process and level of involvement.

According to Mishra et al. (2009), individualized teaching occupies a central position within the TPACK framework, where it converges with Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). Teachers that possess a strong Technological Pedagogical Content Knowledge (TPACK) are capable of effectively tailoring instructional content to meet the unique requirements of individual learners through the appropriate utilization of technology, hence enhancing the overall quality of education. In addition, personalized education encompasses the comprehension of how technology may be effectively utilized to enhance the process of learning, accommodate various instructional approaches, and address the unique learning requirements of individuals with distinct needs. The process entails acquiring the knowledge and skills necessary to effectively utilize information and communication technology (ICT) technologies to deliver content, cater to the requirements of learners, and allow active learning experiences within the field of Environmental Studies (Mishra & Koehler, 2006).

4.4.5 Subtheme 1.5: ICT in education promotes learners' engagement and knowledge retention.

The results of this study confirmed that learners tend to remember and retain well what they learn during ICT-mediated lessons. Participants provided feedback on these sub-themes.

Teacher Green said, "*Using ICT helps my learners learn better, though I do not use it every day. If you ask them questions about the previous lesson topic, they remember it well. I also have some learners who do not participate, but with an ICT-mediated lesson, they are more likely to participate in the discussion.*

Teacher Orange said*, "If I want learners to understand the content better, I will choose video teaching; they are more likely to recall events in a video compared to when I have used pictures, and I have also noticed that they master the content well through video teaching."* Correspondingly, Teacher Red says, *"ICT helps learners remember what they have learned better."* He also added*, "Almost every learner will participate; even those that sleep in class will not sleep. "Learners will clearly remember the sequence of events in the video compared to when I just show the pictures about a specific topic."*

"ICTs do play a role, especially at our rural schools; learners learn a lot and better through the use of ICTs, especially information on things that are not locally available; they also tend to remember and recall what they have learned," said teacher Yellow.

The observational data analysis revealed a clear indication that learners had enhanced levels of engagement and heightened attention for most of the lessons. Teachers frequently initiated discussions by offering inquiries relevant to previous lessons, and learners demonstrated a high level of knowledge retention. In addition, teachers often included cues or reminders, specifically related to prior educational videos, to aid in the learners' retrieval of relevant material.

Alkamel and Chouthaiwale (2018) found that the integration of information and communication technology (ICT) in classroom teaching enhances learners' motivation and

interest in their educational pursuits. Chen et al. (2021) mentioned that information and communication technology (ICT) has played a substantial role in facilitating the process of learning and possesses the capacity to augment the retention of knowledge. According to the above-mentioned authors, information and communication technologies (ICTs) such as overhead projectors (OHPs) provide teachers with the capability to effectively convey intricate or comprehensive information derived from many sources, including textbooks, posters, and diagrams *(*Chen et al., 2021). This enables learners to visually comprehend complex concepts, enhancing their comprehension and recall of the subject matter content in a more captivating and stimulating style.

According to Mishra and Koehler (2006), the possession of Pedagogical information (PK), Content Knowledge (CK), and Technological Knowledge (TK) has the potential to facilitate effective engagement and enhance information retention. Teachers that skillfully incorporate technology into their instructional practices can cultivate interactive learning opportunities that accommodate diverse learning modalities, resulting in enhanced levels of learner engagement and knowledge retention

4.4.6 Subtheme1.6: Timely and better access to relevant information

The findings below support this sub-theme.

Teacher Maroon said, "*ICT is said to help the teacher and learners access vast sources of Environmental Studies that can be effectively integrated with the curriculum objectives."* He further commented, *"Not only has that ICT reduced my time to write on the chalkboard and to explain every detail to the learners".* Similarly, Teacher Blue, said "*while the Grade 2 curriculum emphasizes the significance of teaching learners about transportation and its many purposes, the available textbooks at the school only feature photos of various*

*modes of transportation rather than any text. Under communication topic, learners are also tasked with acting out the reading of a television news broadcast; this can only be easily understood by our learners by showing them a video because some of them never watched news broadcas*t".

Teacher Black said, "The *Internet provides the fastest way to access videos and songs on Junior Primary content. Information is just at our fingertips."*

Teacher Violet said, "*With ICT and the internet, I can search information fast and easily on the content I want to teach." "ICT also enable me to present a lot of information on a topic compared to when using flipcharts to explain every detail".*

Based on the observations made, the participating teachers effectively conveyed a wealth of information with the aid of Information and Communication Technologies (ICTs). As a result, the learners engaged in active exploration and independent discovery, rather than solely relying on passive listening to the teacher. For instance, Teacher Green, who had access to the internet at the school, utilized this resource to present a video from YouTube, illustrating various seasons and employing a PowerPoint Presentation (PPP) on the same subject matter. This approach allowed the same information to be conveyed in distinct formats, encompassing visuals (in the form of pictures and words) as well as through the medium of video.. These findings match those of Maqbulin (2020) who mentioned that based on ICT, learning and teaching no longer depend exclusively on printed materials. Multiple resources are abundant on the Internet, and knowledge can be acquired through video clips, audio sounds, and visual presentation and so on. ICT assists in transforming a teaching environment into a learner-centred one.

4.4.6 Subtheme1.7: ICT enhance social relations in the lesson

Teacher Green stated, "ICT motivates my learners to share ideas with others very well because it is based on what they have watched." *She added, "They also learn certain English words from videos that they will use in the English lesson."*

Teacher Yellow mentioned that **"***ICT improves classroom communication among my learners. The teacher further stated that "if I give my learners a chance to discuss what they have listened to, they have mutual understanding, and their discussions run smoothly compared to when they are discussing something they did not hear anything about."*

Teacher Blue, *there is always live interaction and debate in class whenever I give my learners opportunities to discuss and share their discussions with the whole class. It seems as though each learner views the video in a unique way. So, they always debate. Apart from that, when I am using ICTs, learners probe me with questions like how that specific ICT operates and how to learn to use it, but that happens only when she is using it for the first time.*

Teacher Red *indicated that "ICTs strengthen social relationships with my learners. I normally ask each learner to share what they have heard or watched, and they like it. This is different from lessons where I am not using ICT.* One learner can even say*, "Teacher, there is something I watched that is not mentioned," even* though they have watched the same thing. *It helps me to connect more with my learners and understand them better in terms of how they reason,* she added.

Liberante (2020) found a positive correlation between the incorporation of Information and Communication Technology (ICT) in educational settings and a significant increase in social interaction between teachers and learners, as well as among learners themselves. Furthermore, social connection has a crucial role in improving human communication and engagement, enhancing learner performance, and promoting academic achievements. Martin and Bolliger (2018) have found several benefits in the educational context when teachers and learners establish a positive social relationship. These benefits include increased learner engagement and participation in classroom activities, as well as a heightened drive to learn and improved academic performance. As a result, it is imperative for teachers to carefully develop their instructional designs with the goal of providing learners with beneficial and constructive learning experiences.

The discovery mentioned above is consistent with the findings of Hurst et al. (2019), who argued that the incorporation of Information and Communication Technology (ICT) is crucial in promoting and improving social connections, ultimately leading to an increased sense of comfort among learners. Furthermore, it fosters increased motivation among learners to actively participate in classroom activities and enhance their interpersonal skills. Furthermore, Hurst, Randall, and Nixon (2019) proposed that these interpersonal relationships afford teachers a more profound comprehension of their pupils, hence cultivating an elevated sense of obligation towards their academic progression.

The incorporation of information and communication technology (ICT) to enhance social relationships aligns with the realms of pedagogical knowledge (PK) and technological pedagogical knowledge (TPK), as expounded by Mishra and Koehler (2006). Teachers that possess proficient pedagogical knowledge (PK) and technical pedagogical knowledge

(TPK) have the ability to foster collaborative learning settings using technology, which in turn promotes healthy social connections among learners.

4.5. Theme 2: Challenges experienced by teachers in integrating ICT into the Environmental Studies subject

Teachers indicated that they face various challenges when using ICTs in their lessons. They felt that these challenges hampered their integration of ICTs in Environmental Studies. These challenges include a lack of technical training for Junior Primary teachers, limited accessibility and network connections, overcrowded classrooms, the use of a different medium of instruction at the Junior Primary level, and a lack of resources. The findings below support this theme.

4.5.1. Subtheme 2.1: Lack of technical training for Junior Primary teachers

This study found that teachers lack training on some school ICT facilities. Teachers had this to say.

Teacher Green said, "I don't have the skills necessary to use the modernized tools; I have very limited skills, which I obtained during my teacher training way back, and these have left a lot of gaps in the current technological set-up." *"Using ICT in the introduction phase is easy because I usually play songs on a laptop or poems. It does not require extensive skills".*

Teacher Yellow mentioned, "*Many topics in Environmental Studies need pictures, videos, and sounds from ICTs."" ICTs can teach every topic in our syllabus, with the exception of the occasional difficulty in finding the right information on the internet. "I need support in order to strive for excellence."*

Teacher Blue had this to say: *"I need training on how to integrate ICT into teaching, mostly because the skills I have are very limited." "During university time, we had ICT-related modules, but we did not really do much on lesson presentation with ICT," the teacher added.* The teacher also explained what made her fail to operate the ICT during observation. The participants had this to say*: "It's a new projector at school, and I have not used it before." We're also not sure how to use it on the various laptops that are available.*

Teachers Black, White, and Maroon both stated that they did not receive any ICT training when they began their teaching careers. Although all ten participants mentioned this as one of the barriers during interviews, nine participants (teachers) (white, black, green, yellow, maroon, red, violet, pink, and orange) did not have problems with their facilities during observation. This was not the case for Teacher Blue, since on the third day of observation, the participant failed to operate the ICT facilities and received assistance from a fellow colleague. Iiyambo's (2022) observations bolster these study findings, revealing that teachers, despite possessing ICT tools, seem to have received minimal pedagogical training on effectively incorporating ICTs into their lessons. He et al. (2019) also mentioned that teachers in the junior Junior Primary phase may not have the necessary training or expertise to use ICT tools and incorporate them into their teaching methods. Furthermore, the lack of professional development options available to teachers to advance their digital skills and pedagogical knowledge may impact their capacity to successfully integrate ICT in the classroom.

This study revealed that the teachers did not utilize ICT throughout the entire lesson. According to their responses, some teachers felt comfortable using it in the introduction

phase, delivering a presentation, and concluding their lessons. All participants in this study admitted that they occasionally use posters. Teacher Green said using ICT in the introduction phase is simple because he normally plays songs on a laptop or poems. He added that it did not require extensive skills. He further added that he has limited skills, and these have left many gaps in the current technological set-up. The biographical information of participants in this study also revealed that none of the teachers had any kind of formal training on the use of ICT in the classroom. One can also conclude that this disparity is what makes ICT integration in Environmental Studies difficult. The study by Waigandjo (2021) also highlighted the difficulty the Ministry of Education, Arts, and Culture (MoEAC) has with ICT training for teachers. Even though the ICT policy of Education specifies the creation of a program to ensure training delivery to all teachers, including school principals and teachers in both rural and urban locations, there remains a significant obstacle to staff training (Waigandjo, 2021).

The TPACK aspect of Technological Knowledge (TK) involves understanding the capabilities and functions of various technologies (Koehler & Mishra, 2009). In the context of Junior Primary education, teachers should be familiar with the appropriate ICT tools and devices that can engage young learners, such as interactive whiteboards, educational apps, tablets, and multimedia resources.

4.5.2 Subtheme 2.2: Limited accessibility and network connection

Both interviewed teachers disclosed that their use of information and communication technologies (ICTs) during lessons is contingent upon the availability of ICT resources at their school. The research findings indicate that computers and other ICT facilities are

insufficient to adequately cater to the needs of all school personnel. Teachers emphasised that the available resources were considerably limited in proportion to the number of teaching staff and the volume of classes conducted within the school. Consequently, teachers often find themselves compelled to share these resources with their colleagues, thereby impeding their ability to access and utilise them daily.

Teacher Yellow expressed that she occasionally utilizes her personal tablets for teaching and learning, as senior primary teachers predominantly utilize the ICT in the school. Teacher Green said, "*The resources are very limited in comparison to the number of teachers and the number of classes at the school*." He added, "*Our school is very big; there are about 25 teachers in total." 12 of these teachers are Junior Primary teachers, and all of us need to use the same ICT facilities."* Teacher Green has also mentioned that our internet has been malfunctioning for months, making it difficult to access websites.

Teacher Pink said, *"We do not have enough ICT facilities at school". "We need at least two laptops allocated to Junior Primary grade only." "We also need internet connectivity so that we can access educational information. Most of the time, we rely on our own resources, which may not always be available.*

According to the observations, some teachers do not have internet connectivity at their schools. On the third day of observation, Teacher Red had to use her cell phone to display pictures about HIV/AIDS protection, as other teachers were using the school's available laptop. However, the use of a cell phone posed challenges due to its smaller screen size, making it difficult for learners to view the pictures from a distance. As a result, Teacher

Red had to go around the classroom, going from table to table, to present the pictures individually to the learners. Additionally, she had to reiterate the information whenever learners had questions to ensure their complete understanding.

The limited access to technological resources, such as computers, continues to pose a significant challenge to the implementation of technology in education (Amadhila & Shikalepo, 2020). According to Liu et al. (2019), a significant challenge faced by several Junior Primary schools, particularly those situated in remote or economically challenged regions, is the restricted availability of information and communication technology (ICT) resources. The absence of essential technological tools such as laptops, tablets, internet connectivity, and other gadgets can impede the ability of both teachers and learners to effectively utilise ICT-enhanced learning opportunities. Chirimbana et al. (2022) found that the absence of power poses a significant challenge for schools.

According to Ismail, Jogezai, and Baloch (2020), the matter of restricted accessibility and network connectivity applies to both technological knowledge (TK) and pedagogical knowledge (PK). Hence, it is imperative for teachers to possess a comprehensive understanding of effectively integrating technology into instructional practices, particularly in contexts characterised by resource constraints or unreliable network connectivity. Furthermore, teachers must also demonstrate the ability to modify their instructional approaches in response to these circumstances, necessitating a fusion of technological proficiency and pedagogical expertise.

4.5.3 Subtheme 2.3: Overcrowded classroom

The learner-teacher ratio in Namibia is 1:35; however, some schools have recorded as many as 44 learners in one classroom (Ekandjo, 2018). Haufiku et al. (2022) also mentioned that sometimes teachers find themselves teaching more than 44 learners per classroom, which compromises the quality of education. These study findings revealed that certain Junior Primary grades suffer from overcrowding, leading to adverse effects on teacher-learner communication. According to the teachers' reports, their classrooms accommodate approximately 40 learners, a situation that poses challenges for facilitating effective learning experiences. Furthermore, the teachers emphasised the difficulties encountered in configuring interactive whiteboards or other technologies to ensure optimal visibility for all learners. Teachers had this to say."*My class has about 40 learners, and the space in the classroom is limited*," said Teacher Maroon. *"I struggle with space just to put an overhead projector (OHP) in class." Teacher White stated, "Too many learners in my class do not allow me to use the ICT facilities during the lesson because it is a struggle."*

Techer Red, "Sometimes, the size of my class discourages me from using a laptop in class." *Walking between the desks to show learners videos or pictures is difficult because I have limited free space for movement in the class*. The teacher further added, "*Sometimes I call them to come in front in groups to look at the pictures or a short video, but that takes time.* " *Teaching is more effective when there are fewer learners in the classroom and more time to work one-on-one with each learner.*

Observational evidence confirms these findings. Teacher Maroon encountered challenges in finding suitable space at the rear of the classroom to position the overhead projector (OHP) without obstructing any learner's view. Learners seated adjacent to the projector faced difficulties in obtaining a clear view, as they had to look from the sides. The placement of information and communication technologies (ICTs) further hindered learners' ability to have an optimal view of the screen due to space constraints in the classroom.

Similarly, Teacher Red expressed concern about the excessive number of learners in the classroom, which impeded the effective implementation of technology to support their learning. The confined conditions within the classroom also hindered the interaction between teachers and learners.

Overall, these observations highlight the negative impact of overcrowding on the integration and effectiveness of technology in the learning process, as well as teacher-learner interactions. These results are consistent with those found by Haufiku et al. (2022), who stressed that an overcrowded classroom is a stressful, overwhelming, and discouraging experience, especially for teachers. Overcrowded classrooms challenge even the most productive teachers. Similarly, Kaukewahulo (2023) indicated that large class numbers are one of the major problems that hinder the teaching and learning process.

Within the TPACK framework, overcrowded classrooms are more closely related to pedagogical knowledge (PK). Teachers need to manage diverse learner needs, create engaging activities, and effectively integrate technology even in challenging classroom environments (Chisango & Lesame, 2018).

4.5.4 Sub theme 2.4: Lack of time

Some of the participants claimed they do not use ICT in the classroom due to a lack of time. They complained that they simply do not have sufficient time to prepare for mediated ICT lessons while also tending to their other daily tasks. Class teaching, in which one teacher is responsible for delivering instruction across multiple disciplines, is the norm for most Junior Primary teachers. This primarily resulted in teachers feeling overworked. They also revealed that they already have the necessary instructional materials on hand from prior years; teachers will revert to more conventional methods of instruction. The participants had this to say.

Teacher Green said, "*The fact that we share the overhead projector with other Senior Primary teachers makes it difficult to manage our teaching time." "Obtaining the overhead projector from another teacher takes time."* The teacher revealed that the whole process can take up to 5–10 minutes. Amadhila and Shikalepo (2020) support this finding by revealing that bringing in technology from the lab and setting it up in the classroom significantly increases the time required for lesson preparation and delivery.

Teacher Violet indicated, "At Junior Primary, we do class teaching, and it is not easy to plan for all seven subjects and also prepare for a mediated ICT lesson; for you to use ICTs in all lessons at Junior Primary, including Environmental Studies, you need more time to prepare accordingly."

Teacher Orange said, *"Normally, if I want to use ICT in a lesson, it should be in the morning or after break." That will give me enough time to properly prepare and set up my facilities without wasting any time. "We stay during break time to give ourselves enough*

time to set up ICT for the lesson. The teacher added, "Now you have to use up your break time to set up instead of resting."

Teacher Black *explained, "Time and the work that I have to do will not allow me to use ICT every day or in every lesson; I have to teach, assess, and mark learners' work in all seven subjects."* Amadhila and Shikalepo's (2020) study of schools in the Omusati Educational region revealed that teachers there faced numerous barriers to using ICT in their pedagogical practices due to a lack of time for lesson planning and the incorporation of technology. Similarly, Ndlovu et al. (2019) also revealed that teachers often have a packed curriculum and limited class time, leaving little room for additional activities involving technology. Teachers would rather not spend their allocated 40 minutes of instruction time on mundane tasks like putting up computers and projectors or searching for a single projector; they may or may not be able to locate it (Waigandjo 2021).

4.5.5 Sub-theme 2.5: Medium of Instructions and Junior Primary Level

Study participants mention using mother tongue as the medium of instruction is a hindrance to incorporating ICT into Environmental Studies lessons. Teachers pointed out that in most cases, the information on the internet is in English, and their medium of instruction is Oshikwanyama. It is therefore hard to translate some of the content into the medium of instruction. In most cases the teachers will allow learners to watch a video without sound and task them to focus on the actions in the video. Below are the teachers' responses pertaining to this sub-theme.

Teacher Yellow said, "*In most cases, the things on the internet are in English, and our medium of instruction is Oshikwanyama." It is very hard to translate the content into our*

medium of instruction. As an example, if I want learners to watch a video on road safety, it is in English, and there is nothing I can do about that. In such cases, I let my learners watch the video without sound and ask them focus on the actions in the video and ignore the sound." Similarly, Teacher Orange said, "*Translating the content is sometimes also a problem because the medium of instruction is Oshiwambo, which is not the language of the internet." A video is much more useful than pictures, but I just let my learners watch a video on mute and focus on what is happening in the video. "Though learners learn English as a second language they still have difficulty to comprehend videos in English".*

Teacher Red said, "*The fact that I teach in Oshiwambo means that I am not really motivated to use ICT every day and in every lesson except in English." "Sometimes you can get a nice video on a certain topic about the environment, but how will you translate the video into the vernacular?"* The teacher further added*. "I sometimes look for videos and translate them into audio by recording myself in the vernacular." This is way better, but the original pictures and actions in the actual video will be missing."*

Teacher Green said it differently but had almost a comparable contribution when he said, *"I think we teachers need to also take part in the policy planning process so that we can raise issues that affect us regarding teaching; there is a need for teachers to have their input considered when it comes to making policy (language policy)."*

During the observation, Teacher Orange presented a video illustrating the diverse uses of transportation, while Teacher Red showcased a video focusing on personal hygiene. Notably, both videos were displayed without sound, and the learners were instructed to attentively observe the visual content and subsequently discuss their observations with

their peers. The learners followed the video's outline and actively engaged in sharing their observations or re-watching specific segments as necessary.

Ministry of Education, Arts and Culture (2016) indicated that the medium of learning in Pre-Primary and Grades 1-3 should be in the mother Tongue of the learner. Charlton (2018) elaborates that when it comes to accessing and utilizing ICT resources, teaching in the mother tongue has the potential to create language hurdles since many internet tools and information are offered primarily in major international languages like English. Additionally, if a learner's or teacher's mother tongue is not the same as one of these languages, they may have difficulty accessing appropriate digital content or navigating technology platforms that are not available in their native language; this linguistic barrier can standstill effective ICT integration in the classroom (Charlton, 2018).

According to Zaugg, Hossain, and Molloy (2022), there may be a disparity in the accessibility of digital information between major international languages and resources available in the mother tongue. Although certain localized information may be accessible, the scope and variety of digital resources may be constrained when compared to languages that have a wider user base. The imposition of this constraint could potentially affect the breadth and calibre of ICT resources that can be incorporated into educational settings, thereby diminishing the extent and effectiveness of ICT integration. The data align with the assertion made by Pankaj (2020) that a significant amount of educational software available in the global market is predominantly in the English language. Additionally, in developing nations, there is a notable lack of fluency in the English language, particularly in rural regions. This poses a significant obstacle to fully harnessing the educational advantages offered by ICT (Pankaj 2020).

In relation to the TPACK theory, the medium of instruction challenge involves both content knowledge (CK) and pedagogical knowledge (PK). Teachers must understand the subject matter (CK) and adapt their teaching strategies (PK) to ensure effective communication and understanding of content in the chosen medium (Smith 2020).

4.5.6 Subtheme 2.6: Lack of resources

Teachers have conveyed that the current availability of Information and Communication Technology (ICT) resources at the school is insufficient in comparison to the number of teachers who may require access to these tools. The teachers have pointed out that there is a shortage of laptops, and some have also emphasised the necessity for internet connectivity within their educational institution. Teachers expressed their concern as follows:

Teacher Green stated, *"The primary challenge faced by all teachers at their school is the limited availability of ICT facilities. Our school is large, with a total of 25 teachers and 12 Junior Primary teachers, necessitating the shared use of these ICT resources."* Teacher Blue concurred, stating that their school's size limits the amount of ICT facilities available for teachers to share.

Teacher Violet mentioned that "*the school needs additional facilities. The ones we have are not enough."* Teacher Yellow stated, "We require a minimum of three projectors and a laptop for the Junior Primary phase for our teachers."

Teacher Red stated, *"Sometimes the ministry ignores rural schools and pays attention to urban schools; our school needs funding from the ministry; we need additional laptops because we don't have enough." "The school lacks an overhead projector and internet connectivity, which hinders our ability to effectively integrate technology into our teaching practices."*

The observation revealed that the teacher avoided projecting her presentation because the school did not have a projector. On the last day of observation, the same teacher resorted to using her cell phone for instructional purposes, as the laptops were already in use by upper primary teachers, leaving her with limited alternative options. These instances highlight the challenges faced by teachers when essential ICT equipment is lacking, leading to improvisation and potential limitations in the teaching and learning process.

He et al. (2019) highlighted that many Junior Primary schools, particularly those located in remote or economically disadvantaged areas, encounter restricted access to ICT resources. These include the lack of computers, tablets, internet connectivity, and other necessary devices, which can prevent teachers and learners from fully benefiting from ICT-enhanced learning experiences.

Nkengbeza et al. (2022) conducted research on the challenges faced by primary school English teachers in integrating media technology into English instruction. The study findings indicated that insufficient resource availability was a significant obstacle to effective integration of media technologies in the classroom. The survey participants expressed concerns about the insufficient allocation of resources in schools pertaining to media technology. Amadhila and Shikalepo (2020) conducted a study to explore the role

of Information Communication Technologies (ICTs) in enhancing English language teaching and learning in the Omusati region. The study's findings revealed that the region employs an overhead projector as one of its ICT tools, installed in the computer laboratory. Additionally, another teacher repurposed the computer laboratory as a classroom. Moreover, the current quantity of available computers is insufficient, with a computer-to-learner ratio of 1:5, indicating that there is only one computer for every five learners. According to the study conducted by Waigandjo (2021), the presence of an intermittent supply of electricity poses challenges for teachers in utilising computer technology and the Internet for instructional purposes.

The challenge of insufficient resources encompasses the three components of Technological Pedagogical Content Knowledge (TPACK): Technological Knowledge (TK) to effectively utilize available tools; content Knowledge (CK) to modify and develop content that aligns with the curriculum; and Pedagogical Knowledge (PK) to facilitate meaningful learning experiences despite resource limitations (Koehler & Mishra, 2009).

4.6. Theme 3: Mitigating Strategies to Enhance the Use of ICT in Environmental Studies

Teachers have suggested quite a few mitigating strategies to enhance the use of ICT in Environmental Studies. These strategies include providing technical training for Junior Primary teachers, enhancing the integration of ICT in schools, partnering with the MoEAC to provide digital technology gadgets, collaborating with providers of infrastructural amenities such as Telecom, MTC, and NORED, and reducing classroom sizes. These sub-themes are each presented below. Given the potential barriers and limitations associated with implementing new technologies in the classroom, it is critical to mitigate these

challenges during the planning stages when incorporating meaningful technology. To successfully unpack TPACK and decrease the likelihood of running into these challenges, it is important to select a tool that is user-friendly and easily adaptable to classroom materials.

4.6.1 Sub-theme 3.1: Provision of technical training for Junior Primary teachers

Despite acknowledging their familiarity with ICT, the participants' existing knowledge was evidently insufficient to ensure the delivery of high-quality instruction and effective learning outcomes. Consequently, they expressed a pressing need for accessible instruction on the use of specific ICT resources within their educational institutions. These findings from the study further underscored the teachers' demand for guidance in using technology to enhance their capabilities. While the teachers demonstrated proficiency in implementing the knowledge acquired during their teacher training programmes, they still felt the necessity for supplementary training to keep up with the advancements in ICT.

The teachers proposed that training programs should focus on certain aspects of effective ICT utilization in order to adequately address their requirements. Specifically, they emphasised the importance of providing specialised training programmes, workshops, and continuous professional development opportunities to bridge the gap and equip teachers with the essential skills and knowledge needed to leverage ICT effectively in their teaching practices. Teachers can enhance their overall teaching effectiveness and create a more conducive learning environment by embracing such initiatives. Teachers expressed the following viewpoints:

Teacher Green, Orange, and Violet said they do use some ICT, but they do not have the skills to use it during teaching and learning. "*Every time the school introduces new*

technology, teachers need to receive training; technology can look the same but have different features," Teacher Yellow stated. *"We need to send qualified technicians to schools to train teachers on how to operate different ICT gadgets available at school*," Teacher Blue stated. "*Some of the elder teachers at their phase do not use ICT because they do not know how to go about it*." She added, "*There is so much one can do with ICT in the classroom, but the skill set is limited."*

Abi-Abdallah (2020), who noted that the implementation of technology within educational institutions can give rise to a range of difficulties, including technical complications, inequalities in access, and a reluctance to embrace change, corroborates the observations. Sufficient training can assist teachers in efficiently navigating these issues. Bal and Brysiewicz (2019) assert that professional training equips teachers with the necessary knowledge and abilities to proficiently integrate digital technology tools into their instructional methodologies.

On the third day of observation, Teacher Blue encountered difficulties in establishing a connection between the projector and the laptop, which consequently led to a delay in the initiation of the class. As a result, the school principal had to allocate the authorised time for the next lesson to offset the lost time. This occurrence highlights the potential advantages of offering instructional programmes to teachers, as such programmes have the potential to mitigate the likelihood of such incidents in subsequent instances.

The observation revealed that certain teachers were using muted films instead of incorporating voice-overs in their native language. We can attribute the observed behavior to their limited understanding or unfamiliarity with effective strategies for incorporating

voice-overs. Chen et al. (2019) underscored the significance of school administration organising training sessions for teachers to familiarise them with information and communication technology (ICT) hardware and software. Teachers can use professional development opportunities to strengthen their technological expertise and pedagogical practices for integrating information and communication technology (ICT) into their classrooms.

The authors, He et al. (2019), underscored the dynamic nature of technology, which perpetually evolves and gives rise to novel platforms and tools. To provide learners with captivating and pertinent learning experiences, teachers must remain abreast of contemporary technological innovations. By keeping up to date with these advancements, teachers may guarantee that their instructional methodologies continue to be efficient and in harmony with the ever-changing educational environment.

This theme is also congruent with the technological knowledge component of Technological Pedagogical Content Knowledge (TPACK). It is imperative for teachers to possess a comprehensive understanding of the technical components associated with the information and communication technology (ICT) instruments they employ. This includes acquiring knowledge about the operation of digital technology devices and software, resolving technical problems, and proficiently manipulating digital platforms (Ismail et al. 2020).

4.6.2 Subtheme 3.2: The Provision of digital Technology Gadgets by MoEAC

To advance towards successful ICT integration, active government involvement through the line ministry is essential. One effective approach to achieving this goal is to provide teachers with access to ICT resources and facilitate their participation in relevant university professional development programmes.

For successful implementation, it is crucial to ensure that schools, particularly at the Junior Primary level, have access to essential ICT tools such as projectors, laptops, and speakers. To promote a systematic and equitable distribution of these devices, participants suggested allocating them in phases, with priority given to senior primary grades initially. However, due to limited resources, rural schools face challenges in integrating ICT into their curricula.

In response to these circumstances, teachers expressed the need for MoEAC to provide ICT gadgets and resources at their schools. By taking such initiatives, the government can play a pivotal role in fostering ICT integration within the educational system, empowering teachers to enhance their instructional practices, and fostering a more technologically equipped learning environment.

The teachers indicated that the MoEAC should make provision for ICT gadgets at their schools. “The ministry should provide enough ICT tools at the schools because sometimes you really want to use them, but someone else might need them at the same time," teacher Green said.

Teacher Yellow stated that the government, through the MoEAC, must fully equip schools with educational digital tools to successfully integrate ICT into teaching and learning. Angula et al. (2019), who noted that more teachers had little to no access to the digital technology resources available at their institutions, concurred with these findings, emphasizing the need to improve schools', learners', and teachers' access to digital technology.

Teacher Violet said, *"School management can help by putting in place measures to monitor ICT integration at school." Teacher Red said, "Schools are unable to purchase ICT resources as they are costly, and the government at least assists schools with a few".*

The aforementioned findings receive support from the direct observations made during the classroom observation process. Specifically, we observed that Teacher Red chose to use a cell phone instead of a laptop, possibly due to the unavailability of another laptop that another teacher was already using. This observation highlights the pressing need for ICT resources within this particular school that can be readily accessible and utilised by teachers. Chetty and Fang (2018) stated that school administrators should ensure that the necessary infrastructure and resources are in place to support the effective use of digital tools. This includes providing reliable internet connectivity, access to appropriate devices and software, and technical support for teachers. Furthermore, administrators should allocate a sufficient budget for acquiring and maintaining technology resources, as well as stay up to date on emerging technologies and trends in educational technology (Chetty & Fang, 2018).

According to Pankaj (2020), providing digital technology gadgets aligns with technological knowledge, as teachers and learners need to understand how to operate and use these devices. Additionally, this strategy relates to content knowledge because teachers must ensure that the content delivered through these gadgets aligns with the curriculum goals of Environmental Studies.

4.6.3 Sub-theme 3.3: Collaborating with the providers of infrastructural amenities, OMAS

The MoEAC, through the appropriate service providers, must ensure that all schools have access to the internet and the technology necessary to make learning fun, engaging, and ultimately successful. Teachers suggested that the MoEAC should try to collaborate with service providers to help fund the facilities needed by schools. Furthermore, the MoEAC, through the relevant service providers, needs to provide schools with ICT tools and internet access to make teaching and learning easy, interesting, and fun for our learners. The teachers had this to say.

Teacher Violet said, "*The Ministry of Education, Arts, and Culture, through the relevant service providers, needs to provide schools with ICT tools and internet access to make teaching and learning easy, interesting, and meaningful. "The Ministry of Education, Arts, and Culture should try and work with service providers to help find the facilities needed by schools,"* said Teacher Green. *"Our school is located far away at the border, and we don't really receive sponsorships from anyone else,"* he added.

Teacher Blue stated, "*We need strategies for marketing our village schools to secure sponsorship from private companies." The neglect of most government schools, including ours at the border, contributes to our lack of development".* Teacher Red stated, "We must

encourage stakeholders to participate in donating ICT facilities to schools, as education is a shared responsibility."

Direct observations confirm the aforementioned findings. Specifically, the lack of internet connectivity in certain schools restricts teachers' access to a diverse range of educational information available on various educational websites. This implies that the government requires support in order to provide these facilities to schools, as it may not have the capacity to fund all schools simultaneously. According to Bal and Brysiewicz (2019), collaborative decision-making techniques enhance both individual and group decision-making. To strengthen links with the public, corporate, and nonprofit sectors, leaders must actively participate in fundraising campaigns and educate themselves about ICT. Visionary leaders should look into many options for obtaining necessary resources in order to increase learners' access to and equity in the use of ICT (Bal & Brysiewicz, 2019). Working with telecom and utility companies highlights how crucial technical knowledge is to maintaining the infrastructure required for effective ICT integration. Teachers might need to comprehend how these technologies work and how to use them to further educational objectives (Garcia, 2018).

4.6.4 Subtheme 3.4: Reducing the classroom size

The term "class size" refers to the total number of learners under a teacher's instruction. The class size informs the teacher's assessment tools, pedagogical strategies, and seating options. Three teachers have complained of overcrowded classrooms. They had this to say.

Teacher Maroon said, "*The school needs additional classroom structures; the Junior Primary classes are so overcrowded that even normal teaching cannot succeed"*. Teacher

Red agrees with teacher Maroon when he says*, "Normal teaching cannot take place in an overcrowded Junior Primary classroom; the number needs to be reduced by building another additional block for Junior Primary."* Teacher White stated, *"Too many learners in the classroom hinder their learning and ICT use." "We need to reduce the number of learners, but we lack classrooms to accommodate them".*

In certain instances, teachers encounter challenges in finding suitable locations to set up an overhead projector (OHP) within the classroom. During the researcher's observation of Teacher Maroon, he struggled to identify an appropriate spot at the back of the class to place the OHP without obstructing any learner's view. As a result, learners seated at the back, where the OHP was positioned, had difficulties viewing the presented content. Additionally, both Teacher Maroon and Teacher Red faced obstacles in moving between tables due to the lack of free spaces among the desks.

The close proximity of the desks within the classroom made it difficult to use a laptop to present information to the learners. The limited space made it challenging for some learners to have a clear view of the OHP, hindering the teachers from fully leveraging classroom technology to enhance the learners' learning experience.

Smith (2020) supports the above findings by mentioning that reducing classroom size can positively impact pedagogical and content knowledge. With smaller class sizes, teachers can give more individualised attention, adapt their pedagogical approaches to learner needs, and better manage the integration of ICT tools for personalised learning experiences.

4.6.5 Subtheme 3.5: Local content development

In their respective mediums of instruction, teachers have raised significant concerns about the accessibility of environmental content on the internet. To address this issue, teachers have put forth the idea of making environmental resources available in all Namibian languages. They anticipate saving valuable time on content translation by adopting this approach. Moreover, such a measure promises to enhance the overall efficiency and effectiveness of utilising educational materials.

Teacher Yellow said, "*In most cases, most of the things on the internet are in English, and our medium of instruction is Oshikwanyama. It presents a significant challenge to translate the content into our preferred medium of instruction. For example, if I want learners to watch a video on road safety, it is in English, and there is nothing I can do about that. In such cases, I let them watch the video without the sound and ask them about the actions in the video only*. Similarly, teacher Blue stated, "Translating the content is sometimes also a problem because the medium of instruction is oshiwambo, which is not the language of the internet." *Videos are also much more useful than pictures, but I just let my learners watch a video on mute and focus on what is happening in the video.*

During the observation, Teacher Yellow showed the learners a video that demonstrated the use of various forms of transportation. However, due to its English-language content, the video lacked sound. Consequently, Teacher Red instructed the learners to attentively observe the visual content and subsequently share their observations with their peers. Similarly, Teacher Red utilised a video for teaching hygiene-related concepts, but it was also devoid of local content and remained muted. Consider that when instructional

materials align with local contexts and present in the learners' native language, learners may establish stronger connections and comprehension.

The aforementioned conclusions are corroborated by the research conducted by Zaugg et al. (2022), which suggests that the accessibility of digital content in native languages may be comparatively restricted in comparison to resources available in widely spoken global languages. While localized information may be accessible, languages with a wider user base may offer a wider scope and variety of digital resources. Zaugg et al. (2022) underscored the importance for teachers to establish digital archives of pedagogical materials, encompassing diverse media formats such as videos, articles, and tutorials, with the added provision of translations in several languages.

Minako and Carmel (2018) indicated that teachers can be involved in the development of educational resources, digital government platforms, and localised content in indigenous languages, all of which have the potential to enhance the significance and adoption of information and communication technology (ICT) in the Junior Primary Phase.

Dunne and Sánchez-Naranjo (2018) suggest that local content creators, including teachers, writers, and developers, should receive training and support to enhance their skills in creating digital content. Promoting the development and distribution of appropriate and context-specific content in digital mediums is of utmost importance in facilitating the acceptance and use of information and communication technology (ICT) across diverse user demographics (Dunne & Sánchez-Naranjo, 2018).

4.7. Chapter summary

This chapter provides an analysis and examination of the results obtained from teacher data regarding the implementation of Information and Communication Technology (ICT) in Junior Primary classrooms. The focus is specifically on the use of ICT in the subject matter of Environmental Studies within the Omusati Region. To maintain data confidentiality and adhere to ethical principles of anonymity, the researcher assigned codes to the participants using a set of ten unique colours: Teacher Green, Teacher White, Teacher Maroon, Teacher Violet, Teacher Yellow, Teacher Blue, Teacher Orange, Teacher Black, Teacher Pink, and Teacher Red. The group of teachers involved in this study varied in age, ranging from 26 to 40 years old. The aforementioned group consisted of three male teachers and seven female teachers.

The educational credentials of the teachers involved in the study varied, ranging from a Diploma in Education to Diplomas with an Advanced Certificate in Learner Support Education, as well as Bachelor of Education degrees. The individuals' teaching experience encompassed a duration ranging from four to eleven years.

By identifying emergent themes, the researcher analyses and discusses the findings from both observational data and individual interviews. The study strategically aligned the identified themes to address the research questions. To enhance the expression of the participants' perspectives and empower them, the researcher mostly used verbatim excerpts extracted from the collected data.

Furthermore, this chapter provides a comprehensive analysis of the diverse functions of Information and Communication Technology (ICT) in the context of Environmental

Studies. This study also delves into the challenges teachers encounter when incorporating information and communication technology (ICT) into Environmental Studies lessons. Furthermore, this study scrutinizes and discusses alternative strategies to address the identified issues. The chapter that follows will conclude the study by providing the researcher's detailed conclusions and recommendations for future research directions.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to explore the role of ICT in Environmental Studies in the rural Junior Primary phase in selected schools in the Omusati region. This chapter presents the study's summary and conclusions, along with the recommendations that emerged from its findings. The chapter also identifies possible areas for further research.

5.2 Summary of the study

The study took place in four rural schools in the Omusati Educational Region. This study employed a qualitative research approach and a case study research design to investigate the role of ICT in teaching Environmental Studies in grade two classrooms. The sample consisted of ten (10) Environmental Studies teachers who have teaching experience of at least three (3) years and above in teaching Environmental Studies in a Grade Two classroom.

The following findings were derived from the study's research questions.

5.2.1 **Question 1:** What is the role of ICTs in the teaching and learning of Environmental Studies in grade two rural classrooms?

The integration of Information and Communication Technology (ICT) into education offers several significant benefits. It enables the teaching of abstract or distant subjects in a manner that resonates with learners' daily lives, making these topics more relatable. This technology fosters active participation and engagement among learners, enhancing their

involvement in the learning process. Additionally, ICT helps to maintain learners' concentration on the subject matter, promoting focused learning.

One of the key advantages of ICT is its potential for personalised instruction, accommodating individual learning preferences and needs. This customisation leads to improved learning outcomes. Furthermore, the use of ICT stimulates learner engagement, resulting in improved knowledge retention. The convenience, efficiency, and cost-effectiveness of ICT provide learners with a readily accessible and affordable way to access relevant information, thereby facilitating comprehensive and enriched learning experiences.

5.2.2 **Question 2:** What challenges do teachers experience in integrating ICT into Environmental Studies in Grade 2 Rural, Junior Primary classrooms?

The study also identified the barriers to integrating Information and Communication Technology (ICT) in the Junior Primary phase. These challenges encompass several aspects, such as the lack of technical training for Junior Primary teachers on how to effectively employ ICT in their teaching and learning practices. Additionally, limited accessibility and network connectivity, coupled with overcrowded classrooms, further compound the difficulties. The constrained timeframe available for teaching, the language of instruction at the Junior Primary phase, and the scarcity of resources all emerged as significant impediments.

Furthermore, the research revealed that teachers have not received sufficient preparation for their roles as ICT teachers. Participants stated that their schools did not provide adequate ICT training to adequately equip them to incorporate technology into their

classrooms. The shortage of ICT resources, in comparison to the number of teachers and classes at the school, further exacerbates the problem. Consequently, some Junior Primary grades are overcrowded, negatively impacting the interaction between teachers and learners. Additionally, the challenge of effectively setting up interactive whiteboards or other technologies in a way that ensures all learners have an optimal view emerged as a prevalent concern.

The majority of teachers expressed their struggles with finding enough time during the day to adequately prepare for ICT-mediated lessons while still managing their other daily tasks. The study also revealed that teaching in the mother tongue presented challenges to integrating ICT into Environmental Studies lessons. Teachers reported that much of the information available on the internet is in English, making it difficult to translate content into the mother tongue. As a result, teachers resorted to showing videos without sound and tasked learners with focusing on the visual aspects. Despite receiving English as a second language instruction, learners encountered difficulties in understanding English-presented videos.

5.2.3 **Question 3:** What strategies can be used to enhance the integration of ICT in Environmental Studies in Grade rural, Junior Primary classrooms?

The study's findings proposed several mitigation strategies to enhance the use of ICT in the Environmental Studies subject. One such strategy entails providing specialised training programmes for Junior Primary teachers. The aim is to empower teachers with the necessary knowledge and competencies to make optimal use of ICT tools in their instructional practices. Another recommended strategy involves the Ministry of

Education, Arts, and Culture (MoEAC) allocating digital technology gadgets to schools. This will ensure that both teachers and learners have access to these essential tools. Furthermore, we propose a collaborative approach with providers of infrastructural amenities as another effective strategy. This entails forming partnerships with organisations or companies capable of providing the required infrastructure, such as reliable internet connectivity. Teachers endorse reducing classroom size as a critical strategy. This approach seeks to create a more conducive learning environment by limiting the number of learners in each classroom. By managing smaller class sizes, teachers can more effectively integrate technology into their teaching, catering to the unique needs and learning styles of individual learners. Finally, teachers propose the strategy of local content development to promote seamless ICT integration. This strategy involves creating educational content that aligns with the local curriculum and reflects the cultural context of the learners.

5.3 Conclusion of the study

As a result, the present study, titled "The Role of Information and Communications Technology (ICT) in Junior Primary Phase: A Case Study of Environmental Studies in Selected Grade Two Rural Classrooms," has offered insightful information about the significant benefits of integrating ICT in rural classrooms to improve young learners' learning experiences.

The study's findings highlight how critical it is to thoughtfully integrate ICT tools and resources into Environmental Studies instruction because they help create a more engaging and interactive learning environment. Teachers can efficiently accommodate different learning styles and hold learners' attention by utilizing multimedia components,

educational software, and online resources, which improve learner retention and knowledge of environmental ideas. The study has also shown how ICT integration in rural schools can overcome geographic limitations and give pupils access to a wider world outside of their immediate surroundings. This feature of ICT has significant potential to close the educational gap between urban and rural areas and give learners who live in remote areas equal access to high-quality education. Each identified ICT role in the Environmental Studies subject aligns with distinct aspects of the TPACK framework. Effective integration of technology requires teachers to possess a balanced combination of content knowledge, pedagogical knowledge, and technological knowledge to maximise the benefits of ICT tools in teaching and learning.

Despite the obvious potential benefits of ICT in Junior Primary, successful implementation in rural schools requires addressing a number of issues. Some of these difficulties include infrastructure restrictions, overcrowded classrooms, the selection of the appropriate medium of instruction at the Junior Primary level, and a lack of technical training for teachers. We must address these concerns to fully utilise ICT's potential and ensure its inclusive and sustainable use in rural educational settings. These challenges illustrate the practical application of the TPACK framework in real-world scenarios. Effective ICT integration requires teachers to possess a balanced combination of technological, pedagogical, and content knowledge. Addressing these challenges involves not only technical proficiency but also an understanding of how to best integrate technology within the context of educational content and pedagogy.

To overcome these obstacles, teachers and stakeholders must make adequate investments and provide adequate assistance. We can significantly improve ICT integration in rural

schools by reducing class size, encouraging local content production, and providing teachers with training.

In conclusion, it is critical to prioritise technology integration in education as it develops. Fostering a digitally literate and environmentally conscious generation necessitates providing teachers and young learners with the knowledge and abilities they need to thrive in a world that is becoming more connected and digital. By utilising the ICT options available, teachers may significantly influence the direction of rural education and give learners the tools they need to participate fully in the global information age.

5.4 Recommendations

5.4.1 Recommendations for MoEAC to:

Based on the findings of this study, the following recommendations are proposed:

- Teacher Education and Professional Development; Comprehensive training and professional development programs should be implemented to equip teachers with the necessary technical skills and pedagogical knowledge to effectively integrate ICT into their teaching practices.
- Investment in ICT Infrastructure: MoEAC, educational institutions, and relevant stakeholders should prioritize investment in ICT infrastructure in rural schools. This includes providing reliable electricity, internet connectivity, and sufficient ICT devices such as computers or tablets to ensure seamless integration of technology in the learning process.

- Develop and promote locally relevant and culturally appropriate digital content for Environmental Studies. Localized content will not only cater to the specific needs and context of rural learners but also foster a sense of identity and connection with their environment.
- Public-Private Partnerships: Collaboration between the public and private sectors can play a vital role in supporting ICT initiatives in rural schools.
- Create mentorship and support networks to encourage teachers to share effective teaching methods and resources.
- The Ministry of Education, Arts, and Culture should conduct an ICT needs analysis among teachers, ensuring that the training aligns with the needs of current teachers.
- Create a thorough monitoring and evaluation framework to analyse how teachers are incorporating ICT into their teaching and learning practices.

  This framework should also assess the degree to which the objectives of the ICT strategy are being accomplished, allowing for informed modifications based on d ata-driven insights.
- The Ministry of Education, Arts, and Culture (MoEAC) should promote the integration of extensive ICT training into the teacher education curriculum of higher education institutions. This training should emphasise the actual use of ICT in teaching and learning.

5.4.2 Recommendations for future research

- This study was done in rural schools. A similar study can be done in urban schools in order to compare the findings.
- Another similar study is needed in other rural educational regions to relate the role of ICT in Junior Primary phase in Namibian rural schools.
- The study aims to explore the confidence and attitudes of Junior Primary teachers in incorporating ICTs into their teaching methods.
- The study is investigating the effects of ICT on teachers' ability to perform their teaching duties and the management of other curriculum-related activities.
- The study aims to assess the proficiency of Junior Primary teachers in ICT and their efficiency in utilizing it to enhance the teaching and learning process within the classroom.

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APPENDIX 1: ETHICAL CLEARENCE LETTER UNAM

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: DEC: HPC0001 Date: 8 DECEMBER 2021

This Ethical Clearance Certificate is issued by the University of Namibia Ethics Committee (REC) 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 ethics committee.
Title of Project: **The role of information and communication technology in early childhood education: a case study of environmental studies in selected grade two rural classrooms**

Student: **Emma A. Kashweka**
Student Number: 201200142
Supervisor(s): **Dr C. K. Haihambo Ya-Otto (Main Supervisor)**
Mrs E. Potgieter (Co-Supervisor)

Centre for Research Services
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 Angelina Popyeni Amushigamo (Chairperson DEC HPC)

Prof. Davis Mumbengegwi (Head, Multidisciplinary Research)

APPENDIX 2: RESEARCH PERMISSION LETTER

CENTRE FOR RESEARCH SERVICES
Office of the Pro Vice Chancellor: Research, Innovation & Development
University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park, Office 1223 - Fidel Castro Block
☎ +264 61 206 4573; E-mail: [illegible]; URL: http://www.unam.edu.na

UNAM

RESEARCH PERMISSION LETTER

Date: 09/12/2021

Student Name: EMMA A. KASHWEKA

Student Number: 201200142

Programme: MASTERS OF EDUCATION

Approved Research Title: The role of information and communication technology in early childhood education: a case study of environmental studies in selected grade two rural classrooms

TO WHOM IT MAY CONCERN:

I hereby confirm that the above-mentioned student is registered at the University of Namibia for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees.

The proposal adheres to ethical principles as per attached Ethical Clearance Certificate. Permission is hereby granted to carry out the research as described in the approved proposal.

Best Regards

Dr. AEE Shikongo
Head: Postgraduate Research Support Services
Tel: +264 61 206 3129
E-mail: aeshikongo@unam.na

CENTRE FOR RESEARCH SERVICES
Office of the Director
2021 -12- 09
University of Namibia
UNAM

APPENDIX 3: AUTHORIZATION FROM THE DIRECTOR OF EDUCATION, ARTS AND CULTURE

REPUBLIC OF NAMIBIA

MINISTRY OF EDUCATION, ARTS AND CULTURE

Enquiries: Mr. G. Munene
Tel: +264 61 - 293 3705
Fax: +264 61 - 293 3922
Email: Gibson.Munene@moe.gov.na
File no: 13/2/9/1

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

Ms Emma Kashweka
P. O. Box 15165
Oshakati
Email: ekashweka@unam.na

Dear Ms Kashweka,

SUBJECT: PERMISSION TO CONDUCT ACADEMIC RESEARCH IN OMUSATI REGION

The Ministry wishes to acknowledge receipt of your letter dated 14 February 2022 seeking for permission to conduct academic research in Omusati region for your Masters of Education Degree studies which is focusing on: "*The Role of Information and Communication Technology in Early Childhood Education: A Case Study of Environmental Studies in Selected Grade Two Rural Classrooms.*"

Permission to visit school has been granted to you. However, you have to seek for further clearance from the Omusati Regional Director of Education, Arts and Culture to ensure that:

- staff members' normal work is not disrupted during your interviews;
- participation is voluntary; and,
- parental consent should be granted by the parents / guardians of all participants who are under the age of 16 years.

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

We wish you the best in conducting your research and the Ministry looks forward to hearing from you upon completion of your studies.

Yours sincerely,

17.02.2022

Sanet L. Steenkamp
A/ EXECUTIVE DIRECTOR

Acting ED.

APPENDIX 4: AUTHORIZATION FROM THE MINISTRY OF EDUCATION, ARTS AND CULTURE

REPUBLIC OF NAMIBIA

MINISTRY OF EDUCATION, ARTS AND CULTURE

Enquiries: Mr. G. Munene
Tel: +264 61 -293 3202
Fax: +264 61- 293 3922
Email: Gibson.Munene@moe.gov.na
File no: 13/2/9/1

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

Ms Emma Kashweka
P. O. Box 15165
Oshakati
Email: ekashweka@unam.na

Dear Ms Kashweka,

SUBJECT: PERMISSION TO CONDUCT ACADEMIC RESEARCH IN OMUSATI REGION

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- staff members' normal work is not disrupted during your interviews;
- participation is voluntary; and,
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We wish you the best in conducting your research and the Ministry looks forward to hearing from you upon completion of your studies.

Yours sincerely,

17.02.2022

Sanet L. Steenkamp
EXECUTIVE DIRECTOR Acting ED.

Ministry of Education, Arts and Culture
Office of the Executive Director
Tel: 061-293 3223/4
Fax: 061-293 3971
All official correspondence should be addressed to the Executive Director

APPENDIX 5: INFORMED CONSENT

UREC Annex 5F: Informed Consent for Qualitative Studies

INFORMED CONSENT FORM FOR TEACHERS

Informed Consent for teachers who are inviting to participate in research, I am inviting you to participant in my research titled **THE ROLE OF ICT IN JUNIOR PRIMARY EDUCATION: A CASE STUDY OF ENVIRONMENTAL STUDIES IN SELECTED GRADE TWO RURAL CLASSROOMS**

Name of Principal Investigator:	EMMA AAMANDIRE KASHWEKA
Name of Sponsor:	UNAM

This Informed Consent Form has two parts:

- **Information Sheet (this section, to share information about the study with you)**
- **Certificate of Consent (for signatures if you choose to participate)**

You will be given a copy of the full Informed Consent Form.

PART I: INFORMATION SHEET

Introduction

I am Emma Aamandire Kashweka, learner number 201200142; I am pursuing a Master degree at the University of Namibia. I am doing research on the role of ICT in early childhood education. It is a case study of Environmental Studies in selected Grade two rural classrooms. It is also aims to explore the views of Grade 2 teachers towards ICTs usage in teaching Environmental Studies. I have chosen your school to be the focus area of my research area. You were selected as a possible participant in this study because of the 3 years' experience you possess in teaching Environmental Studies in the Junior Primary phase. I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. This consent form may contain words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain.

Purpose of the Research

The 21st century has brought changes in all sectors due to an increased demand in the use of technology across sectors, and education is not excluded. Teaching methods have drastically changed due to technological advancements such as computer usage. Teachers can integrate technology and media in Environmental Education through activities that encourage children to explore, solve problems, investigate, and demonstrate their learning about the world outside of their classrooms. The purpose of the research is to explore the role of ICT in teaching and learning Environmental Studies in Grade two classrooms. It is also aims to explore the views of Grade 2 teachers towards ICTs usage in teaching Environmental Studies. I believe you can help me to answer that by observing you during Environmental Studies lessons and by telling me your views on ICTs integration in Environmental Studies during the interview session.

Type of Research Intervention

This research will involve your participation in three days classroom observations which will last for 40 minutes during Environmental Studies lessons and semi-structured

interview that will take about half an hour.

Participant Selection

You were selected as a possible participant in this study because of the 3 and more years' experience you possess in teaching Environmental Studies in the Junior Primary phase. I am positive that your experience can contribute much on the roles of ICT integration in the teaching of Environmental Studies and the views towards the integration ICT in teaching Environmental Studies.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You are also free to withdraw from this research any time if you wish to do so.

Procedures

The research aims to explore the role of ICT in teaching and learning Environmental Studies in Grade two classrooms. It is also aims to explore the views of Grade 2 teachers towards ICTs usage in teaching Environmental Studies. If you accept you will be asked to participate in 3 days observation schedule followed by and semi-structured interview. The classroom observation will be done during Environmental Studies lessons and it will take about 40 minutes. An interview of approximately 30 minutes in length will take place on the last day of observation. With your permission, the interview will recorded using a microphone to facilitate collection of information, and later transcribed for analysis. Therefore, please complete and return the consent form for record keeping purposes.

Duration

The data collection will takes about 4 days in total. During that time, I will do a three days classroom observation during Environmental Studies lessons which will last for 40

minutes. The semi-structured interview will be held once and will take about half an hour and that will be on the last day after the observation.

Risks

There are no risks involved in this research, however if you may feel that some interview questions are too personal or talking about them makes you uncomfortable, you are free not to answer them.

Benefits

There will be no direct benefit to you, but your participation is likely to help us find out the role ICTs in teaching and learning of Environmental Studies as well the view of Grade 2 teachers towards ICTs usage in teaching Environmental Studies.

Reimbursements

You will not be provided with any incentive to take part in the research. Your participation will be free of charge.

Confidentiality

All the information that you are going to provide will only be used for the purpose of this study. All the information collected will be treated with strict confidentiality.

Sharing the Results

A link with the study findings will be made available to the participants through the Directorate of Education (Omusati Educational Regional. Soft copies of the data will be saved on a computer with a password only known to the researcher, until the study has been completed. The data will be kept safely and will be deleted after five years.

Right to Refuse or Withdraw

If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and remain in the study.

Who to Contact

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at +264 813707618 or by e-mail kashwekaemma@gmail.com

This research has been reviewed and approved by the relevant Ethics Review Committee at the University of Namibia, which is a committee whose task it is to make sure that research participants are protected from harm. The committee reports to the University's Centre for Research Services. If you wish to contact this Centre, please call +264 61 206 4673 or send an e-mail to research@unam.na.

PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked, have been answered to my satisfaction. I consent voluntarily to be a participant in this study

…….

……

Name of Participant (print) Signature of Participant

……

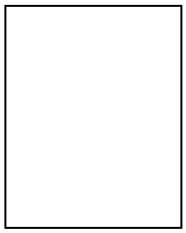
Date (day/month/year)

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

…….

Name of Witness (print)



Thumb print of Participant

……

Signature of Witness

……

Date (day/month/year)

Statement by the Researcher/Person taking Consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1.

2.

3.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best

of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

…….

……

Name of Researcher/Person taking Consent (print) Signature

……

Date (day/month/year)

If Assisted by an Interpreter: Statement by Interpreter

I have accurately interpreted the information sheet to the potential participant in …….. (insert name of target language), and to the best of my ability made sure that the participant understands that the following will be done:

1.

2.

3.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been interpreted correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

I declare that I will not divulge any information that I interpret during this research intervention to a third party outside this study.

…….

……

Name of Interpreter (print) Signature

……

Date (day/month/year)

APPENDIX 6: INTERVIEW PROTOCOL

HREC-NH Annex 5G Individual Interview Guide
INDIVIDUAL INTERVIEW

Dear Participant

1. My name is EMMA AAMANDIRE KASHWEKA learner number 20120014]. I am studying towards a MASTER OF EDUCATION (BY RESEARCH) degree at the University of Namibia (UNAM), and I am conducting interviews about the role of ICT in teaching and learning Environmental Studies in Grade two classroom. I also want to explore the views of Grade 2 teachers towards ICTs usage in teaching Environmental Studies.
2. I have selected you to participate in my study, because you belong to the group of people I want to include for my research. I would therefore like to invite you to an interview.
3. The research I am conducting has been approved by the UNAM Research Ethics Committee. I would appreciate it very much if you would participate in an interview, and I would like to assure you of the following:
    a. You do not have to participate in an interview if you do not want to.
    b. You can stop participating in the interview before the end and leave at any time if you want to, and there will be no negative consequences for you.
    c. Your participation is completely anonymous. This means that, even if I ask information that might identify you or if I know you, I am not allowed to make your identity known to anyone. When I report on my interview data and results, I will not mention any personal information about participants that might identify them. Should I refer to a specific participant, I will use a system of coding, e.g. “Respondent A is of the opinion that …”.
    d. If I want to make any (audio or video) recording of you during the interview, I have to get your permission to do so. You are free to decline to have the interview recorded, and there will be no negative consequences for you. I will then record the contents of the interview in my notes only.
    e. All interview data will be stored in a safe and secure place, and only authorised University officials, my supervisor and I will have access to it. After five years, all the data will be destroyed in an environmentally friendly way.
4. If you have any questions about this interview, or if you do not understand anything, please feel free to ask me, and I will be happy to explain it to you.
5. If you want to know more about the research I am doing, please feel free to ask me, and I will be happy to tell you more.

6. The interview should take about 30 minutes.
7. You can reach me on my cell phone at +264813707618, or send an e-mail to ekashweka@unam.na if you have any questions about this research.
8. If you want to contact the UNAM Centre for Research and Publications for more information or because you have a comment or complaint about this research or about me, please call (+ 264 61) 206 …, or write an e-mail to research@unam.na. Please provide specific information.
9. Thank you very much for your willingness to participate in this research!

Every Participant should receive a copy of this page.

HREC-NH Annex 5G Individual Interview Guide
PERMISSION FOR AN INDIVIDUAL INTERVIEW

SECTION 1: DETAILS OF INTERVIEWER

Name and surname: EMMA A KASHWEKA

Learner number: 201200142

SECTION 2: DETAILS OF THE INTERVIEW

Date of interview:	
Place of interview:	
Type of recording:	
Record reference:	
Start time:	
End time:	

SECTION 3: DETAILS OF THE INTERVIEWEE/PARTICIPANT

Name and surname:	
Cell phone number:	
E-mail address:	

SECTION 4: DECLARATION BY THE INTERVIEWEE/PARTICIPANT

I, (*name and surname of Interviewee/Participant*)
……

declare that:

- I am 18 years of age or older.
- I am participating voluntarily in this interview, and I understand that I can leave at any time before the end of the interview without any negative consequences for me.
- I understand that I provide my details in Section 3 above ONLY for record purposes for this research, and that the information will not be shared with a third party or used to communicate with me about anything else than this research project.
- I understand that my identity will be fully protected in any report on this research, and that all information I provide above and during the interview will be safeguarded.
- I AGREE / DECLINE to being recorded during the interview in the manner stated in Section 2 above.
  (*Delete the non-applicable word.*)

……. ……
……..

SIGNATURE: Participant SIGNATURE: Interviewer

DATE

GENERAL INFORMATION

Name/ Code of School: _____

Region and Circuit: _____

Code of Respondent: _____

Biographical data: _____

Age of respondent: _____

Highest professional qualification: _____

Name of institution: _____

Specialization: _____

Year of Graduation: _____

Number of Professional Development courses in Environmental Studies attended:

_____

Number of Professional Development Courses in ICT attended:

_____

Teaching experience_____

Interview questions

1. What is the role do ICTs in the teaching and learning of Environmental Studies in grade 2 classroom?

1.1 What ICTs are available at your school and how do you use these in teaching Environmental

Studies?_____

_____

_____

1.2 How often do you make use of these ICTs that are available?

_____

_____

_____

1.3 Describes your proficiency levels in using these available ICTs in your Environmental lessons?

_____

_____

_____

1.4 What problems do you encounter when using ICTs in Environmental Studies?

_____

_____

_____

1.5 Explain how you overcome the problems you have encountered when using ICTs in Environmental Studies?

_____

_____

_____

_____

1.6Does the participation of learners varies when ICTs is used compared to when ICTs is not used?

Explain

_____

_____

_____

_____

2. How do teachers use ICTs to improve the teaching of Environmental Studies in Grade 2 rural classrooms?

2.1 Explain briefly how your use of ICTs in teaching Environmental Studies can help your learners grasp the lesson content as well as influence the classroom participation

_____

_____

_____

2.2 Do you give learners the opportunity to use the chosen ICTs in the lessons as well? Give reasons for your answer.

_____

_____

_____

2.3 What do you think can be done to improve the use of ICTs in the teaching and learning of Environmental Studies?

_____

_____

_____

2.4 Does the content of Environmental Studies in Grade 2 support the use of ICTs? Explain?

---

3. How can the integration of ICTs in Environmental Studies enhance Grade 2 learners' participation in the lesson?

3.1 How do the use of ICTs enhance:

3.1.1 learner-participation

_____

_____

_____

3.2.1 learner-concentration

_____

_____

_____

3.3.1 Social-relations?

_____

_____

_____

4. Are there any other point you would like to share about the role of ICTs in the teaching and learning of Environmental Studies in Grade 2?

_____

_____

_____

End!

APPENDIX 7: OBSERVATION CHECKLIST

HREC-NH Annex 5H Individual 0bservation
OBSERVATION CHECKLIST

Dear Participant

10. My name is EMMA AAMANDIRE KASHWEKA learner number 20120014. I am studying towards a MASTER OF EDUCATION (BY RESEARCH) degree at the University of Namibia (UNAM), and I am conducting classroom observation on the role of ICT in teaching and learning Environmental Studies in Grade two classroom. I also want to explore the views of Grade 2 teachers towards ICTs usage in teaching Environmental Studies.
11. I have selected you to participate in my study, because you belong to the group of people I want to include for my research. I would therefore like to invite you to a classroom observation.
12. The research I am conducting has been approved by the UNAM Research Ethics Committee. I would appreciate it very much if you would participate in an observation, and I would like to assure you of the following:
    a. You do not have to participate in the observation if you do not want to.
    b. You can stop participating in the observation before the end and leave at any time if you want to, and there will be no negative consequences for you.
    c. Your participation is completely anonymous. This means that, even if I ask information that might identify you or if I know you, I am not allowed to make your identity known to anyone. When I report on my interview data and results, I will not mention any personal information about participants that might identify them. Should I refer to a specific participant, I will use a system of coding, e.g. “Respondent A is of the opinion that …”.
    d. If I want to make any (audio or video) recording of you during the observation, I have to get your permission to do so. You are free to decline to have the observation recorded, and there will be no negative consequences for you. I will then record the contents of the observation in my notes only.
    e. All observation data will be stored in a safe and secure place, and only authorised University officials, my supervisor and I will have access to it. After five years, all the data will be destroyed in an environmentally friendly way.
13. If you have any questions about this observation, or if you do not understand anything, please feel free to ask me, and I will be happy to explain it to you.

14. If you want to know more about the research I am doing, please feel free to ask me, and I will be happy to tell you more.
15. The observation should take about 40 minutes.
16. You can reach me on my cell phone at +264813707618, or send an e-mail to ekashweka@unam.na if you have any questions about this research.
17. If you want to contact the UNAM Centre for Research and Publications for more information or because you have a comment or complaint about this research or about me, please call (+ 264 61) 206 …, or write an e-mail to research@unam.na. Please provide specific information.
18. Thank you very much for your willingness to participate in this research!

Every Participant should receive a copy of this page.

HREC-NH Annex 5HObservation
OBSERVATION CHECKLIST

SECTION 1: DETAILS OF OBSERVER

Name and surname: EMMA A KASHWEKA

Learner number: 201200142

SECTION 2: DETAILS OF OBSEVATION

Date of observation:	
Place of observation:	
Type of recording:	
Record reference:	
Start time:	
End time:	

SECTION 3: DETAILS OF THE OBSERVEE/PARTICIPANT

Name and surname:	
Cell phone number:	
E-mail address:	

SECTION 4: DECLARATION BY THE OBSERVEE/PARTICIPANT

I, (*name and surname of Observee/Participant*)
……

declare that:

- I am 18 years of age or older.
- I am participating voluntarily in this interview, and I understand that I can leave at any time before the end of the interview without any negative consequences for me.
- I understand that I provide my details in Section 3 above ONLY for record purposes for this research, and that the information will not be shared with a third party or used to communicate with me about anything else than this research project.
- I understand that my identity will be fully protected in any report on this research, and that all information I provide above and during the interview will be safeguarded.
- I AGREE / DECLINE to being recorded during the observation in the manner stated in Section 2 above.
  (*Delete the non-applicable word.*)

……. ……
……..

SIGNATURE: Participant SIGNATURE: observer

DATE

GENERAL INFORMATION

Name of the school: _____

Region and Circuit: _____

Source of Energy: _____

Theme: _____

Topic of integration: _____

Lesson objective_____

ICTs selected for this lesson_____

Teacher's qualifications_____

Biographical data:_____

Age of respondent: _____

Highest professional qualification: _____

Name of institution: _____

Year of Graduation: _____

Number of Professional Development courses in Environmental Studies attended: _____

Number of Professional Development Courses in ICT attended _____

Observation questions

1. How did the teacher use the selected ICTs in this lesson:

During lesson introduction	**During lesson presentation**	**During lesson conclusion**

2. How did the ICTs improve learners' participation in the lesson

During lesson introduction	**During lesson introduction**	**During reinforcement and assessment**	**During lesson introduction**

3. In what way did the ICTs selected for this lesson help the teacher to achieve the lesson objective?

---

4. Any other observation

~END~

APPENDIX 8: PROOF OF LANGUAGE EDITING

Pelino Proofreading & Editing Services
Abed Pele Teofilus
Master of Philosophy in English as Second Language
(MPhil)-University of Stellenbosch
P.O. Box 3167
Ongwediva
Cellno; 0812443243

Date: 20-03-2023

Bank Details: Bank Windhoek
ACC: 115672290
481-972 Branch Code

Dear Sir/Madam

Re: Editing of Master Thesis

I hereby would like to confirm the editing and proofreading of the Master thesis of **Emma Kashweka, Student no: 201200142**, titled:

"The role of information and communication technology in Junior Primary phase: A case study of Environmental Studies in selected Grade Two rural classrooms".

The proof reading concentrated on the grammar, spelling, punctuations and typing errors. It also included the clarification of intended meaning when the author is ambiguous or potentially misleading as well as stylistic and structural consistency.

The references were cross checked according to the APA referencing style and all citations aligned to the rules of APA referencing style.

The confidentiality is guaranteed by encrypting a password when saving it in our computer and will be deleted as soon as our service has been finalized.

Yours in Education
Signed
Mr. Abed Pele Teofilus
0812443243