AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT

by

SHORAI PRISCA PARAYIWA

submitted in accordance with the requirements for

the degree of

MASTER OF EDUCATION

in the subject

ENVIRONMENTAL EDUCATION

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: DR NP SHABALALA

CO-SUPERVISOR: PROF S SHAVA

11 September 2024

DECLARATION

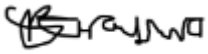
Name : SHORAI PRISCA MACHIRIDZA

Student number : 61661481

Degree : ENVIRONMENTAL EDUCATION

Research topic: AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT

I declare that the above-mentioned dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNATURE:  DATE: 11/09/2024

DEDICATION

I dedicate this dissertation to the following people:

My parents- Catherine and the late Noah Chinembiri Machiridza

I would like to thank you for laying my educational foundation. It was not easy for you to raise the financials, but you could strive to get the way out. I appreciate the guide and the encouragements you kept on giving me not forgetting your prayers as well. For this amongst other reasons encouraged me to complete this study.

My husband Clever

Your love and support from the beginning of this study was just extreme. Thank for your technical, financial and emotional support.

My family

You have been supporting me ever since became part of you. You were there in prayers, financial support and resource provision. I would like to thank and every one of you for the role you played. For this I promise I will make you proud.

My supervisors: The late Professor S Shava and Dr NP Shabalala

Let me extend my gratitude to both of you for supporting me tirelessly until I reach this position. It was not easy. I could not make it without you. May God bless you.

Pastor Patrick, Student Pastor and Mrs Tizirai

I would like to thank you for your earnest prayers. It has not been easy, but through your prayers, the road became easier. Our God made it possible. For real we can do all things through Christ who strengthen us.

Joyce Parayiwa

Thank you aunty for the support and sacrifice during the time of my research. You ended up carrying some of my responsibilities in order to create time for me to work on this research. God richly bless you.

Unisa library and the online lecturers

My sincere gratitude to all the relevant literature and guide for this study I got from you. I thank Unisa master's bursary for their financial assistance.

ABSTRACT

This study presents the environmental awareness and related practices among high school learners in selected schools around Johannesburg Central District. There have been drastic changes in the environment, including global warming, deforestation, natural calamities, and different types of pollutions that can cause damage to the global environment. Environmental challenges have been increasing in everyday lives. Many of these environmental challenges are rooted in the human actions (Casalo & Escario, 2018). Relatively, humans are destroying the environment because they are not aware of the impact of their action on the environment (Amrullah & Nurcahyo, 2019). If humans continue to lack awareness, the environment will keep on degrading leading to environmental stress. It is believed that environmental problems will be reduced through promotion awareness (Islamoglu et al, 2017). There should be ways to safeguard the environment and protect it from an on-going degradation. The school environment gives more emphasis on environmental awareness in a consistent way (Maleficio, 2018). It can be used to promote environmental conservation behaviour and creating environmental awareness thereby reducing further damage. The study aimed to answer the research question of better understanding the level of environmental awareness and related practices among high school learners. The two further sub-questions were based on the environmental activities that are carried out in schools which portray environmental awareness and the strategies can be adopted to improve environmental awareness and to get over the problems related to environmental problems. Data was collected from four high schools in the district that were selected through purposive sampling. High school learners' population comprises of two phases which are part of the senior phase and the FET phase. One grade per phase was selected, grade 8 for the senior phase and grade 11 for the FET phase. The nonprobability sample methods, quota sampling and purposive sampling in particular, were applied to select learners to be interviewed. Observations were also made to collect further information on environmental awareness in schools. The researcher had to seek permission from the department of education before she collected the data. The collected data was analyzed using thematic analysis. The results had proven that most schools involve their learners in waste management. Moreover, most of the learners have knowledge on the recycling process and they

can list examples of recyclable materials. However, only one school had policies in place on waste management. Most learners were involved in the energy conservation and environmental projects such as the gardening and tree planting. Environmental campaigns were also happening in schools as well as the environmental clubs though there is more to improve on the environmental clubs. The department of education was recommended to be visible in schools when they will be commemorating the environmental campaigns. Another recommendation was of increasing awareness through use of the social media. Generally, learners in grade 11 displayed greater levels of awareness and knowledge on most practices. However, most of the grade 8 leaners were having some ideas only on practices but lesser levels of awareness and knowledge. This implies that the more the learners are in high school the more the gain environmental knowledge and awareness. The significance of this study is that it helps the learners to acquire the sustainable ways of safeguarding the environment and discourage the further deterioration.

Key words: Environmental awareness, Environmental practices, Experiential learning, High schools, Sustainability

Contents

List of Abbreviations and acronyms

AED: United Arab Emirates Dirham

CAPS: South African Curriculum and Assessment

CIDEA: Interinstitutional Technical Committees of Environmental Education

CEDU: College of Education

DBE: Department of Basic Education

DEA: Department of Environmental Affairs

EE: environmental education

HVAC: heating, ventilating and air conditioning system.

NCF: Nigerian Conservation Foundation

NEEP: National Environmental Education Programme

NGO: Non-governmental organisation

NERDC: Nigeria Educational Research Development Council

PRAE: Programs School Environmental Projects

PROCEDA: Citizen Projects for Environmental Education

RNPE: Revised National Policy on Education

SGB: School Governing Board

UAE: United Arab Emirates

UNESCO: United Nations Education scientific and Cultural Organisation

WESSA: Wildlife and Environmental Society South Africa.

TABLE OF FIGURES

TABLE OF TABLES

CHANGES TO NOTE

Personal

At the beginning of the study, I registered using my maiden name. I was known as Shorai Prisca Machiridza. After I got married my surname changed to Parayiwa. I am now known as Shorai Prisca Parayiwa.

CHAPTER ONE

ORIENTATION OF THE STUDY

1.1 INTRODUCTION

This dissertation examines the level of environmental awareness and practices among high school learners in four schools in Johannesburg Central District. By assessing learners. knowledge, attitudes and behaviours towards the environment, the study aims to enhance environmental awareness and promote sustainable practices. Empowering high school learners as environmental stewards is crucial for fostering a culture of sustainability (Barraza& Chen, 2006; Morelli, 2011). Environmental awareness refers to the understanding of the importance of protecting the natural environment and knowledge, attitudes, and skills necessary to do so (Uralovich et al., 2023). According to Mahirah et al. (2020), in the past two decades, managing and raising the general level of environmental awareness on all levels of society have increased than ever before. This is crucial for maintaining the natural balance in the environment and preservation of the human society (Uralovich et al., 2023).

Of late the world has been dynamic in terms of economic activities carried out by people. Previously, people used to survive by hunting and gathering as well as planting of crops and rearing of animals (Matias et al., 2018). Nowadays, human activities are more based on industry, which requires a lot of energy (Mazungunye, 2022). Some are still practicing farming but now in a mechanical way such as irrigation, use of machinery which also require a lot of energy and change the state of the environment (Admasu & Kaynata, 2017). Drastic changes in the environment, including global warming, deforestation, natural calamities (floods, earthquakes, Tsunamis, wildfires, volcanoes), different types of pollutions (air pollution, land pollution, water pollution, sound pollution) can cause damage to the global environment (Prem, 2019). Wildlife natural habitat pollution and water pollution remains a major challenge that needs to be dealt with as a matter of urgency (Jansen et al., 2013).

It is now widely acknowledged that the impact of human activities on environment is significant and will have serious consequences for future generations (Puri et al., 2020). There should be ways to safeguard the environment and protect it from an on-going degradation. According to Uralovich et al. (2023), the environment can be protected only by creating awareness among the people so that it becomes part of their lifestyle. Environmental awareness can be developed through educational and experiences that teach individuals how to interact with their surrounding and improve their inner world (Uralovich et al., 2023). The school environment gives more emphasis on environmental awareness in a consistent way (Maleficio, 2018). Environmental education (EE) has been at the forefront of global and national efforts since the 1960s in creating awareness on what the environment is and how to humans should relate to it to safeguard it (Eten, 2015). Islamoglu et al. (2017) mentioned that the place and building in which education takes place constitutes good habitual materials. Nikolaeva (2008) also mentioned that (EE) received within the school discipline ensures results that are more positive. Environmental educators and researchers are currently focusing on researching and promoting environmental conservation behaviour with an emphasis on children and youth (Jorgenson et al., 2019). The priority goes mainly for creating awareness among the learners through mass media, campaign, competitions and voluntary work.

The South African Curriculum and Assessment Policy Statement (CAPS) advocates for the integration of EE in all grades and subjects to create awareness (Hebe, 2019). Uralovich et al. (2023) mentioned that environmental awareness does not only mean understanding about the environment but also attitude, principles and abilities which are essential for solving environmental problems. According to Hebe (2019), in South Africa, the advent of democracy heralded the onset of gradual but notable public school curriculum reforms. From the introduction of Curriculum 2005 in 1997 to the current Curriculum and Assessment Policy Statement (CAPS), which came into being in 2011, the national Department of Basic Education (DBE) has expressed its wish to have EE accommodated in South African classrooms across the spectrum, commencing in Grade R (known as the Preschool Class or Kindergarten elsewhere) to Grade 12.

To achieve the main goal of environmental sustainability, schools must be flexible with no boundaries and have unlimited structures in terms of EE. Schools must facilitate learners to

have full exposure to the natural environment and have their own experiences with the natural world. As Barraza & Chen (2006) argues, research must be conducted to find out what people think, know and feel about their natural environment, as this will help to design and implement educational programs that encourages participation and environmental responsibility. Uralovich et al. (2023) also mentioned that environmental awareness shows interest towards the environment or the environmental problems. There is a need for high school learners to come up with their own ideas and practices that will save the environment for the near future.

Environmentalists need to urge learners to practice sustainable ways of managing the environment. According to Morelli (2011), an ecological definition of sustainability that connects human needs and ecosystem services is meeting human needs without compromising the health ecosystems. The importance of environmental awareness, encompassing knowledge, attitudes, and skills for conservation efforts, has become increasingly recognized in contemporary society (Uralovich et al., 2023; Mahirah et al., 2020). With the transition from traditional practices to industrialization and mechanized agriculture, human activities have brought economic prosperity but also environmental challenges like global warming and pollution (Matias et al., 2018; Admasu & Kaynata, 2017). Pollution and habitat destruction pose threats to global environmental integrity and human health, necessitating urgent action (Prem, 2019; Jansen et al., 2013).

To address these challenges, proactive measures are essential, including fostering environmental awareness to mitigate degradation and preserve natural resources (Puri et al., 2020). Schools are pivotal in nurturing environmental consciousness and promoting responsible environmental stewardship (Maleficio, 2018). Environmental education (EE) is central to global initiatives, and in South Africa, it is integrated into the national curriculum to create environmentally literate citizens (Eten, 2015; Hebe, 2019).

1.2 RATIONALE OF THE STUDY

Over the last few decades, the exploitation of our planet and degradation of the complex of physical, chemical and biotic factors such as climate, soil and living things have gone up at an alarming rate (Marin-Gonzalez et al., 2022). Many industrial and human activities have devastated the natural environment, causing severe ill health effects on human beings

(Anbalagan & Shanthi, 2015). The rapid depletion of the earth's natural resources and the fast-degrading environment are the realities which can no longer be denied. These are the grave scenarios that threaten the existence of both humankind and the earth (Marpa, 2020). If these actions continue to happen without any corrective measures being taken, the environmental resources will be depleted in a short space of time. There is a need for environmental education (EE) since there is an increase in environmental problems in the nation.

Environmental education (EE) as a new demand for educational systems has been launched in many countries towards the end of the sixties in the twentieth century as a response to growing fears about the degradation of the environment (Kyburz-graber, 2012). Jansen et al. (2013) reveals that in the year 2005 to date, South Africa has become one of the fastest progressing countries in the world, in addressing its environmental issues and improving its environmental quality. According to Trollip & Boulle (2017), South Africa has adopted various international and national strategies to solve and mitigate many environmental issues. These included environmental courts, environment friendly products, un-leading of petrol, and ban on harmful pesticides, national waste management council, public liability insurance, and pollution by motor vehicles, regulation of seashore hotels, national river action plan, solar energy commission, and prohibition of smoking in public places (Trollip & Boulle, 2017). Despite these efforts, many environmental problems remain unresolved. South Africa has still a long way to go to reach environmental quality in developed countries (Jansen et al., 2013).

Fullan (2016) in his study stated that there are more than 2500 industrial sites in Johannesburg central which have been classified under the highly polluting or 'red' category. There are cement units, distilleries, sugar, sago, paper, dairying, electroplating, chemical and fertilizers (Agro chemicals), mining industries, ores/mineral processing industries and a variety of other industries which are water consuming and generate large quantities of effluents (Fullan, 2016). As environmental issues are becoming more and more complex and the need to act becomes more urgent, high school learners need to be equipped with appropriate skills that can help them to make better decisions and choices (Trollip & Boulle, 2017). The Deputy Minister of the Department Environmental Affairs Forestry and Fisheries (DEAFF), MS Barbara Thomson, spoke on the launch of the inaugural South African Green Schools Programs that the school

learners are supposed to become ambassadors for the future generations to care for and protection of the environment (DEAFF, 2017).

The call for EE that presumably subsumed environmental awareness is an effort directed at reducing the effects of anthropocentric activities on the environment (Omoogun et al., 2016). This study aims to determine the level of environmental awareness and related practices among high school learners and to assess the learners' knowledge and come up with solutions for the improvement of the natural environment. The public's perception of environmental conservation through education is one of the most influential changes in society in improving construction and enhancing human capacity in addressing environmental issues and development (Ardoin et al., 2020). It is imperative for educational curricula at all levels to integrate environmental awareness to ensure that all learners are acquainted with environmental knowledge.

The exploitation and degradation of our planet's natural resources have reached alarming levels in recent decades, with severe consequences for both the environment and human health. Industrialization and consumer-driven activities have significantly contributed to the rapid depletion of Earth's resources and the degradation of critical ecological components such as climate, soil, and biodiversity (Marin-Gonzalez et al., 2022); Anbalagan & Shanthi, 2015). These developments pose substantial threats to the sustainability of our planet and the well-being of current and future generations (Marpa, 2020).

Recognizing the imperative to address environmental challenges, many nations have increasingly prioritized environmental education (EE) to foster awareness, understanding, and action towards environmental conservation and sustainability (Kyburz-Graber, 2012). South Africa has made notable progress in implementing environmental policies and strategies aimed at mitigating environmental issues and improving environmental quality (Jansen et al., 2013; Trollip & Boulle, 2017). However, despite these efforts, numerous environmental problems persist, especially in urban areas such as central Johannesburg.

Central Johannesburg is characterized by a high concentration of industrial sites, many of which are highly polluting (Fullan, 2016). Industries such as cement production, distilleries, mining, and chemical processing plants contribute to air and water pollution, posing significant

environmental and health risks to nearby communities. In this context, equipping high school learners with environmental awareness and related practices becomes imperative. As future leaders and decision-makers, these learners play a crucial role in shaping the sustainable development trajectory of their communities and the nation (Trollip & Boulle, 2017).

The launch of initiatives such as the South African Green Schools Program underscores the importance of engaging high school learners as environmental ambassadors and advocates (DEAFF, 2017). However, to fulfil this role effectively, learners must possess adequate knowledge and skills in environmental awareness and related practices. Integrating EE across the curriculum and promoting environmental consciousness in schools can empower learners to make informed decisions and take proactive steps towards environmental stewardship (Omoogun et al., 2016).

Therefore, this study aims to assess the level of environmental awareness and related practices among high school learners in selected schools around the Johannesburg central district. By understanding learners' knowledge, attitudes, and behaviours towards the environment, the study seeks to identify areas for improvement and develop targeted interventions to enhance the effectiveness of environmental education. Ultimately, promoting environmental awareness among high school learners is essential for building a sustainable future and mitigating the adverse impacts of human activities on the environment (Ardoin et al., 2020).

1.3 THE PROBLEM STATEMENT

Environmental challenges have been increasing in everyday life. Many of these challenges in high schools are rooted in human actions (Casalo & Escario, 2018). According to a study conducted by Dalu et al. (2020), there is a lack of integration of management practices for plastic littering and an understanding of its dangers in most South African high schools. Mashaba et al. (2022) revealed that about half a million learners matriculate from South African high schools each year, with limited environmental knowledge and an underdeveloped capacity to live sustainable lives. Furthermore, Mashaba et al. (2022) state that environmental education (EE) seems not to be incorporated into South African high schools until postgraduate institutions of higher learning. In support of their findings, Damoah & Omodan (2022) stated

that among other things, that there is no practical and structured policy design for EE in schools. Teachers and principals do not understand the policy objective of EE as stated in the Curriculum Assessment Policy Statement (CAPS) document due to obscurity (Damoah & Omodan, 2022). As a result, most youth will complete their education without receiving the capabilities required to live well in the future, given the multifaceted global socio-ecological crisis.

Amrullah and Nurcahyo (2021) support the findings from the previous paragraph, emphasizing that learners are contributing to environmental degradation due to insufficient environmental knowledge. Their study, along with others, highlights that learners are unaware of the consequences of their actions on the ecosystem and lack the necessary knowledge to implement environmental safety measures, even after completing high school. Mashaba et al. (2022) adds that privileged youth often lead less sustainable lives and exhibit lower levels of eco-literacy. Environmental education (EE) is essential for fostering lifelong learning and enhancing environmental stewardship (Mashaba et al., 2022). Without increased awareness among high school learners, environmental degradation will likely continue, leading to further environmental stress. Additionally, Damoah & Omodan (2022) argues that instilling responsibility in learners through active participation in environmental conservation is important. This further reinforces the importance of robust educational programs that equip learners with the knowledge and skills needed to protect the environment.

The general perception is that environmental degradation is partly due to a lack of environmental awareness (Otinga & Ngigi, 2018). It is believed that environmental problems will be reduced through the promotion of awareness (Islamoglu et al., 2017). The emergence of this idea in the 1960s and 1970s led to increased interest in environmental studies in academic and scientific communities (Eten, 2015). Scientists in fields such as psychology, environment, agriculture, sociology, anthropology, and political science all attempted to bring scientific knowledge to behaviour research (Borden, 1977). The extent of current debate on the interface between environmental survival and the role of education is disappointing (Tilbury, 2004). It is necessary to conduct a detailed examination of processes occurring in ecosystems, promote respect for all living things, raise concern for the state of the environment, and foster a desire to solve social and environmental problems (Korotkova & Zarikova, 2021). Environmental challenges are increasingly affecting everyday lives, with many of these challenges rooted in

human actions. Despite the noticeable impact of environmental degradation, there is a lack of consolidated environmental management practices and awareness of environmental dangers in South African high schools.

Moreover, it has been observed that high school learners lack awareness of the environmental impacts of their actions and possess limited knowledge of environmental management practices (Amrullah & Nurcahyo, 2021). Despite the potential benefits of increased environmental awareness and education programs, there is a general lack of eco-literacy among learners and an integration of EE has proven to be highly effective in increasing learners' knowledge, skills and attitudes on the environment (Damoah & Omodan, 2022). The predominant perception is that environmental degradation is partly attributable to a lack of environmental awareness (Otinga & Ngigi, 2018). Promoting environmental awareness has been put forward to mitigate environmental problems (Islamoglu et al., 2017). However, despite the growing interest in environmental studies since the 1960s and 1970s, there is still a disconnect between the role of education and the state of environment (Eten, 2015). This gap in understanding highlights the need for a comprehensive examination of ecosystem processes, fostering respect for all living things, and addressing social and environmental challenges through education (Korotkova & Zarikova, 2021).

Considering these issues, this dissertation seeks to investigate the level of environmental awareness and related practices among high school learners in selected schools around the Johannesburg Central District. By identifying gaps in environmental education and understanding learners' perceptions and behaviours regarding environmental issues, the study aims to provide insights for the development of effective environmental education programs tailored to the needs of South African high schools.

1.4 THE RESEARCH QUESTIONS

The study aimed to answer the following research question to better understand the level of environmental awareness and related practices among high school learners in selected schools around Johannesburg central district.

1.4.1 Main question

What are the levels of environmental awareness and the existence of environmental practices among high school learners in selected schools in Johannesburg central district?

1.4.2 Sub questions

1.4.2.1 What the environmental activities that are carried out in schools which portrays environmental awareness?

1.4.2.2 What strategies may be implemented to improve environmental awareness and to minimize environmental problems?

1.5 AIMS AND OBJECTIVES OF STUDY

1.5.1 Aim

To explore the level of environmental awareness and the existence of environmental practices among high school learners in selected schools in Johannesburg central district.

1.5.2 Objectives

The objectives of the study were:

1.5.2.1 To explore the environmental activities carried out by high school learners in selected schools in Johannesburg.

1.5.2.2 To establish the strategies that can be applied to improve awareness of learners to related to environmental problems.

1.6 CONTEXT OF THE STUDY

The study was carried out in Johannesburg central district schools in Gauteng province. Four schools were selected. The city of Johannesburg, colloquially known as the city of Gold is the largest city in South Africa and is classified as the Megacity (Boesten & Scanlon, 2021). The city is in the mineral-rich, Witwatersrand range of hills and is the central of large-scale gold and diamond trade (Khenisa, 2016). Johannesburg represents one of the most diverse cities in the

African continent areas (Abrahams & Everrat, 2019). The racial makeup of Johannesburg in the year 2019 was as follows.

Table 1.1 Johannesburg racial makeups (Boesten & Scanlon, 2021)

Black African	76,4%
White	13.7%
Coloured	5.3%
Indian/Asian	4.9
Other	0.8%

Johannesburg central district, the study site is situated on Corner Modjadji and Old Potch Road, Soweto College Pimville, Soweto, in Gauteng Province, South Africa. Soweto was a separate city from the late 1970s until 1994 and is now part of Johannesburg (Khenisa, 2016). Originally an acronym for "South-Western Townships", Soweto originated as a collection of settlements on the outskirts of Johannesburg, populated mostly by native African workers from the gold mining industry (Boesten & Scanlon, 2021). Khenisa (2016) explained that Soweto had been separated as a residential area for blacks only (no whites allowed), who were not permitted to live in other White designated suburbs of Johannesburg, although eventually incorporated into Johannesburg. Lenasia is predominantly populated by English-speaking South Africans of Indian descent (Khenisa, 2016). These areas were designated as non-white areas in accordance with the segregationist policies of the South African government known as apartheid. According to Abrahams & Everrat (2019), the middle class (of all races) have been increasingly found in cluster and complexes in the north Johannesburg, while poor and working- class African and coloured communities are densifying in the south. This means the Soweto area is fully packed with people, and this may result in the environmental problems. Beck (2011) mentioned that the highly urbanized and populated South African province of Gauteng currently faces problems of groundwater over-abstraction and pollution.

1.7 RESEARCH METHODOLODY

Research methodology is a collective term for the structured process of conducting research (Creswell & Creswell, 2018). Patel & Patel (2019) described a research methodology as a way to systematically solve the research problem. Methodologies explicate and define the kinds of problems that are worth investigating (Creswell & Creswell, 2018). A research methodology seeks to inform why the research study has been undertaken, how the problem has been defined, in what way, why the hypothesis has been formulated, what data has been collected, what particular method has been adopted and the method to analyse the data (Patel & Patel, 2019).

1.7.1 Research paradigm

A research paradigm is a method, model, or pattern for conducting research (Kivunja & Kuyini, 2017). It is a set of ideas, beliefs, or understandings within which theories and practices can function (Katri, 2020). There are four major paradigms: positivism, interpretivism, constructivism (sometimes referred to as social constructivism) and critical theory (Rehman & Alharthi, 2016). In this study, the researcher followed the interpretivism research paradigm to understand the different realities among high school learners and to explain how these realities influence their behaviours. The interpretivist paradigm enabled the researcher to gain deeper insights by exploring learners' experiences and perceptions of the environment (Alharahsheh & Pius, 2020).

1.7.2 Research approach

Research approaches are plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation (Creswell & Creswell, 2018). This study applied a qualitative research approach. According to Moser and Korstijens (2017), qualitative research asks open-ended questions whose answers are not easily quantified. The researcher applied the qualitative research approach because it can be used to explain the processes and patterns of human behaviour towards the environment, which can be difficult to quantify (Cleland, 2017). This research approach is also effective for exploring and providing deeper insights into real-world problems such as pollution, deforestation, climate change, and global warming (Moser & Korstijens, 2017).

1.7.3 Research Design

Asenahabi (2019) describes research design as a framework for collecting and analysing data which is employed in a research project or study. Research design is a plan or guide for data collection and interpretation, with sets of rules that enable the researcher to conceptualize and observe the problem under study (Hennink et al., 2020). This study employed a case study research design. Priya (2021) defines a case study research design as a researcher explore in-depth a program, event or activity in practical investigation of a current event in its actual context. Asenahabi (2019) adds that the case study methodology maintains deep connections to core values and intentions. This approach can be used to narrow down a very broad field of research into one or a few easily researchable examples (Hennink et al., 2020). In this study, the researcher focused on four schools out of all the schools in the Johannesburg Central District. This approach saved time and allowed for a concentrated focus on a few schools, providing extremely convincing data that could reflect trends in other schools (Siggelkow, 2007). This is important as the researcher can examine contemporary real-life situations in schools.

1.7.4 Population and Sampling

A sample is a subset of the population, selected to be a representative of the larger population (Banks & Piggott, 2022). The high school learners' population comprises of two phases which are part of the senior phase and the FET phase. The researcher could not study the entire population since it was too big to interview all learners. The researcher employed quota and purposive sampling. One grade per phase was sampled purposively for the interviews. Grade 8 for the senior phase and grade 11 for the FET phase. Grade 8 was purposively selected as they are in the initial stages of high school learning. This could give the researcher an insight of the environmental awareness knowledge content grade eight learners was having in terms of EE. Grade 11 learners were also purposively selected since they are in almost the final stages of the high school. The researcher could not sample the highest grade; matriculates as mostly were busy with their intervention programmes.

1.7.5 Data Collection

Data for this study was collected from four selected schools in the district through purposive sampling for this study. Data was collected through semi-structured interviews, open-ended questionnaires, and direct observations. The researcher sought permission from the Department of Education before collecting the data.

1.7.6 Data Analysis

The process of data analysis involves preparing the data for analysis, conducting different analyses, moving deeper into understanding the data, representing the data and making an interpretation of the larger meaning of data (Creswell & Creswell, 2018). In this research, data was analysed using the thematic analysis searching across a data set to identify, analyse, and report repeated patterns (Braun &Clarke, 2006).

1.8 VALIDITY IN QUALITATIVE RESEARCH

According to Leung (2015), validity in qualitative research means appropriateness of the tools, process and data. The author further explained that validity include whether the research question is valid for the desired outcome, the choice of methodology is appropriate for answering the research question, the design is valid for the methodology, the sampling and data analysis is appropriate and finally the results and conclusions are valid for the sample and the context. In this research, triangulation of data was applied through utilizing three methods of data collection. These included the open-ended questionnaires, the interviews and the observations.

1.9 LIMITATIONS AND DELIMITATIONS

The limitation of the study was that schools were observed in a short period of time which was approximately one month out of twelve months in a year. Given the short observation period of approximately one month out of the twelve months in a year, the study's results may not offer a comprehensive representation of all annual activities. Factors such as weather conditions,

which influence environmental activities like gardening, further limit the study's ability to provide a true reflection of the entire research period.

Due to the large number of potential participants in the study population, the delimitations of the study were that it included ten learners who were involved in semi -structured interviews per school. Only Grade 8 & 11 learners were included in the study. The two grades represented the two phases in the high schools which are the senior phase and the FET phase.

1.10 DEFINITION OF KEY CONCEPTS

1.10.1 Sustainability

According to Ben-Eli (2015), sustainability is a dynamic equilibrium process of interaction between the population and the carrying capacity of its environment. Acquiring the sustainable knowledge creates awareness to the learners on how they can interact with the environment at the same time caring for the future generations. The term sustainability in this study refers to a dynamic equilibrium process of interaction between the learners and their school environment such that they will enjoy the environmental benefits that the learners who will enrol in the future generations will also benefit from.

1.10.2 Pollution

According to Mitra (1998), pollution is defined as an unfavourable alteration in the physical, chemical, or biological characteristics of air, water, and land that adversely affects human life, industrial progress, living conditions, and cultural assets. Van der Plog and De Zeeuw (1992) further elucidated pollution as a by-product of production that causes environmental damage. The researcher concluded that pollution is the introduction of contaminations into the natural environment that causes adverse change. This includes the empty can bottles, the paper plates, the empty fruit juice boxes disposed into the school environments on daily basis. Pollutants, the components of pollution, can be foreign substances /energies or naturally occurring contaminants (Israel et al., 2020). When learners can identify the pollutants and the ways to reduce them it will help to combat pollution in the area and hence a safer environmental area.

1.10.3 Environmental Education

Banda et al. (2021) describe environmental education (EE) as a process that enables individuals to explore environmental issues, engage in problem-solving, and take action to improve the environment. The International Union for Conservation of Nature (IUCN) (1971) defines EE as a process of recognizing values and clarifying concepts to develop the skills and attitudes necessary to understand and appreciate the interrelatedness among people, their culture, and their biophysical surroundings. Environmental education encompasses not only events but also a strong underlying approach to societal building, such as raising awareness about the environment (Banda et al., 2022). Environmental education is crucial in this study as it helps learners make decisions and formulate their code of behaviour concerning environmental issues (Taylor et al., 2009). It also promotes and advocates for the efficient usage of natural resources and the prevention of natural resource degradation.

1.10.4 Environmental Awareness

Liu et al. (2014) describes environmental awareness as the ability of an individual to understand the connection existing between human activities and environmental quality. Umuhire and Fang (2016) defined the environmental awareness as the willingness to take part in environmental activities. The term environmental awareness is crucial in this study as it will enable the learners to interact with the environment in a way that will maintain the environmental quality. The researcher has defined environmental awareness as the ability of learners understanding the connection existing between their activities and the status of their environment and their willingness to interact with the environment to maintain its best quality.

1.10.5 Environmental Degradation

The term environmental degradation was referred to the deterioration of the land, flooding, environmental pollution, erosion, earthquakes, water resources through the consumption of assets, for example, air, water and soil, the destruction of environments and the eradication of wildlife (Alaba & Tayo, 2014). Learners need to know the state of their environment so that they will apply for the proper practices to combat the environmental deterioration.

1.10.6 Recycling

According to Michael et al. (2024), recycling is the recovery and reprocessing of waste materials for use in new products. Koppelaar et al. (2023) explained that recycling involves sorting of products at collection points based on critical raw materials contents and flagging of products for critical component extraction. According to Avery et al., (1944), recycling is a major contributor to sustainability and resource efficiency in the built environment by minimising waste without loss of properties. Recycling is important in this study as it has a potential to minimise the stockpiles of waste products efficiently while offering significant environmental benefits (Indraratna et al., 2022).

1.10.7 Energy Conservation

Is the effort to reduce wasteful energy consumption by using fewer energy services (Jaelani et al., 2020). According to Zaman et al (2023), energy can be conserved by reducing waste and losses, improving efficiency through technological upgrades, improving operations and maintenance as well as changing users' behaviours. Energy conservation through users' behaviours requires an understanding of household occupants' lifestyle, social and behavioural factors which includes purchasing new energy – efficient appliances or upgrading the building insulation without curtailing economic utility or the level of energy services (Pranav et al., 2022). Energy conservation is important in this study as energy is the source of sustainability and through energy efficiency and conservation learners will be able to find ways to maintain sustainability towards energy needs (Jaelani et al., 2020).

1.10.8 Environmental Knowledge

Vallero (2017) describes environmental knowledge as the amount of information individuals has concerning environmental issues and their ability to understand and evaluate its impact on society and the environment. Environmental knowledge is crucial in this study as it has a significant positive effect on environmental attitudes as well as on pro- environmental behaviours (Liu et al., 2014). It is particularly important to organise learners, develop sense of ownership, increase their environmental knowledge and strengthen their capacity to sustain structures for resource management (Primavera et al., 2020).

1.10.9 Environmental Campaigns

Refers to the organization and education of the general community about the importance of understanding our environment's vulnerability and protecting it (Muller, 2021). Environmental campaigns involve designing colourful posters, pamphlets, as well as cartoons that can be posted in school magazines, newsletters, and on notice boards. They play a significant role in creating awareness about environmental issues and their adverse effects on people (Sallem, 2018). Environmental campaigns are vital in this study as they raise awareness among ordinary people and encourage more ecologically responsible actions.

1.10.10 Environmental Practices

According to Kim (2011), environmental practices serve as the precursor to environmental performance. This term holds significance in this study as it aims to minimize harm to the environment and promote environmental sustainability efforts (Maas et al., 2018). This approach will encourage and enhance positive environmental actions aimed at protecting the environment.

1.11 OUTLINE OF THE CHAPTERS

In this study, the researcher worked on five chapters which were:

CHAPTER 1

The first chapter embraces an overview of the whole study. It enlightens us with the introduction, rationale of study, the problem statement, the aim and objectives of the study, the study questions, and the context of study, research methodology and summary of trustworthiness, summary of ethical consideration, limitations and delimitation of study, outline of the chapters, definition of key terms and the chapter summary. Generally, it gives the orientation of the study.

CHAPTER 2

In this chapter, literature review consists of the following subtopics: environmental education and its role in creating environmental awareness, experiential learning and its role in creating

environmental awareness, environmental knowledge, attitudes, skills and participation. Outcomes and benefits of environmental education in schools and the environmental practices carried out in schools were also explained in this chapter.

CHAPTER 3

This chapter highlights the research methodology, and procedures followed in data collection.

CHAPTER 4

Data presentation, analysis and interpretation are explained in this chapter.

CHAPTER 5

In the last chapter, all the findings are summarized, and the possible resolutions are expressed giving the remarks in conclusion.

1.12 CHAPTER SUMMARY

This chapter covered the introduction which is the insight of the research. It included the specific purpose of the research, statement of the problem, research objectives, research questions, and limitations, summary of trustworthiness, ethical considerations and the definition of key terms. The summary of data collection methods to be used in the study was discussed, among others. Furthermore, the forthcoming chapters were outlined.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

In the initial chapter, the researcher presented the study outlining the problem statement, research aim and research questions. A summary of the research methodology was presented, together with an explanation of the study's limitations and delimitations, as well as the definition of key terms. A chapter outline was provided to demonstrate what each chapter entails and the chapter summary. The researcher conducted a comprehensive review of literature on environmental education (EE), sustainability and environmental awareness, focusing on a global perspective, several African countries, and particularly South Africa. This literature review includes the environmental practices implemented in schools throughout various grade levels within the high school. The researcher systematically collected the data for the study by employing a thorough approach to discover, assess and integrate relevant research studies on the research topics. An overview of the chapter was provided.

2.2 THEORETICAL FRAMEWORK

A theoretical framework is a blueprint guiding the structure of the entire dissertation inquiry, providing a foundation for constructing and substantiating the study (Grant & Osanloo, 2014). Varpio et al. (2020) describes theoretical framework as a logically developed and connected set of concepts and premises that serve as the foundation for specific investigation. A framework is a systematic structure that outlines how the researcher defines their topic in terms of philosophy, epistemology, methodology and analysis (Grant & Osanloo, 2014). This study was guided by the application of experiential framework theory. The theory was developed by David A. Kolb in 1984, drawing inspiration from other great theorists including John Dewey, Kurt Lewin and Jean Piaget (Kolb & Kolb, 2009).

According to Dewey (1897), all learning is relearning and is facilitated by a process that draws out the learners' beliefs and ideas about a topic that they can be examined, tested and combined with new, more refined ideas. Dewey (1897) came to the realization that most experience is culturally meditated by many previous trips around the learning cycle and he called this empirical experience (Roberts, 2003). Although punctuated by knowledge milestones, learning does not end at an outcome, nor is it always evidenced in performance (Passarelli & Kolb, 2020). Rather, learning occurs through the course of connected experiences in which knowledge is modified and re-formed (Dewey, 1897). Dewey's principle of continuity states that all experiences are carried forward and influence future experiences and decisions (Dewey, 1897).

Lewin (1948) believed that social problems should be solved by a social inquiry. Lewin (1948) states that learning occurs best when tension exists between experience and theory and when groups are encouraged to dissect this tension through their subjective experiences. According to Greenwood & Levin (2006), research should not be separated from action and research personnel from active players. Teachers were given as an example to be included in all phases of research. Kolb's learning cycle is based on John Dewey's claim that learning must be grounded in experience (Miettinen, 2000). Kolb's experiential learning theory is the learning theory that describes how knowledge is created through experience (Kolb & Kolb, 2009). It consists of two parts of a four-stage cycle of learning and four separate learning styles (Kurt, 2022). Below is a pictorial representation of how experiential learning occurring (Kurt, 2022).

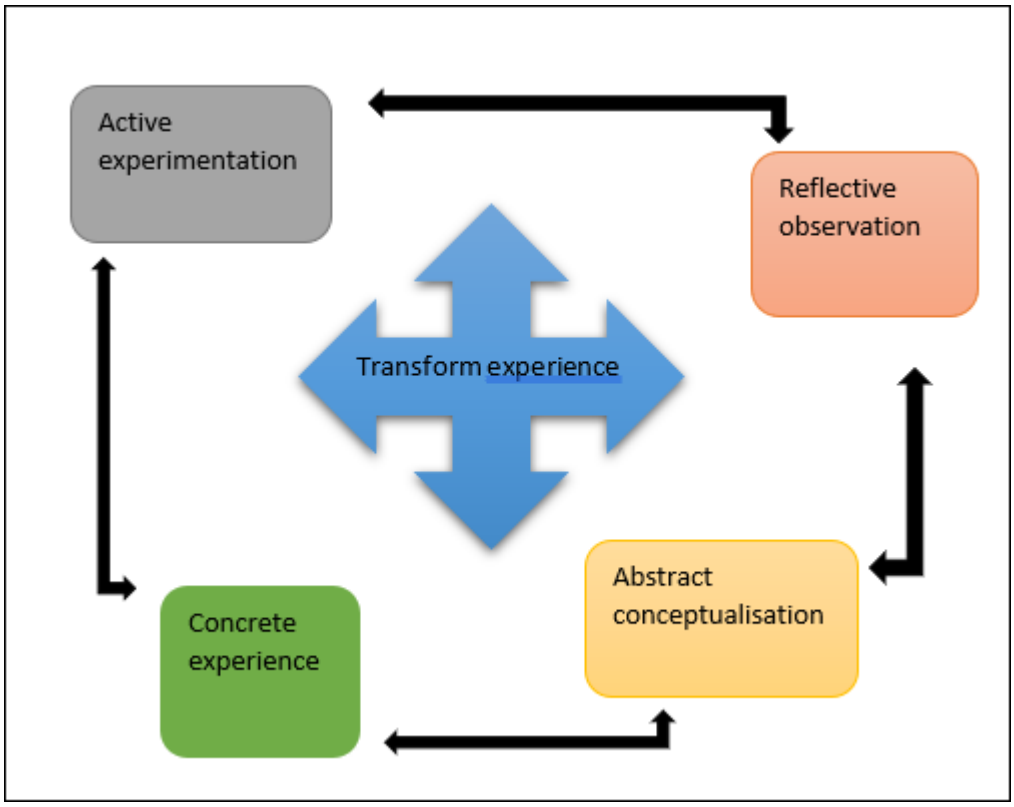


Figure 1: Representation of how experiential learning occurs (Kurt, 2022)

In experiential learning theory, learning is best conceived as a process, not in terms of outcomes (Kolb & Kolb, 2009). Experiential learning starts from learners' experience of their communities and local environments that aims to apply learners' experience in finding solutions for real-life problems that are affecting the local communities (Yanniris, 2021). Experiential learning can be understood as "a process through which a learner constructs knowledge, skills and values from direct experiences" (Jacobs, 1999, 51). Experiential learning activity combines the principles and methods of natural education, field trip, and experiential courses and is promoted to schools (Gilbertson et al., 2022). Experiential learning provides purposive active learning opportunities through real situations to strengthen individual growth and interactive operation (Kwon et al., 2019). According to Meyer (2020), experiential learning-based EE has a potential to provide for learners to be able to design pro-environment actions or participate in providing solutions to environmental problems. The water monitoring youth portal highlights the essential elements of the experiential approach, assessing learners' effectiveness, intellectual

engagement, physical involvement and reflection following direct contact with the studied reality. Experiential learning enhances motivation in learners, particularly those who struggle with traditional classroom teaching (Schwartz, 2012).

According to Kolb and Kolb (2009), learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world and the conflict, differences and disagreement are what drivers of the learning process. These tensions are resolved in iterations of movement back and forth between opposing modes of reflection and action and feeling and thinking. Furthermore, under experiential learning theory, learning is considered a holistic process of adaptation. Learning is not just the result of cognition but involves the integrated functioning of the total person— thinking, feeling, perceiving and behaving (Munna & Kalam, 2021). The authors further explained that learning encompasses other specialized models of adaptation from the scientific method to problem solving, decision making and creativity (Munna & Kalam, 2021). Also, proponents of experiential learning theory suggest that learning results from synergetic transactions between the person and the environment.

A substantial body of empirical evidence suggests that the most effective way to support pro-environmental behaviour is outdoor, experiential learning and during childhood is the strongest predictor of adult environmental concern (Gifford & Nilsson, 2014). Indeed, besides active and experiential learning in real-world environments is shown to directly support learners' pro-environmental behaviour in meso-scale experimental designs (Bogner, 1998). Hence, the relevant literature supports that experience-based learning has been shown to be more effective in changing learners' behaviours than knowledge-based learning. Generally, it has already been established that outdoor experiences during childhood have multiple benefits for individuals' mental and physical health (Mutz & Muller, 2016). Conversely, children surrounded by low amounts of green space have up to a 55% higher risk of developing a mental disorder in their later lives – even after adjusting for other known risk factors such as socio-economic status, urbanization and the family history of mental disorders (Engemann et al., 2019).

Following Levin's famous formula that behaviour is a function of the person and the environment, experiential learning theory holds that learning is influenced by characteristics of the learner and the learning space. Learning is the process of creating knowledge. According to

Kolb and Kolb (2009), in experiential learning theory, knowledge is viewed as the transaction between two forms of knowledge: social knowledge, which is co-constructed in a socio-historical context and personal knowledge, the subjective experience of the learner. This conceptualization of knowledge stands in contrast to that of the "transmission" model of education in which pre-existing, fixed ideas are transmitted to the learner. Experiential learning theory defines learning as the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience (Kolb & Kolb, 2009). Knowledge results from the combination of grasping and transforming experience (Kolb & Kolb, 2009). Transferring knowledge to learners will empower them to comprehend environmental concepts more deeply, which they can then apply to address environmental issues within their school environment.

2.3 LITERATURE REVIEW

A literature review is a structured overview of sources, using an organizational structure that integrates summary and synthesis (Ramdhani & Ramdhani, 2014). Likewise, Transfield et al. (2003) defines a literature review as a systematic technique to collecting and synthesizing previous research. This section presents a comprehensive review of previously published literature on environmental education (EE), sustainability, and environmental awareness in high schools worldwide, including those in Africa, with a particular focus on South Africa. Sources of academic literature on environmental education (EE) and sustainability were obtained from countries such as Colombia, Philippines, Nigeria, Botswana and South Africa. The countries were chosen randomly from inside the country where the study was conducted, including both nearby and distant countries, to systematically analyse and contrast the literature.

2.3.1 Environmental Education, Awareness and Sustainability

Over the last few decades, the exploitation of our planet and degradation of our environment have gone up at an alarming rate (Singh & Singh, 2017). It is believed that environmental problems will be reduced through the promotion of environmental awareness (Islamoglu et al.,

2017). The emergence of this idea in the 1960-1970 led to an increase in interest in environmental studies in academic and scientific communities (Eten, 2015). Environmental education is one of the key areas researched on how it can assist in maintaining and safeguarding the environment from further degradation. The school environment can be used to raise awareness and improve the practices at an earlier stage thereby promoting sustainable environmental management (Roome, 1992).

In 1987, the United Nations Brundtland Commission defined sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs. This is imperative for fostering environmental awareness as it mitigates environmental degradation. Environmental embeddedness is being lost at an accelerated pace with direct implications on the rational, sustainable use and management of existing resources (Whiteman & Cooper, 2000). Environmental education (EE) seeks to develop knowledge needed to limit the further degradation of the environment promoting the improvement in the quality of life of current and future generations (Gevorgyan & Adanalyan, 2009). Developing knowledge in people will equip them with the skills, concepts, and ideas to protect their environment, ensuring sustainable use of resources. The fully functional environment is a beneficiary of everyone on earth (Gupta et al., 2016). Ajibike et al. (2021) emphasized that humans must leave a route of destruction and pollution and allow the environment to restock itself for later generations to meet up with their needs.

The community must explore environmental issues, engage in problem solving, and take action to improve the environment (Sobus et al., 2018). EE is there to impart knowledge on how to interact fully with the surrounding world and to improve his inner world (Chaturvedi et al., 2014). In a study conducted by Dlamini (2017), solid waste management was realised to be a challenge in the Republic of South Africa. The above-mentioned authors further explained that a country has a role to play in reducing the waste production and come up with strategies to minimize waste production such as the alternatives to make solid waste a resource, reuse and recycling (Dlamini, 2017). Environmental education is considered as one crucial aspect in developing environmental knowledge, awareness and attitudes to encourage civic participation for sustainable development (Edsand & Broich, 2020).

According to Tu et al. (2019), human societies rely on natural resources available both locally and in other regions of the planet. As the community quest to satisfy its needs it should not compromise the quality of the environment and the ecosystem should be sustained for the sake of future generations (Kaswan & Rathi, 2019). According to Chau et al. (2022), the sustainability of natural resources has become a global issue that requires the focus of recent literature and policymakers. Chapter 36 of Agenda 21 (Section: 3) declares that EE is critical for promoting sustainable development and improving the capacity of the people to address environmental and development issues (UN, 1992). According to Negi et al. (2008), environmental awareness constitutes a fundamental component of EE, instilling in learners the appropriate sentiments and emotions for environmental protection. When environmental awareness is raised to learners and sustainability is promoted, we can expect a marked improvement in our lifestyles.

Environmental education has been promoted across the whole world, its major developments started internationally. In the following sections, I will be discussing its development globally, internationally, nationally and locally.

2.3.2 Environmental Education in the Global World

Today, a growing global population demands the allocation of more natural resources to meet a seemingly insatiable desire for consumption (Meyer, 2020). The demand strains the availability of natural resources and increases competition over their use (Yanniris, 2021). Paglia (2021) states that the United Nations (UN) in 1968 declared growing scientific and public concerns over the impacts of accelerating environmental issues on human well-being. This motivated the UN General Assembly (UNGA) to organize the United Nations Conference on the Human Environment in Stockholm in 1972. The conference aimed to guide the international community on the preservation and enhancement of the human environment (Meyer, 2020). The conference resulted to a declaration that consists of 26 principles covering a multitude of issues ranging from environmental education, science and technology nuclear weapons, institution, transfer of financial and technological assistance, the need for social and economic

development in the developing region, and the sovereign right of resource exploitation, among others (Handl, 2012).

According to Yanniris (2021), awareness can help alleviate the disaster by demonstrating (a) the effects of our civic and economic choices on the state of the natural environment and (b) the impact of environmental issues on the health and resilience of human societies. The author further explained that international organizations have successively called for environmental education, sustainable development and education for global citizenship to incorporate these complex socio- environmental issues in mainstream education (Yanniris, 2021). In 1977, the world's first intergovernmental conference on Environmental Education was organised under the auspices of UNESCO and UNEP in Tbilisi (Yanniris, 2021). The goals of EE were explained as to foster clear awareness and to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment (Ollerer, 2015).

"Environmental Education should help raise awareness of the economic, political and ecological interdependence of the modern world in order to accentuate the spirit of responsibility and solidarity among nations" (Hoggart, 1978, 12). The Tbilisi declaration expounds that "Environmental Education must adopt a holistic perspective which examines the ecological, social, cultural and other aspects of problems (Yanniris, 2021). The United Nations Environment and Development Conference in Rio de Janeiro was held in Brazil in 1992 to promote economic development, reduce poverty and to protect the ecological systems (Hens, 1992). At this conference, it was resolved that the concept of sustainable development was an achievable goal for all people worldwide, irrespective of their local, national, regional or international levels (Labadi, 2017).

To foster environmental awareness, in the following decade, efforts to integrate EE and sustainability themes into diverse educational curricula continued with initiatives such as the 2005–2014 UN Decade of Education for Sustainable Development (Labadi, 2017). Furthermore, the UN Sustainable Development Goals constitute a collection of 17 global goals, announced in December 2014 and adopted by the United Nations General Assembly in September 2015 (United Nations, 1992). Labadi (2017) introduced Global Citizenship

Education, a form of civic learning that involves learners' active participation in projects that address global issues of a social, political, economic or environmental nature. In 2016, UNESCO mandated that "(i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment" (Labadi, 2017). Environmental education and awareness have been implemented countries around the whole world including Columbia and Indonesia. The researcher randomly selected countries such as Columbia to discuss the state and developments of environmental awareness in the country as one of the international countries, following with Indonesia.

2.3.2.1 Environmental Awareness in Columbia

In 1990, Columbia prioritized EE in national policy (Caceres et al., 2020). According to Edsand & Broich (2020), Columbia has partnered with neighbours in Latin America and United Nations to expand the scope of its environmental protections in addition to directing environmental education initiatives. The authors further explained that since 1991, the Colombian National Constitution (Article 67) has raised education as an important tool to promote environmental awareness and protection (Edsand & Broich, 2020). The National Constitution of 1991 declared the environment as a common heritage of humanity, emphasizing that its protection guarantees the right to a healthy environment and the concept of sustainable development (Caceres et al., 2020).

Following Article 67, several initiatives have been taken to encourage EE in Colombia (Caceres et al., 2020). There have been national efforts of introducing specific programs on EE with the aim of enabling learners to become more responsible citizens (Clemens & Kremer, 2016). One example is policy documents from the Ministry of Environment and Ministry of Education outlining objectives and financing alternatives, while emphasizing the autonomy of each region for implementation (Edsand & Broich, 2020). In addition, a specific committee: Interinstitutional Technical Committees of Environmental Education (CIDEA), was established along with specific programs School Environmental Projects (PRAE) and Citizen Projects for

Environmental Education (PROCEDA) to assist the integration of environmental education in different regions and municipalities of Colombia (Caceres et al., 2020).

According to Zelenika et al. (2018), Columbia communities were inspired by the United Nations to develop a novel community-based education program that engages people in local sustainability topics. In the Sustainable Communities Field School (Field School) program, advertised as team building tours, participants from local organizations where they were guided by instructors through the University of British Columbia Botanical Garden, while receiving verbal and experiential education on topics of food systems and choices, biodiversity conservation, water conservation and waste reduction (Zelenika et al., 2018). The authors discovered that after the Field School program, participants were significantly more knowledgeable about environmental issues; more connected to nature and showed greater intentions and willingness to engage in sustainability actions compared to garden visitors from the public who did not go through the program (Zelenika et al., 2018).

2.3.2.2 Environmental Education in Indonesia

Environmental education in Indonesia examines educational curricula, pedagogy and "green" activities to reveal what is currently being done in schools to educate learners about the environment (Parker& Prabawa-Sear, 2020). Historically, the concept of EE in Indonesia can be traced back to Suharto's authoritarian regime (Darmawan & Dagamac, 2021). For nearly 30 years in governance, his administration achieved Indonesia's most rapid economic growth in the late 1960s including stronger environmental efforts for the country (Nomura, 2009). Educating learners about green activities and environmental efforts will enhance their environmental awareness, helping them understand how and why they should maintain the natural environmental status. This, in turn, will contribute to reducing environmental issues in their surroundings.

Indonesia is a country of dire environmental problems: of untrammeled exploitation of forests and marine resources, of serious air and water pollution, of population growth and a large and growing middle class set on material prosperity (Parker& Prabawa-Sear, 2019). According to

Tang (2024), there is a lack of concern for the natural environment in Indonesia, especially in waste management in schools. Tang (2024) explained that school learners must be involved in direct practice of sorting and recycling waste. The authors further stated the advantages of the implementation of reduce reuse and recycling programs to improve waste management in schools (Tang, 2024). By implementing well-labelled sorting bins, learners can actively participate in waste management. This becomes more practical when learners engage directly in waste handling tasks, such as segregating decomposable materials for composting and arranging for recycling companies to collect the waste when the bins reach capacity.

Although EE could be integrated into many university courses in Indonesia, the primary, elementary, and high school level in the country do not yet have an independent subject related to EE (Parker & Prabawa-Sear, 2019). Rather, scouting is encouraged as an outdoor EE activity (Nomura, 2009). Environmental topics are incorporated into the curriculum system in almost all subjects taught at the secondary level of education in Indonesia (Prihantoro, 2014). EE in Indonesia examines educational curricular, pedagogy and green activities to reveal what is currently done in schools to educate children about the environment (Parker & Prabawa-Sear, 2019).

The continued rising of environmental issues such as loss of biodiversity, climate change, and pollution over the last decade triggered preparedness for natural calamities and management of risk disasters in tropical Southeast Asia, it is expected that schools in Indonesia have implemented novel teaching strategies to raise environmental awareness and risk attitudes among the youth sectors (Darmawan & Dagamac, 2021). Generally, schools in Indonesia have conducted environmental education programs through both curriculum activities and schools' environmental programs (Sholahuddin et al., 2021).

The development of environmental education is not only evident in international countries, but in African countries as well. Below is a discussion of the emergent of environmental education is African countries such as Botswana, Nigeria and in South Africa.

2.3.3 Environmental Education in Africa

According to Ezimah (2021), the African environment poses formidable problems for sustainable socioeconomic development. Africa has been one of the regions suffering from the effects of climate-induced disasters and risks in the increased anthropogenic effects of modern development (Chirisa & Matamanda, 2022). Among these are unpredictable and increasing incidence of droughts, aridity, and desertification; decline in agricultural and natural resources productivity; water shortages for plants, animals and humans; vector- and water-borne diseases; HIV/AIDS pandemic; unemployment; poverty; and crime (Ezimah, 2021). Efforts in this regard are made possible through environmental awareness, which has proved to be useful in the discourse of disaster risk management in different parts of the world (Chirisa & Matamanda, 2022). Environmental Education (EE) is one of the means of solving poverty problems on the continent through mass mobilization, enlightenment programs and introduction of EE at all levels of learning (Ezimah, 2021).

2.3.3.1 Environmental Education in Botswana

Botswana, like other Southern African countries, is facing socioeconomic development challenges (Ketlhoilwe, 2013). According to Velempini et al. (2018) to achieve effective environmental literacy, EE needs to be integrated into all aspects of learners' learning experience. In 1994, Revised National Policy on Education statement introduced environmental education into Botswana's education system (Ketlhoilwe, 2013). According to Nkambwe & Elssifie (2012), Botswana introduced EE in its school curricula in 1995 to be infused in all subjects as part of an overall improvement of the school curricula. The Revised National Policy on Education (RNPE) statement on EE is mandated to the Department of Curriculum Development and Evaluation to 'provide leadership in improving the quality of education through curriculum development, review and revision (Ketlhoilwe, 2013). The author further explained that the Department of Basic Education infuses EE across the curriculum and is responsible for syllabus design, monitoring, evaluation, materials design, and development, and provides guidelines for policy interpretation for use by teachers and learners in schools (Ketlhoilwe, 2013).

Nkambwe & Essilfie (2012) explained that the actual infusion in practice was left to the classroom educators offering a unique opportunity to compare what they taught and perceived as being important in EE with the official programme and policy. However, efforts to integrate EE into the curriculum were limited by a lack of educational resources needed to support these endeavors as well as a lack of adequate educator training promoting this educational goal (Velempini et al., 2018). Although EE is integrated primarily in social science subjects, the findings suggested that it is in a state of confusion due to ineffective professional development of educators and neglect of educational authorities and the high-level teachers rarely include EE because learners are not tested on it (Velempini et al., 2018). A high percentage of the educators showed limited understanding of what they were expected to do under the EE programme, and many were unable or unwilling to participate in it (Nkambwe & Essilfie, 2012).

2.3.3.2 The Development of Environmental Education in Nigeria

Equally, in the early 1980s the Nigerian government witnessed the growth concern of environmental issues in the Nation (Bosah, 2013). The increased concern of environmental issues in Nigeria, called for environmental awareness to all and sundry in schools at all levels (Bosah, 2013). Bosah (2013) further explained that Nigeria has little or no provision for such awareness in curriculum/syllabus in areas of some related subject(s). Abubakar (2014) supported Bosah's statement by stating that introducing EE as a course or subject into Nigerian education system is in needed. The Nigeria Educational Research Development Council (NERDC) and Nigerian Conservation Foundation (NCF) contributed immensely towards the development of EE among the formal and non-formal education in Nigeria (Bosah, 2013).

According to Abubakar (2014), Nigeria initiated the EE programme and policies dated back to the 1970s as a response to the motion of the world summits on environmental issues. However, Abubakar (2014) argues that many of these policies and programmes have failed to attain their objectives or fallen short of the ends they were set up to attain. Abubakar (2014) explained that in April 1971, Nigeria analysed the serious need and urgency of establishing and developing new teaching programmes at school, college, and university level. On the other hand, EE is

not taught as a separate subject in the Nigerian education system but rather is taught as multidisciplinary through existing subjects such as Social Studies, Geography, Integrated Science, Biology, Chemistry and Physics (Abubakar, 2014).

The desire and commitment of government to tackle EE issues in Nigeria pointed to the need to develop a baseline survey, the Nigeria living standard survey 2003/2004 for monitoring and evaluation of the various government programmes for example: the tree planting campaign, sustainable environmental management technique such as soil erosion control, shelter belt control, afforestation and reforestation and the biodegradation programme for pollution amongst others.

2.3.4 Environmental Education in South Africa

Environmental education is there to foster clear awareness and to provide learners with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment (Gobel, 2022). In South Africa, education can be recognised as an important tool to promote environmental awareness and protection (Mashaba et al., 2022). The roots of EE can be traced back to the 18th century when Jean-Jacques Rousseau identified the importance of EE in that it is a learning area that focuses on the environment (Eneji et al., 2019). However, the interest in EE in South Africa was first observed as early as the 1960s, where foundations were first laid by non-governmental and state-owned conservation agencies (Irwin, 1990). South Africa only attempted to include EE in nation-wide formal curricula in 1989 in the form of the White Paper on EE (Sanders, 2018). EE secured its place within the South African education system when EE was included in the 1995 Government White Paper on education training in South Africa in the 21st century (Sanders, 2018).

According to Reddy (2017), the right to a healthy environment has been enshrined in the South African Constitution through the Bill of Rights and directives for including environmental issues in formal education have been made in the White Paper on Education and Training in 1995. After South Africa's first democratic elections in 1994, education reform took place to restructure the school curricula aiming to create a more holistic approach to learning (Mokhele,

2011). In 2005, the educational curriculum which is learner - centered pedagogy was revised to focus on lifelong learning (Yangambi, 2021). During this era, the South African government introduced the National EE Programme (NEEP), marking the South African governments' commitment to EE and the development of the discipline in South Africa. The NEEP was seen to have two phases; the first was a research phase and the second a professional development phase for the development of educators (Yangambi, 2021).

South Africa has made progress, in both the policy and practice spheres of education, including EE in formal education curricula (Reddy, 2017). Various projects have been launched in South Africa to support EE implementation in schools in terms of the national curriculum for schools (Reddy, 2017). Even though EE has been included as key learning outcomes in all eight learning areas in the South African school curriculum, the status of the implementation of EE into school curricula and the views of educators towards EE is not well known (Schudel et al., 2008). According to Sanders (2018), the implementation of EE across school curricula in South Africa has been particularly slow. Educators indicated that there is not enough EE content, not only in geography, but also in other school subjects (Marques & Xavier, 2020). Even though teachers understood the importance of producing environmentally literate learners, few recognised that they were championing EE within their own schools (Sanders, 2018). Generally, EE has been recognised as a vital link to the creation of environmentally literate and active citizens and to be used to ensure that all South Africans enjoy a decent quality of life through the sustainable use of resources, which is to be inter-disciplinary and integrated across all levels (Sanders, 2018).

Building upon the progress made in integrating environmental education (EE) into South African curriculum, it is evident that schools play an important role in addressing environmental challenges. However, despite the inclusion of EE in national policies, the practical implementation remains inconsistent across the educational spectrum. This inconsistency highlights the need for more robust strategies to foster environmental awareness and practices within schools. The next section explores how schools can further contribute to environmental sustainability by promoting energy-efficient practices and utilizing renewable energy sources. These initiatives aim to instill practical environmental stewardship in learners, bridging the gap between policy and practice in different countries across the world.

2.3.5 Environmental Awareness and Practices in Schools

The earth is suffering from innumerable afflictions caused by human activities that relentlessly denuding the environment (Rogayan & Nebrida, 2019). Schools can play a big role in minimizing environmental problems. Schools are considered as one of the most important places to teach the learners on how to become energy efficient citizens (Chung & Milkoreit, 2021). This can be done to promote energy efficiency and conservation to reduce operating costs. Chung and Milkoreit (2021) further explained that renewable and clean sources of energy such as solar energy are increasingly used as a substitute in load shedding which saves a lot of energy.

2.3.5.1 Environmental Awareness and Practices in International Schools

The environment is under pressure from climate variability and anthropogenic activities across the whole globe (Marpa, 2020). Labadi (2017), stressed that the natural balance has been disrupted and natural resources are exhausted. To avoid the continuation of this scenario, new environmental attitudes, skills, expertise, understanding and behaviours are required by high school learners internationally (Damoah & Omodan, 2022).

A. Environmental Programmes in Philippine High Schools

In their study, Marpa & Juele (2016) assert that the Philippines is not immune to environmental hazards and problems. The study, titled "Environmental Awareness and Practices among High School Learners: Basis for Disaster Preparedness Program," examined the current living conditions of the population in relation to climate change, global warming, ozone depletion, pollution, species extinction, desertification and insufficient waste management (Marpa & Juele, 2016). The research findings indicated a high level of knowledge and practices, but a moderate level of environmental greening among the respondents (Marpa & Juele, 2016). A strong link was seen between the two variables, thereby indicating the necessity for advocacy and integration of environmental education (EE) with a focus on green technology (Marpa & Juele, 2016).

In his study, Punzalani (2020) found a large and substantial correlation between the degree of environmental awareness among senior high school learners and their active engagement in environmental practices. Based on the summary of findings, the researcher proposed the creation of environmental education programs that will strive to both preserve and enhance the knowledge and skills of the learners' in understanding environmental issues and principles environmental sustainability (Punzalani, 2020).

B. High Schools in Spain

According to Ablak & Yesiltas (2020), the promotion of environmental awareness through environmental education (EE) resulted in a decrease in the unfavorable public perceptions of nature and environmental issues. The objective of their research was to quantify the degree of awareness among high school learners on issues related to EE (Ablak & Yesiltas, 2020). The research findings indicated that high school learners who took part in the study exhibited a significant degree of knowledge regarding the entire principles of environmental education (EE) (Ablak & Yesiltas, 2020). In contrast, the study by Ablak and Yesiltas (2020) found no statistically significant difference in the level of awareness of environmental education (EE) ideas among high school learners based on their gender.

Another study was conducted by Sa-ngiemjit et al. (2022) to assess the extent of environmental awareness among learners in high schools in Mallorca. The survey comprised forty items, which were categorised into three components: knowledge, attitudes and behaviour. The findings indicated that the learners have knowledge on the underlying factors contributing to environmental issues (Sa-ngiemjit et al., 2022). Furthermore, the learners' attitudes indicate their perception of the interrelatedness between humans and the environment (Sa-ngiemjit et al., 2022). In relation, Eneji et al, (2019) mentioned that the conduct of the learners indicated that they refrained from generating environmentally detrimental waste. Spain exhibits a superior degree of environmental awareness, as learners proactively refrain from generating hazardous waste and display favorable views towards the environment.

C. Environmental programmes in the schools in India

Dhanya & Pankajam (2017) conducted a study on the environmental awareness among high school learners in India. For their study, a sample of 300 high school learners from six government and private schools which are situated in and around Coimbatore district in Tamil Nadu were selected (Dhanya & Pankajam, 2017). Their findings reveal that there was no significant environmental awareness among high school learners. However, the type of school and the presence of an eco-club had a significant influence on the level of environmental awareness among high school learners. Halder (2017) evaluated the status of EE in the high school education system in India, with focus on North Bengal Several specific factors were investigated in the field survey, including practical, nature of study, teaching approach and assessment system (Halder, 2017). This study revealed that the state of environmental education (EE) in higher schools was unsatisfactory, highlighting the necessity to standardize and enhance the education system (Halder, 2017).

The study conducted by Laiphrakpam et al. (2019) investigated the environmental achievement of grade 9 learners by analysing their performance in enhancing environmental education and environmental awareness. This study identified a correlation between the learners' achievement in environmental education and their level of awareness (Laiphrakpam et al., 2019). Laiphrakpam et al. (2019) asserted that EE has an important role in achieving personal satisfaction and fostering social growth. The author emphasized the necessity of including environmentally relevant subjects in the curriculum of EE to safeguard and conserve the environment and uphold the standard of living (Laiphrakpam et al., 2019). The study also suggested the implementation of outdoor projects, an orientation program to enhance and reinforce EE projects and out-of-classroom activities to improve learner performance (Laiphrakpam et al., 2019). The suggestions illustrate the magnitude of the tasks that need to be undertaken to augment the degree of awareness in India. This includes teaching subjects relating to the environment, implementing outdoor projects and organising orientation programmes.

As seen in international schools, such as those in the Philippines, Spain and India, targeted environmental programs and practices have shown varying degrees of success in promoting awareness and fostering sustainable behaviours among learners. In the context of African schools, similar trends are emerging, with countries like Botswana, Nigeria and Kenya making

strides in integrating environmental education into school curriculum. These initiatives highlight the importance of empowering learners with the knowledge and skills needed to address environmental challenges, thereby shaping future generations to be proactive in conserving natural resources and promoting sustainable development.

2.3.5.2 Environmental Awareness and Practices in African Schools

African cities are undergoing significant transformations as they grapple with rapid growth, inequality, and environmental degradation (Watson & Odendaal, 2013). Damoah & Adu (2022) suggest that effective environmental management in Africa requires increasing public awareness and understanding of sustainable development principles. Environmental education (EE) equips communities with the knowledge and skills needed to improve Africa's environmental conditions (Constanza et al., 2016).

In African countries, EE has evolved from a need to enhance discussions about natural resources and is often integrated into geography curricula (Kretzer et al., 2023). According to Harper & Snowden (2017), teaching learners about environmental issues is crucial in today's increasingly complex world of environmental challenges. Increased environmental awareness in schools will provide learners with more information about environmental management, thereby shifting community behaviour from environmental destruction towards conservation (Ardoin et al., 2020).

A. Environmental Education in Botswana

Botswana faces several environmental challenges, including increasing pressure on water resources due to population growth, urbanization, and development, as well as deforestation and unfavorable climatic conditions (Dube, 2013). In response, the government has implemented conservation strategies and measures to protect the environment from further degradation (Ketlhoilwe, 2003). Additionally, various non-governmental organizations have been involved in natural resources conservation and have provided platforms for discussing environmental and natural resource issues to raise public awareness (Dube, 2013). Numerous

studies have been conducted to assess environmental awareness in Botswana, some of which are discussed below.

Kanene (2016) investigated the impact of EE on the perceptions and attitudes of high school learners concerning environmental sustainability in selected schools in Botswana. The objectives were set to investigate the teaching of EE in high schools; to examine the perceptions and attitudes of EE learners towards environmental sustainability. The findings of their study indicated were that EE is indeed integrated in teaching subjects at high school level in Botswana. According to Kanene (2016), the teaching of EE is fundamentally teacher-centred resulting mainly in enriching learners' knowledge about the environment without really providing them with the capacity to act for environmental sustainability which places an emphasis on experiential learning. Subsequently, the teaching of EE in the studied schools has failed to transform the perceptions and attitudes of learners towards responsible and action oriented environmental stewardship (Kanene, 2016).

Another study conducted by Ajiboye & Silo (2008) focused on an intervention study enhancing Botswana Children's Environmental Knowledge, Attitudes and Practices through School Civic Clubs. It was found that there is a significant change in the knowledge and attitudes of the learners after their exposure to the club activities. Furthermore, there was a significant difference in the knowledge of learners exposed to the EE club activities and those not so exposed (Ajiboye & Silo, 2008).

B. Environmental Education Nigeria

Bosah (2013) conducted a study with a focus on Environmental Education in Nigeria: Issues, Challenges and Prospects at high school in Umuahia North Local Government Area of Abia State, Nigeria. Environmental education is discussed as a key to creating environmental awareness in learners from their early educational career (Bosah, 2013). The study revealed that seventy-five percent of the respondents agreed that environmental topics are being incorporated into other relevant courses or programs taught in the school. Moreover, eighty-five percent of the respondents agreed to being aware of the global trend in climate change (Bosah, 2013). These findings explains that the schools in Nigeria (primary schools, high schools, colleges and

universities) are the key to environmental adequacy and knowledge in learners as future influential decision makers.

Abenu et al. (2023) in their study conducted in Nigeria mentioned that EE was promoted across all levels of education. Their study examined the level of environmental awareness among senior high school learners in Kano Municipal, their perceptions and their responsibility towards improving the environment. The results show that 75% of the respondents have been exposed to subjects that have environmental topics and 72.2% have heard about environmental talks at school assemblies. However, school clubs that are pro-environmental are not widespread, as their existence was only acknowledged by 38% of the respondents. 89% of the respondents hold the right perception that there is a relationship between human activities and the quality of the environment.

In another study, Robinson (2013) directed his attention to the relationship between the environment and sustainable national development. He mentioned that the environment and development are intertwined and therefore must be systematically integrated into educational activities to produce environmentally accountable and responsible citizens. The findings of this study revealed that the Nigerian education system is hinged on an integrated curriculum of general education, aimed at the balanced growth of learners through developing basic skills and inculcating a healthy long-life attitude and moral values critical to the maintenance of the Nigerian nation. According to Robinson (2013), environmental education at the primary level reflects an infusion of several subjects centred on social sciences, culture, and the biophysical environment. However, the high school syllabus contained no specific subject on environmental education (EE). This study also revealed that EE can be executed in non-formal ways, such as raising public awareness through campaigns and published materials (Robinson, 2013).

Environmental education in Nigeria is being implemented from the earlier stages of primary education, promoting environmental awareness from a younger age. However, it is not comprehensive, especially at the high school level, and needs to be improved and made more detailed to achieve sustainability.

C. Environmental Education in Kenya

In Kenya, Gikonyo et al. (2021) conducted a study entitled: Assessing the Influence of Environmental Programmes on the Environmental Attitude and Behaviour among Secondary School Learners in Muranga Country. The study focused on the pro-environmental attitudes and behaviour of high school learners to assess the effects of environmental education programmes on environmental issues such as waste management, water resources management, natural resources management and climate change in the schools (Gikonyo et al., 2021). There were significant differences about solid waste management, natural resources management, climate change and environmental concerns between members of Environmental Clubs and non-members (Gikonyo et al., 2021). Pro-environmental attitudes and behaviour were influenced by current membership of the Clubs rather than past membership. It is concluded that experiential environmental programmes improve the student's pro-environmental attitudes and behaviour, hence environmental management within the schools (Gikonyo et al., 2021). The authors recommended that appropriate policies be formulated to enhance the implementation of school experiential environmental programmes to ensure capacity building of the learners to effectively manage environmental issues in the schools (Gikonyo et al., 2021).

Gilbert (2019) mentioned that EE is gradually promoted as a sustainable tool in protection of the natural environment in Kenya. The core objective of his study was to investigate barriers hindering successful EE implementation to achieve the core objectives of the study examined the effect of teachers' and learners' attitude, administrative support and curriculum design on EE implementation (Gilbert, 2019). Findings indicated a positive relationship between teacher attitude, learner attitude, administrative support and curriculum design (Gilbert, 2019). The positive attitudes and behaviours of educators, learners, and administrative support, coupled with the gradual promotion of environmental education in schools, have led to significant improvements in waste management and natural resources management. This suggests that the level of environmental awareness is also increasing in the nation and, consequently, overall, in most African communities.

Environmental education (EE) in African schools plays a significant role in addressing the continent's unique environmental challenges, such as rapid urbanization, resource depletion and climate change. The focus of EE in these regions is not only to impart knowledge but to foster a change in attitudes and behaviours toward sustainable environmental practices. For instance,

Botswana, Nigeria and Kenya are making efforts to integrate EE into their school systems with varying levels of success. In Botswana, EE is part of the curriculum, but it remains largely teacher-centered, with limited experiential learning to encourage active environmental stewardship. Similarly, in Nigeria, while environmental topics are incorporated into the curriculum, there is still a need for more widespread and detailed EE implementation, particularly at the high school level. In Kenya, pro-environmental attitudes and behaviours are encouraged through school programs like environmental clubs, but barriers such as administrative support and curriculum design still pose challenges.

In South Africa, the efforts to raise environmental awareness are also noteworthy, with studies showing the impact of EE on learners' perceptions of climate change risks and water conservation practices. However, challenges remain, particularly in rural areas like the Manyeleti community, where environmental degradation and poor farming practices threaten livelihoods. Non-formal education initiatives, such as those provided by NGOs, have shown promise in empowering communities with the skills and knowledge needed to improve environmental sustainability and crop yields, highlighting the potential of EE to transform not just schools but entire communities which are discussed below.

2.3.5.3 Environmental Awareness and Practices in South African Schools

Nkoana (2020) carried a study to explore the effects of an EE course on the awareness and perception of climate change risks among seventh and eighth grade learners in South Africa. His findings revealed that environmental awareness influenced perceptions of current and future climate change risks (Nkoana, 2020). Nkoana (2020) further explained that there was daily struggle to meet the basic needs represented at the local context and discourse within which learners view and experience their world Nkoana (2020). In his study, Nkoana (2020) concluded that EE was necessary to raise the awareness and perceptions of learners to environmental risks such as climate change. He further recommended that more studies were required to explore the topic of EE on raising awareness and perceptions of environmental risks such as climate change with head of households (Nkoana, 2020).

In another study in South Africa, Pamla et al. (2021) examined the persistent drought and water scarcity: Household’s Perceptions and Practices in Makhanda. In their study they mentioned

that Households in many cities worldwide consume substantial amounts of water but increasing aridity will result in serious water supply challenges in the future (Pamla et al., 2021). They further explained that in South Africa, droughts are now a common phenomenon, with severe implications on water supply for urban households (Pamla et al., 2021). Results indicate that a substantial proportion of households were aware of water scarcity and attributed it to poor municipal planning rather than drought and wasteful use practices (Pamla et al., 2021). Households reported good water use behaviour, but wasteful practices (e.g., regular flushing of toilets) were evident (Pamla et al., 2021).

Gender, age, education and environmental awareness influenced water use practices, but the relationships were generally weak (Pamla et al., 2021). Pamla et al. (2021) concluded that households participated in water conservation measures but felt the local municipal authority lagged in addressing water supply challenges. The level of environmental awareness is generally low in Makhanda, as many people are not well informed about the source of water. This is evidenced by the tendency of people in this area to blame the municipality for wasteful water management practices. Given that water is a natural resource, it's crucial for people to be educated about it to understand how to manage it properly and mitigate negative impacts such as droughts.

Lagendjik & Gusset (2008) carried another study in Manyeleti community in South Africa. The study was based on environmental awareness- using non- formal education to impart skills and knowledge to improve crop yield (Lagendjik & Gusset, 2008). Lagendjik & Gusset (2008) shed light on how non-formal education was used as a tool to provide knowledge and skills for Manyeleti community members who are engaged in subsistence farming to improve their crop yield. Manyeleti is a rural village in the Mpumalanga province, which, like most rural areas, was experiencing environmental degradation caused by the depletion of natural resources, and poor farming practices (Lagendjik & Gusset, 2008). The environmental challenges experienced by the Manyeleti rural community include among others, the less arable land, changing climatic conditions and poor rainfall leading to a growing number of households live in poverty since subsistence agriculture is the only source of livelihood (Lagendjik & Gusset, 2008).

The community lacks the advanced farming skills needed to deal with arid land and acid soil. This study provides insight into a community engagement project spearheaded by Bokamoso Impact Investment (BII), a non-governmental organization that works to increase the crop production of marginalized groups. Through the above project, the environmental awareness campaign was launched to impart skills and knowledge that helped the Manyeleti community to deal with the environmental challenges. The training which the project members received through non-formal education developed a heightened sense of awareness and ways to improve their farming methods to enhance their livelihood sustainability (Lagendjik & Gusset, 2008). The finding of this study indicated that the skills and knowledge imparted by the NGO and the University of South Africa, improved the community's farming methods and boosted crop production (Lagendjik & Gusset, 2008).

2.3.6 The Role of Environmental Education in Raising Environmental Awareness

The aim of environmental education is to teach and educate the public about the function of natural environments and, particularly, how human beings can manage their behaviour and ecosystem. The United Nations emphasized a sustainable clean water and sanitation goal of sustainability where people are encouraged to ensure availability and sustainable management of water and sanitation for all (Montiel et al., 2021). They also emphasized ensuring universal access to affordable electricity by 2030 meaning investing in clean energy sources such as solar, wind and thermal. Expanding infrastructure and upgrading technology to provide clean energy in all developing countries to encourage growth and a healthy environment. Environmental education (EE) has equipped the public with information and knowledge to sustainably manage environmental resources, such as water and energy. Additionally, it has raised awareness about technological advancements that promote sustainability, such as clean energy sources.

Sakarya et al. (2023) from Turkey examined the goal of EE of recent societal people with their knowledge and awareness about the environment and the solution of adaptation to encourage responsible environmental behaviour. EE emphasizes that knowledge, attitudes and abilities are related to the environment and through developed education, the foundations of a sustainable environment are established (Zsoka et al., 2013). Abdullah (2018) have studied green education

in Malaysia and have identified the elements of the environment and the environment in which teaching and learning methods apply. A new vision regarding the impact of green school (Dyment, 2005; Zsóka et al., 2013). In their opinion, this kind of green school helps learners' involvement and creativity by enhancing the learning process on green fields, compared to in-house learning, and enables them to develop their knowledge, skills and attitudes towards the environment. This plays a positive role in environmental education as learners gain a deeper understanding of environmental matters, enabling them to develop strategies to mitigate any negative environmental issues that may arise.

Cho & Park (2023), propose a new strategy for the environmental education taking into account the new generation of Facebook users and the impact of computers on new gaming styles by teaching simulation games, a kind of re-education of the environment with educational activities that helps learners to be involved in the simulation of ecological education situations and to help them to meet the needs and applicability of solutions in real life in different situations (Ntanos et al., 2019). Utilizing current technological equipment encourages most learners to engage with environmental issues. Given that today's generation spends a significant amount of time on social media platforms like Facebook, incorporating educational content into these platforms can be highly effective. Additionally, using simulations allows learners to assess changes in environmental systems such as water supply, drought, and climate fluctuations. This fosters environmental education by providing learners with a comprehensive understanding of environmental issues and their underlying causes. Overall, there is considerable effort being made to promote environmental awareness in African communities. However, progress is slow, and it will take time for widespread understanding of environmental issues and effective resolution strategies to be achieved.

2.4 CHAPTER SUMMARY

In this chapter, the researcher has highlighted the source of information from similar research carried out before and the framework guiding this study was also included. This includes the environmental awareness and experiences in the global world, Africa as well as in South Africa as a nation. In this chapter, the researcher examines mostly the literature on environmental

awareness in high school learners, their understanding of the environmental crisis and the current issues surrounding the environment and EE issues of current concern.

CHAPTER THREE

STUDY METHODOLOGY

3.1 INTRODUCTION

The preceding chapters provided an overview of the research, clearly defining the research problem, research purpose and research questions. The theoretical framework was explained and the literature aligns with the study was reviewed. In this chapter the researcher provided a detailed research methodology that was employed in this study. According to Snyder (2019), research methodology is the specific procedures or techniques used to identify, select, process and analyze information about a research topic. On the other hand, Patel & Patel (2019) defined a research methodology as a systematic approach to solve a research problem.

In this chapter, the researcher discussed the research paradigm, research approach, research design, population, sampling, data collection procedures and data analysis procedures employed in this chapter. The research methods that are used in the data collection, data analysis and establishing legitimacy of the instrument was discussed. Furthermore, the ethical considerations and trustworthiness of the study was discussed in this chapter. The current study explores the level of environmental awareness in high schools and the environmental practices by high school learners. The study further relates the findings to environmental problems and strategic ways of improving environmental awareness to eradicate environmental problems.

3.2 RESEARCH PARADIGMS

A research paradigm is a method, model or pattern for conducting research (DeCarlo, 2018). Research paradigms are a set of common beliefs about research and should be a key facet of any research project (Brown & Duenas, 2020). Pham (2018) outlined the four paradigms commonly employed in research: positivism, interpretivism, constructivism and critical theory. The positivist paradigm operates from the assumptions that society can and should be studied empirically and scientifically (DeCarlo, 2018). According to Pham (2018) positivists apply the

methods of natural sciences to explore the study of social science. A positivist believes in observable and measurable facts as a basis and focuses on statistical results and generalizations of universals (Ma & Ma, 2022). Park et al. (2020) explained that the lack of interaction between researchers and participants often leads to bias in the positivism paradigm. The assumption that social reality can be measured and quantified in the same way as the natural world will not give a clear picture of complex situations and the diversity of human experiences. Due to this fact, the researcher could not apply the paradigm in this research.

In this study, the researcher employed the interpretivist paradigm. According to Pham (2018), the interpretivist paradigm is used in most of the qualitative research conducted in the social sciences. Interpretivist research predicted the existence of numerous realities rather than a single reality and emphasizes the subjective meaning of the study subject (Ma & Ma, 2022). The research participants had different environmental life experiences they shared through their responses by completing the questionnaires, through interviews and some that were observed. Thus, the use of interpretivist research assisted the researcher to study how particular high school leaners formulate different realities and give them meaning, as well as to demonstrate how these norms explain their behaviour.

Moreover, an interpretative phenomenological analysis approach allows the interviewees (research participants) to express themselves and their lived experience or stories the way they see fit without any distortion and/or prosecution. Therefore, utilizing the interpretive approach in a qualitative research study reiterates the fact that its main objective and essence are to explore the lived experiences of the research participants and allow them to narrate the research findings through their lived experiences. This involves social processes that are driven by humans through interaction and action under the assumption that social structures are not naturally formed (Alharahsheh & Pius, 2020).

The following section discusses the different research approaches, research design, population and sampling, data collection and data analysis that have been adopted in this study.

3.3 THE RESEARCH APPROACH

Research approaches are plans and procedures for research that encompass the steps from broad assumptions to detailed methods of data collection, analysis and interpretation (Creswell & Creswell, 2018). There are four research approaches: qualitative, quantitative, mixed methods and action research approach (Quayson, 2019). In this study, the researcher employed the qualitative research approach. The qualitative research approach was employed to provide rich descriptions of environmental awareness and related practices in high schools. According to Hammarberg (2016), qualitative studies involve the systematic collection, organization, description and interpretation of textual, verbal and visual data. Qualitative research explores and provides deeper insights into real world problems (Tenny et al., 2022). Flick (2014) mentioned that qualitative research is interested in analysing subjective meaning or the social production of issues, events or practices by collecting non-standardized data, texts and images rather than the numbers and statistics.

The qualitative research methods of data collection do not involve the collection of data that involves numbers or a need to be deduced through a mathematical calculation; rather it is based on the non-quantifiable elements like the feeling or emotion of the researcher (Gericke et al., 2018). The qualitative research approach was chosen for this study because the data collected focused on qualities such as attitudes, practices and behaviours. The qualitative method is the most suitable approach for collecting and analysing the data on the attitudes, practices and behaviours of the participants.

3.3.1 Advantages of a Qualitative Research Approach

Qualitative research approach produces detailed description of participants' feelings, opinions, and experiences and interprets the meanings of their actions (Denzin, 1989). The researcher could achieve deeper insights into issues related to environmental practices and awareness in high schools. Qualitative research approach (interpretivist) holistically understands human experience in specific settings (Rahman, 2017). The researcher could encompass a wider range of the views and opinions collected to understand the high school learners' research ascertains deeper underlying meanings and explanations (Rahman, 2017).

The qualitative research permits the and to figure out how meanings are shaped through culture (Corbin & Strauss, 2008). This can only be obtained via qualitative methods which can account for how the social reality is shaped and maintained, or how people interpret their actions and others (Blaikie, 2007). In qualitative research, during the data collection process, the researchers interact with the participants directly during the data collection stage. Consequently, data collection is subjective and detailed (Rahman, 2017). In this research, the researcher collected detailed information on environmental awareness and environmental awareness from the high school learners.

Qualitative research design has a flexible structure as the design can be constructed and reconstructed to a greater extent (Maxwell, 2012). The thorough and appropriate analysis of an issue can be produced by utilizing qualitative research methods, and therefore the participants have sufficient freedom to determine what is consistent for them (Tenny et al., 2022). As a result, the complex issues can be understood easily.

3.3.2 Disadvantages of Qualitative Research Approach

According to Heritage (2010), in qualitative research the researcher's influence can have a negative effect on collected data. Heritage (2010) argues that qualitative research approaches sometimes leave out contextual sensitivities and focus more on meanings and experiences. If the contextual influence is not considered at all it can bypass the impacts of environmental awareness and environmental practices. This will lead to policymakers giving low credibility to the results from qualitative approach (Rahman, 2017).

Heritage (2010) highlighted that a small sample size is not always a representative of a larger population demographic, even if there are deep similarities individuals involve. Smaller sample size raises the issue of generalizability to the whole population of the research (Harry & Lipsky, 2014). Tipton et al. (2017) admitted that due to the small sample size the study results do not wish to claim wider generalization to other contexts.

Analysis of the cases takes a considerable amount of time, and one can generalize the results to the larger population in only a very limited way (Tenny et al., 2022). According to Heritage

(2010), the number of details that are often collected while performing qualitative research is often overwhelming. They further explained that sorting through that data to pull out the key points can be a time-consuming effort. The researcher cannot wait for some months for a qualitative study to be administered (Sallee & Flood, 2012).

Despite the disadvantages explained above, the researcher opted for qualitative research as it gave her more insight and thorough investigations on the behavior and environmental experiences in a flexible way.

3.4 RESEARCH DESIGN

According to Bryman et al. (2008), a research design is a framework for the collection and analysis of data which is employed in a research study. Research design is a plan or guide for data collection and interpretation, with sets of rules that enable the researcher to conceptualize and observe the research problem (Buckingham & Saunders, 2004).

A research design is classified as pure research, applied research, descriptive research, analytical research, fundamental research, conceptual research, empirical research, longitudinal research, laboratory research, exploratory research and conclusion-oriented research (Pawar et al., 2021). According to Casula et al. (2021), literature identifies three basic types of research which are explanation, description and exploration. Explanatory research answers the “why” question (Babbie, 2017), by explaining “why things are the way they are”, and by looking “for causes and reasons” (Adler & Clark, 2019). Descriptive research addresses the “What” question and is not primarily concerned and exploration. Explanatory research answers the “why”, by explaining “why things are the way they are” and by looking “for causes and reasons”. Descriptive research addresses the “What” with causes (Shields & Tajalli, 2006). Exploration research is associated with discovery, creativity and serendipity (Stebbins, 2001).

In this study, the researcher employed both descriptive and exploratory case study designs. The descriptive design was applied to provide detailed insights into environmental issues in the real world. Descriptive case study research design is an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Robert, 2014). The exploratory design

was also employed to connect ideas and understand causes and effects. Kumar et al. (2006) defines an exploratory case study as a method of exploring and analysing the life of a social unit be it a person, a family, an institution, a cultural group or even an entire community. This study focuses on a case study of four schools in the Johannesburg Central District. Bell et al. (1999) states that a case study is particularly appropriate for individual researchers because it gives an opportunity for one aspect of a problem to be studied in the same depth within a limited time scale. A case study is an in-depth study of a (single case unit) situation (Pacho, 2015). In this research, there is a problem of environmental degradation which is partly due to lack of environmental awareness (Otinga & Ngigi, 2018). The researcher used the case study to understand this phenomenon by examining four schools in one district.

The case study assisted in bringing an understanding of this complex issue through contextual analysing of the level of environmental awareness in high schools and the environmentally sustainable practices that were carried out by learners. It strengthened and extended experiences that already existed. Generally, the case study had to explore and investigate the situation of complex environmental issues thoroughly and deeply for possible solutions to be obtained.

3.5 POPULATION AND SAMPLING

3.5.1 Population of the study

The population of a study refers to the group of individuals or subjects chosen or identified to participate in a research study or investigation (Sigurgeirsson & Baran, 2014). According to Villegas (2024), the population of the study is a group considered for study or statistical reasoning. Babbie (2017) describes the population of the study as a subset of the target population from which the sample is selected. The study population is not limited to the human population but includes a set of aspects that share common characteristics, such as objects, animals, and measurements (Villegas, 2024). In this study, the targeted population consisted of high school learners. Grade 8 and grade 11 were the specific groups which the researcher was interested in for gathering information and drawing conclusions (Cohen et al., 2000). From this target population, the researcher could narrow her focus down to specific participants who were involved in the study, as will be explained in the following subsections.

3.5.2 Sampling of the study

A sample is a sub-set of a population in which the research is based. In qualitative research, determining the appropriate sample size is a critical aspect that impacts the quality and validity of the study. The decision on sample size is not based on statistical formulas but rather on judgment, experience, and the specific research methodology and purposeful sampling strategy employed (Sandelowski, 1995). The adequacy of the sample size is contextual and influenced by the scientific paradigm under which the investigation is conducted (Boddy, 2016). Guidance is essential to estimate saturation before data collection to identify an effective sample size for qualitative research proposals (Hennink et al., 2020). The concept of data saturation, where sampling stops when no new information is obtained, plays a crucial role in determining the number of samples in qualitative research (Urrahman et al., 2024). There are different kinds of qualitative data techniques, however purposive sampling is a widely used technique in qualitative research for selecting information-rich cases (Karafil & Oğuz, 2019). The sampling process in qualitative research is typically determined by the methodology employed, but this may not always be clearly defined in published studies (Savin-Barden & Howell, 2013). The researcher chose a purposive sampling to select the participants.

Purposive sampling is a technique used to select a specific group of individuals or units for analysis (Rai & Thapa, 2015). Purposive sampling is used to select respondents that are most likely to yield appropriate and useful information (Campbell et al., 2020). According to Nikolopoulou and Zacharis (2023), in purposive sampling, the sample is selected based on the defined purpose of the study and is intended to be a representative of the characteristics or attributes in which the researcher is interested in. It is useful when finding information -rich cases or making the most out of limited resources (Campbell et al., 2020). In this study, the researcher had to apply the purposive sampling to select a sample of schools and learners to represent the population of the study. This was particularly useful as she was able to select four schools from different areas and backgrounds in the district to represent the whole district's schools. Purposive sampling also allows the researcher to gather in-depth data on specific topics or issues (Rai & Thapa, 2015). In this research, the researcher purposively selected high achieving learners in grade 8 and 11 to collect as much detailed information as possible.

However, in purposive sampling, there are high risks of biasness. The researcher may unconsciously select individuals or units for their expectations or preconceived notions, which has a potential to affect the study's validity (Nikolopoulou & Zacharis, 2023). Sampling error is highly possible in purposive sampling since the sample is not selected randomly which can result in reliability and accuracy of the study (Rai & Thapa, 2015).

3.5.2.1 Sampling procedure

For the open-ended questionnaire survey, only two grades from selected schools in the Johannesburg Central District participated in the study, grade 8 and grade 11. Twenty-six learners were selected from grade 8 and twenty-four learners were selected from grade 11. Initially, it was intended to select twenty-five learners in each grade. This was not the case due to divisibility of numbers. From the first two schools, the researcher selected twenty-six grade 8 learners (13 learners from each school). From the other two schools, the researcher selected Twenty -four grade 11 learners (12 learners from each school), giving a total of fifty learners selected for the entire study.

For the open-ended questionnaires, the researcher purposively selected the best four learners from the three different grade 11 subject streams which are science, humanities and commercials. This resulted in a total of twelve per school and twenty-four four two schools. As for the grade 8 learners, the researcher purposively selected the learners who were high achievers in the grade since they learn the same subjects. Selection of the learners to be interviewed in this study was done from the same learners used for the open- ended questionnaire. Purposive sampling was employed to select the three learners from grade 8 and three per stream from the three grade 11 streams (nine learners per grade). This gives a total of twelve learners being selected to be interviewed for the entire study. The learner selection process was done based on academic performance information from schools. The performance reports were used to select the best academic achievers in sampled schools.

For the observations, the participants to be observed were sampled purposively. Firstly, Case A was observed, followed by Case B, Case C and lastly Case D. The observation days and times

were alternated to gather as much information as possible for each case. This was done using purposive sampling.

3.5.3 Selection of schools

This study included four high schools which were selected from Johannesburg Central District D14 using the purposive sampling method. Four schools were selected on the purpose of involving all races comprised in the racial composition. These include the black African, the Indians, coloureds and the other. According to Boesten & Scanlon (2021), Johannesburg racial make-up comprises of Black African, Whites, Coloureds, Indians and multi-racial people. The Black African are the people originally from South Africa (Van Warmelo, 2024). The Indians are people who have relocated from India and are now residing in South Africa (Samuelson, 2010). The coloureds are descendants from two different races. The multi -racial comprises of two or more races (Van Warmelo, 2024). There was no white school to select since the racial composition is not significant in the district. Khenisa (2016) explained that Soweto had been separated as a residential area for blacks only (no whites allowed), who were not permitted to live in other White designated suburbs of Johannesburg, although eventually incorporated into Johannesburg.

Two high schools were from Lenasia representing more of Indians, a minimal of Black Africans and Coloureds, one from Eldorado Park representing the coloureds and one from Protea representing the Black Africans. The schools in Lenasia were referred to as Cases A and B, the high school in Eldorado Park as Case C and the high school from Protea Glen as Case D. Even though this technique may not result in a selection that is representative of the whole population and may therefore lack generalizability, it still provides an in-depth understanding of the curriculum about environmental awareness and related practices in high schools (Potsi, 2013). The location of schools in different locations might perceptions, even their knowledge and awareness of environmental concerns. For example, in Lenasia, schools have a higher percentage of Indians as compared to Protea. The two areas comprise of people who have different cultural backgrounds. In South Africa there is cultural identity, playing down linguistic and other cultural differences between different races (Dodson et al., 2000). Nevertheless, there

are some similarities in terms of infrastructure such as classrooms, school discipline and waste management in selected high schools.

3.6 DATA COLLECTION PROCEDURE

The data collection process is a series of interconnected activities designed to provide the researcher with answers to research inquiries and to appraise the outcomes (Creswell & Creswell, 2018). The process includes activities such as locating a study site, sampling of participants and cases, as well as the choice and operation of data collection methods. According to the researcher's own understanding, it is crucial to correctly collect data to obtain accurate results and provide proper recommendations. In this research, the researcher obtained information from 50 learners selected from four different high schools. This data was collected through semi-structured interviews, observations and open-ended questionnaires. The information was collected directly from learners to assess their level of awareness and the related environmental practices that are implemented in schools.

The level of environmental awareness at all levels has been increasing over the past two decades (Mahirah et al., 2020). This study aims to help reduce the level of environmental degradation, which is also mounting at a greater level. Learners were given an opportunity to share their views on the level of environmental awareness in their schools and explain what they were doing to promote environmental awareness. This was done through semi-structured interviews and responding to the issued questionnaires. The researcher also collected data through observations, noting the environmental practices carried out in schools, such as school gardening, recycling and tree planting. The stages of the data collection procedure followed are listed in Table 3.1 with clear descriptions (Kristjansson et al., 2013).

Table 3.1: Stages for collection of data among learners in Johannesburg Central District high schools.

Stage	Activity	Description of activity	Time frame

1	Obtain approval from the university for using people as the source of data.	Obtaining approval from the Committee of the College of Education and obtaining an ethical clearance certificate from the board to receive permission to perform the research. This is done to ensure that the study is compatible with South African laws and to ensure that there are no drawbacks in working with the selected population. This had to be done three to four months before the data collection took place. It is necessary to avoid any problems in conducting research a publishing result.	June 2024
2	Dictate suitable schools and prospective population.	One to two months before data is gathered, this process is performed (Kristjansson et al., 2013). Data is gathered from the four selected schools, which includes the name, school address, learner's roll, etc. Fifty learners (26 grade 8 learners & 24 grade 11 learners) from the selected schools will be included in this research, as this study is mainly aimed at the Johannesburg Central District schools. A letter of intent is sent to the school principals and the DBE gatekeeper to seek permission for data collection in their schools prior to any information being collected. This is very valuable data that needs to be preserved by the university.	June to August 2022

3	Data collection, interpretation and analysis	The purpose of research is to find answers to questions that were raised (Callus, 2019). In this research data was gathered from the high school learners through completion of questionnaires, conducting semi-structured interviews and some observations. Research is broken up to clear steps that lead to conclusions (Callus, 2019). After the data collection, data was analysed and then interpreted to come up with solutions to the improvement of environmental awareness in schools.	August to December 2022

3.6.1 Data Collection Tools

According to Gericke et al. (2018), data collection tools refer to the devices or instruments used to collect data. The researcher decided to use the following data collection tools for this research: observations schedules, open-ended questionnaires and semi-structured interviews. The researcher combined the three methods for triangulation to corroborate information. Triangulation minimized the incidence of errors and false conclusions which could arise from the use of one data collection technique. The researcher first issued out the questionnaires for completion followed by semi-structured interviews. Observations were carried out throughout the study simultaneously. The research instruments are discussed below.

3.6.1.1 Observations

Observation is the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them (Nieuwenhuis, 2010). According to George (2022), an observation study is used to answer questions based purely on what the researcher observes. Observational studies provide critical descriptive data and information on long-term efficacy and safety that trials cannot provide (Gilmartin-Thomas et al., 2018). Gilmartin-Thomas et al. (2018) further explained that observational studies include case reports and case series, ecological studies, cross-sectional studies, case-control studies, and cohort studies.

Observational studies may be the best or at least the only feasible way to answer environmental questions as the researcher could see and hear what is occurring naturally in the research site (George, 2022). George (2022) outlines four types of observation: participant observation, non-participant observation, covert observation, and overt observation. In this study, non-participant observation was employed. According to George (2022), non-participant observation involves the observer remaining outside the group and simply observing their behaviour. This method is less time- consuming. However, the inherent risk of non-participant observation is its high selectivity and subjectivity (Nieuwenhuis, 2010).

Through observation process, the researcher observed the following in four different cases: reuse, reduce and recycle thus observing if the learners had knowledge on recycling and sorting the garbage. This served as a gauge for the researcher to assess the level of environmental awareness in schools. The extent of reuse, reduction, and recycling activities can indicate a higher level of awareness. The researcher also observed the sustainable attitudes on energy saving projects and any items or crafts made from homemade products. The researcher observed the environmental activities carried out in cases such as gardening and any tree planting activities. She had to use the observation guide attached during these observations. The researcher also captured everything that was environmentally related such as the cleanliness of every case, learners' behaviour towards littering as well as the type of activities carried out

during play times. All these made the researcher understand the position of the learners in terms of environmental awareness in the cases.

With observation, the researcher was able to collect data continuously throughout the duration of data collection processes. Recording sheets and checklists were used as ways of collecting and capturing observation data. According to Kumar et al. (2006), recording sheets and checklists are the most standardized way of collecting observation data and include both present questions and responses and these forms are typically used for collecting data that can be easily described in advance.

The observation guide was developed following the criteria below:

Firstly, a researcher had to maintain the privacy of the cases as well as the learner's privacy. Not everything that was observed was recorded. Only the elements related to the research observation guide were considered. Secondly, the researcher had to determine the research objective and goals of the research. She had to figure out what questions to be answered and determine what to observe and why. The researcher had to establish a method of gathering data on how she was going to conduct the observations. In this case the researcher used the non-participant observation. According to Mazhar et al. (2021), non-participant observation is the process when the observer is a detached participant. Lastly, the researcher had to decide how the observation data would be captured through recording audio or video, taking pictures and/or taking notes. In this case observation checklists were used.

The observation guide used in this research is attached at the end of this research as appendix A on page number 169.

3.6.1.2 Open-ended Questionnaires

The researcher used the questionnaires that comprised of the open-ended questions for the collection of data. The questionnaire was divided into four sections; the first one was based on the learner demographic information, followed by the learners' relationship with the environment, learner's knowledge about the environment and its issues/problems. Open- ended questions in the questionnaire enabled the learners to elaborate on all their perspectives on environmental awareness and environmental challenges. The use of open-ended questions

allowed for open and free-flowing discussions, providing a platform for individuals to express their thoughts and ideas without limitation (Turabian, 2018).

The researcher issued the questionnaires to all 50 participants (26 grade 8 learners from two schools and 24 grade 11 learners from two schools) and the researcher provided participants with amble time to complete the questionnaires. The researcher used an open-ended questionnaire to collect unique data that provides solutions to environmental issues. The use of an open-ended questionnaire was for the participants to provide reliable and trustworthy answers that can be used to obtain information on environmental education. In addition, the questionnaire simplifies the state of data analysis (Ocansey, 2006). The questionnaire also allows the explanation of ambiguous words during the completion process thereby minimising confusion as clarity will be provided.

The questionnaire was developed following the steps:

Questions should be concise. According to Turabian (2018), complex inquiries should be simplified into straightforward ones. Turabian (2018) advocated for concise and direct questions directing researchers to steer clear of vague terms like "probably," "maybe," or "perhaps." Questions should be in sequence. Question order effects of part-whole combinations occur where one question is more general with respect to a certain concept while the other one is more specific (Baker, 2008). Questions should proceed in a logical sequence moving from easy to more difficult questions. The more general questions should precede more specific questions as the latter have been shown to influence responses to the former (Bradburn et al., 2004). Technical terms should not be used in questionnaires. Baker (2008) stressed the importance of formulating questions with simplicity in mind. Questions should focus on current attitudes and very recent behaviour (Bradburn et al., 2004).

The questionnaire that was used in this research is attached at the end of this research as appendix B on page number 170.

3.6.1.3 Semi Structured Interviews

Hannagan (2006) describes an interview as a conversation with a purpose. From an interview one can get direct information from the participant. The interview is defined as a form of data collection in which groups/individuals are questioned orally (Elser, 2006). According to Kathari

& Tangirala (2020), an interview is a method of collecting data which involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses through personal interviews and telephone interviews. Interviews allowed the researcher to ask the question, ‘’Why’’, “What”, “How” and she could get answers in depth.

In this study, 12 learners were purposively selected from the four schools which were sampled for the study. The best academically achievers from grade 8 learners or grade 11 learners were selected from each school. In Cases A and B grade 8 learners were selected whilst in Cases C and D, grade 11 learners were selected. This gave a balanced pool of interviewees which were from different learning backgrounds especially for the grade11. Learners from grade 11 were from the three different streams such as commercials, science and humanities. This selection gave a variety of insights when data was collected.

The rationale for selecting semi-structured interview method was based on the potential the method had to help the researcher obtain more information and in greater depth, through probing beyond the predetermined questions. Semi structured interview was selected because unlike the structured interview, the researcher is free to ask additional detailed questions that can explore more deeply into the participants deep feelings, that means a researcher does not have to stick to the interview guide only (Magaldi & Berler, 2020).

Apart from using open-ended questionnaires to collect data, the researcher had to conduct semi-structured interviews as well. The semi-structured interviews had the potential of gathering deeper meaning of the learners’ opinions. This provided the researcher with information that she could rarely find which also provided unexpected but useful perspectives (Koshy, 2005). Creswell & Creswell (2018) posits that the advantages of using semi-structured interviews are dual as a researcher can get responses from both verbal and non-verbal communication. The researcher could pick some of the responses through the gestures by the participants during the semi-structured interviews. Interviews were also flexible, and adjustments could be introduced in the data collection process. Though it was time consuming, interviews involved direct interaction and relationship with the participants which yielded firsthand in-depth information.

To overcome the challenges posed by interviews as a method of data collection, the researcher first called respondents and set up an interview schedule. During the interview, the researcher

tried as much as possible to create a relaxed and friendly atmosphere. When the interviewee trusts and feels comfortable around the interviewer, he or she will be likely to provide rich information (Saunders, 2018). Questions were structured such that they did not contain cues which could alter the interview's direction. Interviews were set up well in advance to give the respondent time to prepare themselves and avoid unnecessary inconveniences.

A digital voice recorder and a cell phone were used to record the interviews. The use of recordings enabled the researcher to capture all the information that has been provided by participants. Either a voice recorder or cell phones were used as backups in case one device malfunctioned to limit any chances data loss provided by the participants. Generally, interviews were effective in gathering comprehensive data. However, more time was required, there was a language barrier in some cases, and some participants were nervous.

A. Developing Interview Questions

In qualitative research, developing the interview questions is often referred to as a straightforward process (Kalilo et al., 2016).

Questions should be simple. Do not ask more than one question at a best time,

• The questions are those which elicit the longest answers from the respondent. Do not ask questions that can be answered with one word.

Do not ask questions that require your respondents to do your analysis for you. This is a researcher's job.

• Likewise, do not ask for hearsay or opinions on behalf of the group they are a part of "What do people around here think of x?" You rarely get anything interesting.

• Do not be afraid to ask embarrassing questions. If you do not ask, they will not tell.

The interview questions that were used in this research are attached at the end of this research labelled as appendix C on page number 173.

3.7 DATA ANALYSIS METHODS AND INTERPRETATION

Qualitative data analysis, used by researchers to make sense of their data, comes in a variety of approaches which tend to be aligned with conceptual frameworks and methods (Williamson et al., 2018). It is a process in which research advances from the collected qualitative data to an explanation, understanding or interpretation of the people and the situation under investigation through a range of processes and procedures (Immergut & Bohle, 2018).

Qualitative data analysis serves three major aims: first, to describe a phenomenon in some or greater detail based on the subjective experiences of a specific individual or group. Secondly, to compare several cases of individuals or groups and what they have in common or of the differences between them. For instance, the researcher can discern and contrast the similarities and disparities in environmental conditions across various schools. Lastly, it aims at developing a theory from the analysis of empirical material (Flick, 2014).

Various methods exist for qualitative data analysis, including content analysis, narrative analysis, discourse analysis, thematic analysis, and grounded theory analysis (Sutton & Austin, 2015). In this study, thematic analysis was applied. According to Castleberry & Nolen (2018), thematic analysis helps in identifying and interpreting patterns in qualitative data where large pieces of text data are grouped into themes or categories that come up frequently in the text. In terms of analysing data, the researcher adopted thematic analysis and categorized the data that seemed to be the same and listed the data for review.

Table 3.2: Steps of data analysis

Number of steps	Researcher activity
1	Firstly, in data analysis the researcher had to set the goals that will result in answers to the research questions.
2	The researcher established the data collection methods and the data sources.
3	Data collection, getting on the field to collect data.

4	Data review. The researcher had to go through all the data collected, removing an inaccurate data to avoid false result outcome.
5	Data analysis, this involved sorting data according to identified themes by examining the major characteristics of data. Thereafter, data collected was then analysed through translating, transcribing and then coding to identify similarities and differences and to come up with findings and conclusion.
6	After data was collected, sorted, and analysed, the researcher could interpret the data. This put her in a position to determine whether the data collected was the best in answering the research question.

3.7.1 Thematic Analysis

According to Braun and Clarke (2006), a thematic analysis is a methodology that systematically defines, organizes and offers insight into meaning patterns (themes) through a dataset. Thematic analysis may be used to extract themes and analyse similarities and differences across the participants (Sechelski & Onwuegbuzie, 2019). In this research, the researcher had to look for connections within data and identified thematic patterns such as gardening, sorting of litter and tree planting.

Thematic analysis was used to interpret the data that was collected from semi-structured interviews, observations and questionnaires. This was done following the processes of translating, transcribing and then coding to identify similarities. Transcription is the action of providing a written account of spoken words (Powers, 2005). According to Nikander (2008), transcribing originates from various interactional contexts into a written form and is an integral part in qualitative research practice. In this study, the participant's spoken words that were recorded during the semi-structured interviews were transcribed so as for them to be analysed. Translation is essentially an informed guess and therefore relies on the trust and acceptance of readers from different language backgrounds to a certain extent (Nikander, 2008). When researchers are not native speakers of the language spoken by participants, the assistance of translators is often necessary (Powers, 2005). In this study, the researcher required translation

assistance for certain IsiZulu and Afrikaans words used during interviews, while only English was used for the questionnaires. Following translation and transcription, participants were given the opportunity to review the transcripts to ensure accuracy. These translation and transcription processes were vital for establishing credibility and reliability. Subsequently, the data underwent coding, where it was organized into three themes and categories to facilitate interpretation of the findings.

3.8 TRUSTWORTHINESS

Trustworthiness is the degree of confidence in data interpretation and methods to ensure the quality of study (Connelly, 2016). Lincoln & Guba (1988) refined the concept of trustworthiness by introducing the criteria of credibility, transferability, dependability, and confirmability to parallel the conventional quantitative assessment criteria of validity and reliability. To maintain trustworthiness in this study, the researcher had to ensure the research dependability, credibility, transferability and confirmability.

3.8.1 Credibility

Credibility, synonymous with the positivist concept of internal validity, concerns the degree to which the findings accurately reflect reality (Norman et al., 2020; Gunuwan, 2015). In addressing credibility, researchers aim to ensure that the study provides a faithful depiction of the phenomenon under investigation (Rose & Johnson, 2020). The richness of the data and depth analysis is crucial in establishing credibility and can be reinforced through triangulation (Patton, 2014). Triangulation in this study involved the use of multiple data collection methods. The researcher employed semi-structured interviews, questionnaires, and observations to gather data. By employing a combination of interviews and observation schedules, the study triangulated data to verify and validate the findings (Borg & Gall, 1992).

3.8.2 Dependability

Dependability relates more to reliability (Gunuwan, 2015). In qualitative research, dependability fosters trust by presenting research findings consistently and reproducibly (Norman et al., 2020). Achieving dependability involves ensuring that the research process is logical, traceable, and well- documented (Tobin & Begley, 2004). In this study, the research

notes underwent peer review by another researcher, providing an insider analysis and feedback before publication. Moreover, all information and data will be securely stored for five years, ensuring traceability until relevant documentation is complete.

3.8.3 Transferability

Transferability is a form of external validity (Gunuwan, 2015). It is how the qualitative researcher demonstrates that the study findings are applicable to similar cases. To allow transferability, findings provide sufficient detail of the context of the fieldwork for a reader to be able to decide whether the prevailing environment is like another situation with which he or she is familiar and whether the findings can justifiably be applied to the other setting (Rose & Johnson, 2020). In this study, the researcher provided a detailed report on all the observations that were made in different schools.

3.8.4 Confirmability

In qualitative research, confirmability is a key aspect of trustworthiness, aiming to approach as close to objective reality as possible (Norman et al., 2020). Rose & Johnson (2020) emphasizes that confirmability ensures that the researcher remains unbiased and does not distort the interpretation of participants' responses to fit a particular narrative. To establish confirmability in this study, the researcher meticulously documented the data using clear coding schemas that identified the codes and patterns identified in the analysis (Rose & Johnson, 2020). To promote trustworthiness, the researcher employed credibility, confirmability, and dependability. Ensuring trustworthiness is a fundamental responsibility for researchers conducting qualitative inquiries (Rose & Johnson, 2020).

3.9 ETHICAL CONSIDERATIONS

Ethics is a branch of philosophy that involves systematizing, defending and recommending concepts of right and wrong conduct (Sharma, 2020). According to Reamaer (2012), the most common way of defining "ethics" are norms for conduct that distinguish between acceptable and unacceptable behaviour. In this study, the researcher focused on the following considerations: permission to conduct the study, informed consent from participants, anonymity and confidentiality as well as conflict of interest.

3.9.1 Permission to Conduct the Study

The researcher had to seek permission to conduct the study from the university. I had to apply at the research ethics at the University of South Africa in the College of Education (CEDU). I received the ethical clearance on 8 June 2022, Ref:2022/06/08/61661481/10/AM. The researcher had to apply for approval to carry out the research from the knowledge management unit of the Gauteng Department of Education as well as the Johannesburg Central District (D14). Moreover, the researcher had to approach the school principals as well as the School Governing Board (SGB) members of those schools that were purposively selected to seek permission to carry out the study in their schools. Thereafter, the researcher had to send the consent letters to the parents for their approval to work with their children during the research.

3.9.2 Informed Consent from Participants

According to Fleming & Zegwaag (2018), informed consent process can be seen as the contract between a researcher and the participants. In this study, participants were given enough information regarding the research prior to the administration of the research. This was done by attaching a covering letter to the interview questions that states the purpose of the study. Issues related to the study were also mentioned such as the research aim, procedures of investigation and possible advantages and disadvantages were shared with the participants. The participants were fully informed of what was asked of them, how data was going to be collected and any consequences that could arise.

3.9.3. Assent for Minors

The concept of assent comes in when children cannot consent for themselves or protect their own interests (Spriggs, 2023). The minor assent involves the independent approval

to participate in research, given parental approval had been sought and granted (Nepi, 2019). The assent procedure reflects an effort to enable the minor to understand, to the degree they are capable of, what their participation in the decision-making process would involve (Cotrim et al., 2021). In this research minors were engaged in the collection of data. Therefore, the researcher had to request parental consent for their children to participate in the study. In the minor's assent form, the researcher explained that the parent's permission is voluntary. This will respect the minor's rights to dignity and autonomy (Spriggs, 2023).

3.9.4 Confidentially and Anonymity

Participant confidentiality means the participant's identity is known to the researcher, but the participants information is kept confidentially (Fleming & Zegwaag, 2018). will be de-identified and identity is kept confidential (Fleming & Zegwaag, 2018). Confidentiality involves safeguarding personal information about the participants, whereas anonymity ensures that even the researcher cannot discern which responses came from specific respondents (Dougherty et al., 2021). The practices of anonymity and confidentiality are used to protect the privacy of human subjects who are participating in a study while collecting, analyzing and reporting data (Badampudi et al., 2022). In this study no secret information was divulged since the right of confidentiality was respected. The participants were identified by pseudonyms and not by their names for confidentiality's sake. The data collected was also kept confidentially in the researcher's office under lock and key and will be kept there for a minimum period of 5 years.

3.9.5 Conflict of Interest

Fleming & Zegwaag (2018) defines conflict of interest as a commercial practice or scenario that, if not properly handled, can prioritise the interests of one group of clients over another. It can be difficult for the researcher not to let subjective feelings interfere with the study when familiarized with the participants. To mitigate this, a researcher did not conduct research in the school where she is teaching. The researcher disclosed all potential conflicts of interest by avoiding her roles and responsibilities. The researcher was also acknowledged for her position and interest, reviewing all illegally binding agreements before signing to ensure her consent to all the terms and conditions outlined.

3.10 CHAPTER SUMMARY

The current chapter focused on the methodology of the study. In this chapter, the researcher described and explained the research paradigms which are the positivist, interpretivism, constructivism and the critical paradigms. The descriptive qualitative research conducted in this study was described as the approach and design to be applied in this study. The purposive random sampling as well as the quota sampling was the two population sampling methods that were used to select learners that took part in the study. The data collection was collected using questionnaires, semi-structured interviews and observations from four cases and was analysed using thematic data analysis. In this chapter, ethical considerations and quality assurance measures were also covered. Issues in line with data presentation, analysis and interpretation of results obtained from collected data are discussed in chapter four.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The previous chapter focused on the methodology and techniques employed in collecting data for the current study. This study aimed to explore the level of environmental awareness and the existence of environmental practices among high school learners in selected schools in the Johannesburg central district. Additionally, the researcher examined the environmental activities and strategies carried out in high schools. The study aimed to answer the following main and sub- research questions.

4.1.1 Main research question

What is the level of environmental awareness and the existence of environmental practices among high school learners in selected schools in Johannesburg central district?

4.1.2 Sub questions

1. What are the environmental activities that are carried out in schools which portrays environmental awareness?

2. What strategies can be adopted to improve environmental awareness and to get over the problems related to environmental problems?

This chapter focuses on the data gathered through semi-structured face -to-face interviews, observations and open -ended questionnaires, which were analysed and interpreted in conjunction with the existing literature. Semi-structured interviews were conducted face- to -face with twelve purposively selected learners. The researcher asked questions, noting down important points while recording all interview sessions using a voice recorder. Open- ended questionnaires were issued to the fifty learners who were purposively sampled from grade 11 and grade 8 classes from the four selected schools. Furthermore, the researcher collected data through observations utilising an observation guide.

The researcher observed the environmental behaviour and actions linked to environmental practices. A large proportion of information provided by participants was

essential in answering the main research question. To properly analyse the data, the researcher had to consider the alignment of the theoretical framework, aims of the study, research questions, problem statement and the purpose of the study.

A thematic analysis was adopted to analyse the data. Thematic analysis method is a process of identifying patterns or themes within qualitative data (Maguire & Delahunt, 2017). Thematic analysis was used in this research as it allowed the researcher to make sense of collective or shared meanings and experiences of learners from different schools (Braun & Clarke, 2006). This may include identifying the environmental practices taking place in the selected schools. Moreover, thematic analysis is a flexible approach that enabled the researcher to generate new insights derived from the data (Braun & Clarke, 2006).

In this study, three main themes were identified: environmental activities in high schools, environmental knowledge acquired by learners and environmental awareness practiced in schools. For the theme of environmental activities in schools, the following categories were analysed: waste management, energy conservation and school projects. Under the theme of environmental knowledge, the categories of sustainable use of natural resources and environmental pollution were examined. Lastly, the theme of environmental awareness was analysed through the categories of environmental awareness campaigns and environmental clubs.

4.2 DESCRIPTION OF CASES AND CODES

Qualitative research utilizes non-numerical data such as words, phrases or even images (Kumar et al., 2006). To analyse this type of data, researchers need to code the data (Yin et al., 2014). A code is a label that describes the content of a piece of text (Linneberg & Korsgaard, 2019). The data that was coded, was essentially collected from a case study which is referred to as an experimental unit from which data are collected (Yin et al., 2014).

4.2.1 Cases

As previously mentioned in Chapter 3, this study employed a case study research design which is an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Yin et al., 2014). A case study of four schools in Johannesburg central

district was carried out where environmental practices were explored and analysed (Linneberg & Korsgaard, 2019). The use of case studies gave the researcher the opportunity to study the environmental problems in the same depth within a limited time scale (Cluzel et al., 2020).

The four high schools which are the cases were as follows: case A, case B, case C and case D. In the first two cases, twenty-six grade 8 learners (13 learners from each school) were purposively selected. In the last two cases, twenty- four grade 11 learners (12 learners from each school) were purposively selected. All grade 11 learners in schools were divided into groups according to their learning areas which were the languages, commercials and the sciences. This allowed the researcher to obtain an effective size from each group separately and to obtain samples from minority represented populations (Bayat et al., 2019). Fifty selected learners were a sample of the entire population as it is impossible to investigate the whole population (Acharya, 2013). This sample was neither too big nor too small that the researcher could not suffer accumulation of more data than the available time to analyse (Miles, 1994). These learners act as data sources in accordance with the purpose of the study (Sharma, 2020). From the same fifty, three high achieving learners from each of the selected schools were further selected purposively for semi-structured interviews.

The table below, table 4.1 represents the cases selected and the pseudonyms of the learners who were selected for the interviews and the completion of the questionnaires.

Table 4.1 Cases and Participants

DATA COLLECTION METHODS	**CASE A**	**CASE B**	**CASE C**	**CASE D**
QUESTIONNARES	Is presented by: G8 1-13	Is presented by: G8 14-26	Is presented by: G11 1-12	Is presented by: G11 13-24

INTERVIEWS	Is presented by: G801 G802 G803	Is presented by: G814 G815 G816	Is presented by: G1101 G1102 G1103	Is presented by: G1113 G1114 G1115

4.2.2 Codes

According to Korsgaard (2018), coding is identifying segments of meaning in your data and labeling them with a code which can be defined as a word or a short phrase that symbolically assigns a summative, salient and essence-capturing and evocative attribute for a portion of language –based or visual data. This process is important in analysing qualitative data as it allows the researcher to pick out relevant information to show the reader (Pratt, 2009). The codes in this research were derived from the data that was collected in a way to answer the research questions. The study aimed to understand the level of environmental awareness and related practices among high school learners. This included the environmental activities that were carried out in schools and the strategies that could be adopted to improve environmental awareness and to mitigate the problems related to environmental problems.

According to Williams & Moser (2019), coding in qualitative research is comprised of processes that enable collected data to be assembled, categorized and thematically sorted, providing an organised platform for the construction meaning. Coding is a process of assigning codes, words or phrases that identify to which topics or issues portions of data refer, and organizing the data in a way that is useful for further analysis (Gupta et al., 2007). Generally, coding reduces lots of data into small chunks of meaning (Maguire & Delahunt, 2017). The table below, Table 4.2 illustrates the codes that were used by the researcher in this study and their meanings.

Table 4.2 Codes Used in Data Analysis

CODE	MEANING
PP	picking up papers
RRR	reuse, reduce & recycling
SB	Sorting bins
NS	Natural sunlight
SP	Solar panels
ES	Energy savers
TP	Tree planting
GN	Gardening
GG	Greenhouse gases
FB	Burning of vehicle fuel
CC	Climate change
EP	Environmental pollution
RS	Resource sustainability
ED	Environmental degradation
EC	Environmental clubs
ECA	Environmental campaigns

4.3 DATA PRESENTATION

According to In & Lee (2017), data is a set of facts that provide a partial picture of reality. The above-mentioned authors further explained that data is usually collected in a raw format thus the inherent information is difficult to understand (In & Lee, 2017). There is a need for the data collected to be interpreted by people to have a full understanding of what will be happening in the research and thus where data presentation comes in. Data presentation is a process of using various graphical formats to visually represent the

relationship between two or more data sets so that an informed decision can be made based on them (Remus, 1984).

4.3.1 Research questions, themes and categories

There were two research questions that the researcher aimed to answer. These were as follows: what are the environmental activities that are carried out in schools which portray environmental awareness and what are the strategies that can be adopted to improve environmental awareness and mitigate environmental related problems. As mentioned on the introduction of this chapter, to analyses the responses that were given to answer the questions, the researcher had to use the thematic analysis method. According to Dawadi (2020), thematic approach is teaching in which a single context forms the basis of a unit of learning. Three themes were derived in this study. Thematic analysis is an accessible, flexible, and increasingly popular method of qualitative data analysis (Braun & Clarke, 2006). According to Boyatzis, (1998), thematic analysis is a process of encoding qualitative information involving reading through a set of data and looking for patterns in the meaning of data to find themes.

The table below represents the research questions, the themes and categories that answer the research questions. The theme(s) for each research question were highlighted and the categories which fall under the themes were listed against the theme(s) in this table.

Table 4.3 Research Questions, Themes and Categories

Research questions	**Themes**	**Categories**
1. What are the environmental activities that are carried out in schools which portrays environmental awareness:	Environmental activities carried out in high schools.	Waste management. Conserving energy at school level. Projects carried out in schools to enhance environmental education.

2. What strategies can be adopted to improve environmental awareness and get over environmental related problems?	Environmental knowledge that the learners have acquired. Environmental awareness portrayed by the leaners.	Sustainable use of natural resources. Environmental pollution. Environmental campaigns and Environmental clubs.

4.4. RESULTS

The section below presents the results of the study after data analysis and interpretation. The qualitative results are presented in themes and categories following the adoption of a thematic analysis approach that was earlier mentioned in this chapter. Dawadi (2020) describes a theme as a variety of learning experiences that are situated over an extended period. In this research three themes were derived which included the environmental activities carried out in high schools, the environmental knowledge that the learners have acquired, and the environmental awareness practiced in schools. Each theme was derived from sub-questions that were answered by the learners on their view of environmental awareness and their related practices.

4.4.1 Theme 1: Environmental Activities Carried in Schools

Environmental activities are any events which reduce or eliminate pressures on the environment and which aim at making more efficient use of resources (Zsoka et al., 2013). According to Carson (2011), the history of the earth's life of living things interacts with their environment. This interaction may lead to environmental damage if not controlled or replenished and hence the need for environmental activities to be carried out. In this study, the researcher gathered information on some environmental activities that were carried out by learners in high schools. These included waste management, conserving energy and some projects carried out in schools to enhance environmental education which falls under categories of this theme.

4.4.1.1 Category 1: Waste Management

In this category, the researcher aimed to understand how learners manage waste in schools. According to Maphosa (2023), waste management is a challenge in developing countries such as the Republic of South Africa hence the researcher had to understand how it is done in schools. On her observation schedule she had to observe the ways in which waste is managed in schools which includes the quantity and type of rubbish bins, recycling materials used and other ways reducing waste such as compost making. The researcher observed learners in Case B and D picking up trash and throwing it in the labelled bins. At case B it was done according to the classes on duty after every break. In case D, all learners would pick up the trash after break and after school sessions.

In both cases, the researcher observed that some under privileged people were allowed in schools on specific days to collect the sorted trash for sale to the recycling companies. This would assist the community financially and at the same time protect the environment. Case C did not have sorting bins, but there was a culture of dustbins in corridors as well as in each classroom. There was a policy under the trash disposal. This policy stated that litter was only to be disposed of in dustbins. The repercussions of not following the policy were also stated in the policy such as the cleaning up of the corridors. The application of the policy assisted in minimising the throwing of litter everywhere. Picking up of paper and utilisation of sorting bins indicates that the learners value a clean environment. Moreover, the same learners had an idea of recycling as they promote the use of sorting bins. The schools also involve the community in maintaining their environment by reducing greenhouse emissions and reducing energy consumption of making new products from raw materials.

The researcher also observed that most learners in Case A carried reusable water bottles to fill in water before going back to their classes after break. At Case A there was a borehole installed and most of their learners had a culture of drinking water more than any other drinks. In the same school, case A as well as Case C used the paper packs to serve the food sold at their tuck shops. Moreover, at Case C they used paper straws for drinking their juice or cold drinks. Use of reusable bottles results in a smaller number of empty bottles to be thrown into the dustbins and hence less plastic production and waste in the landfills thereby reducing pollution. Buying cold drinks and juices results in more litter in school, however; the paper straws and paper plates are easily biodegradable which

an advantage to the environment is. These results imply that in high schools, there was a lot of effort that learners were putting to reduce waste on the environment. Moreover, the learners were aware of the advantages of using reusable bottles on the environment.

Based on the observed behaviour in Case B and D of throwing trash anyhow and only waiting for end of breaks to pick trash and throw it in the bins portrayed an environmentally irresponsible behaviour. Learners seem to understand that throwing of litter poses a threat to the environment. However, the tendency of being environmentally irresponsible and only correcting the mistakes after is a challenge. In Case C, a policy stipulated throwing of litter as a serious offence. There were serious consequences for throwing of litter anyhow. Case A and C is a true reflection of *"taking action for a better environment"*.

During interviews, the researcher asked one question that is directly linked to waste management. The researcher wanted to understand how human activities contribute to the reduction of climate change. Some learners from all four cases explained that recycling helps to reduce greenhouse gases by reducing energy consumption. They were able to explain how greenhouse gases lead to climate change giving some examples. For instance, one learner from Case A, G08 03 explained that *"using recycled materials will reduce the utilisation of the new materials that also produce excess gas emissions when extracted"*. Another learner in Case C, G1105 mentioned that *"people need to practice smart shopping whereby they will be using reusable bags rather than disposable bags that can increase the greenhouse gases"*.

Another learner from Case B, G0814 elaborated on this by encouraging customers to buy products from recycling materials such as paper, plastics that also reduce energy consumption. Another learner from Case D, explained the *"ecological science of climate change in that, the more waste prevention and recycling paper products are promoted it will allow more trees to remain standing, where they can continue to remove carbon dioxide from the atmosphere and hence reduce the climate change"*. However, most learners were generally giving the one-word answer without giving further information. There is a need to give more information to the learners so that they can relate human activities to the environmental issues. From the interview, learners seemed to have knowledge about ways to minimise human activities that might be harmful to the environment.

From the questionnaire, there were two questions which were asked that were linked to waste management. The researcher wanted to understand the learners' knowledge on what recycling is and the items that are used in schools which lead to waste management that can be recycled. The first question on the questionnaire was on defining recycling and naming at least three items that can be recycled. Some even listed more than three which were asked. On their list were the following items: plastic items such as juice bottles, water bottles, sauce and spice bottles and plain drinking cups, cold drink bottles, newspaper, cardboard, office paper, books and magazines. Across all cases A, B, C and D defined recycling as the process of converting waste into reusable materials. However, there were a few learners in all cases who failed to give a proper definition of recycling. For example, from cases A and B, learners G0804 and G0814 respectively defined recycling as to *"cut back on the amount of trash generated".*

The second question was what learners would do with a piece of trash where there is no trash bin closer to them. On this question, most learners in Case C responded that they would look for the next found dustbin and dispose of the trash in the proper place. At Case C, learner G1112 responded that she would rather be late for a class looking for a trash can to dispose of the trash in a proper place. She further explained that trash will be collected for recycling if it can be recycled. However, from Case A, learners were not that worried about throwing trash anywhere. Some responded on living trash on desks for the maintenance people to pick the trash up. Learner G808 mentioned that she will *"leave the trash on their feeding tables for the cleaners to correctly dispose the trash".* This reveals that learners from this school are not encouraged to be part of waste management in the school which leads to more pollution in the school environment.

Table 4.4. Summary of results on waste management

Case A	Case B	Case C	Case D
Trash bins not easily accessed	Labeled sorting bins available	Dustbins in corridors and classrooms	Labeled bins available
		Displayed policy on trash disposal	

Use of reusable water bottles	Learners buy water from the school shop	Use of reusable packaging	Learners buy water from the school shop

4.4.1.2 Category 2: Energy Conservation

From the observations, the researcher wanted to understand how light energy has been conserved in schools. On her observation list she had to observe the energy sources that were used in schools. She had observed that in most cases, learners were taking advantage of natural sunlight by not switching on lights in broad daylight. Learners were also switching off lights in unoccupied rooms. Schools would only switch on the lights when the environment is dark or cloudy, thus taking advantage of the natural sunlight to conserve the energy. Most rooms which were not occupied all the time such as the auditorium, the school hall and some laboratories always had lights off. They were only switched on during the times when they were occupied. For instance, lights were only switched on in the auditorium during assembly period and in the science lab only during practical times.

The researcher also observed that in cases A, B and Case D they are now using energy saving light such as the LEDs which use 85% less energy as compared to the original lights. In cases A and D were even extending the saving of energy by using renewable sources of energy such as solar panels. For example, in Case A, they installed solar panels in all classrooms as well as the administration block. In this school they operate as usual even during the load shedding times. In Case D, only the administration block has some solar panels installed. The office work can continue even during the absence of electrical power. The results of the current section transpired that high school learners were involved in the conservation of energy including light and the electrical energy and were aware that electrical energy from solar is a renewable resource which can be continued to be used for generations to come.

In the semi structured interviews that were conducted under energy conservation, the researcher wanted to understand the link between human activities and energy conservation. On the interview guides were two questions concerning the human activities. On the first question, learners described recycling as a human activity that leads to energy conservation. For instance, one learner in Case C, G1103 explained that

"manufacturing products from recycled materials typically utilising less amount of energy as compared to the making of products from scratch".

Some learners explained that some human activities do not conserve energy. These activities include the burning of energy sources which results in over utilisation of energy leading to more environmental problems.

The burning of energy resources such as coal, charcoal; and any other fossil fuels during cooking may lead to the accumulation of carbon dioxide in the atmosphere. Learners came up with ways to minimise the accumulation of carbon emissions such as using cleaner energy resources that are renewable, giving examples of solar and hydroelectric power. One learner from Case B G01114 explained that *"burning of fuels when people are driving their cars may lead to more combustion"*. She encouraged people to use public transport that will reduce carbon emissions and hence less degradation on the atmosphere. The information that these learners were highlighting implied that the learners were aware of most environmental processes. The learners could link human activities such as burning of fossil fuel to more carbon emissions resulting in the climate change. From the data presented, it transpired that there is a higher level of environmental awareness in high schools.

From the questionnaire, the researcher wanted to understand the learners' interaction in environmental conservation activities in schools. Learners were asked a general question if they are involved in any environmental conservation projects. This question required a yes or no response. Almost half of learners in all cases responded yes whilst the other half responded gave a no response. In another question on the questionnaire, learners were asked what they think can be done to conserve energy at school level. Most learners across all cases A, B, C and D stated that there is a need for educating learners on the importance of conserving energy and encourage everyone to adopt energy-efficient habits. They also mentioned that there is a need to encourage learners and staff to power down equipment when it is not in use, such as computers, projectors, and printers.

Only a few learners, including three from Case A who were coded G0804, G808 and G811 and one from Case D coded G1118 mentioned that *"there is a need to install programmable thermostats to control the temperature in classrooms and other areas of the school, so that heating and cooling is only used when necessary".* Learner G0811 from Case A continued to write that "there is a need to use proper insulation that can help

to reduce energy consumption by keeping heat inside during winter and outside during summer". Another exceptional response was from most learners in Case A and one learner from Case B, G0817 who mentioned that *"the use of energy-efficient appliances, such as refrigerators and freezers, in the school areas also reduces the used of energy"*. On learners' interaction in environmental activities, almost half of the learners were having more information, and they are willing to learn more on conservation. This means that there is still a lot of work to be done on environmental awareness in high schools.

Table 4.5 Summary of results on energy conservation

Case A	Case B	Case C	Case D
Use of natural sunlight	Use of natural sunlight	Use of natural sunlight	Use of natural sunlight
Energy saving lights	Energy saving lights		Energy saving lights
Solar panels			Solar panels
Knowledge on the use of thermostats			Knowledge on the use of thermostats
Energy efficient appliances	Energy saving appliances		

4.4.1.3 Category 3: Projects Carried in Schools

The researcher wanted to identify the environmental projects that were carried out in schools that can be recommended for environmental protection. On her observation schedule she had to observe the school activities that are linked to the environment. From the observations, the researcher observed that in all the schools that were surveyed they had vegetable gardens. The difference was in the type of the vegetables and how they took care of the plants. In Case A, their vegetable garden was always green despite the spring season. They used the sprinkler pipe to water their garden. Learner participation

was limited in this school. This might be since there were many grounds man who were employed to do most of the work. However, in other cases, thus cases B, C and D learners used to water the garden during specified times per grade. It was a culture in those cases that learners must take part in the maintenance of their gardens. This also includes the weeding, seeding as well as watering of plants. This implies that in most schools, the learner participation generally is limited when it comes to real gardening. This is because learners have to be acquainted with all the information from the beginning thus beds preparation, planting seeds and not only maintenance of plants grown by other people so that they can establish their own gardens even at their homes thereby raising awareness even in their communities.

Another project that was observed was that of tree planting in schools. In all schools that were part of the survey, there was evidence that tree planting was once practiced or still being practiced. Case A was more characterised by the fruit trees. There was a section of the school orchard which had so many different types of fruit trees. At Case B the researcher observed some recently planted trees from the entrance point. In the same school there were also some grown trees on the school grounds. In Case C were some old trees and were not even well maintained. The trees were on the outskirts of the school. Learners were not using them for shelter. They were just part of the environment. In Case D, there were some trees around the playground. Some learners would enjoy the shade during their break times. The above results transpired that there is greater element of tree planting projects in schools especially with the young trees planted at the entrance gate. It shows that they are even encouraging everyone who visits their schools to have the idea of tree planting.

They were some school projects that were practiced in some cases that were exceptional. These include compost making and the installation of rainwater tanks in schools to enhance environmental education. In Case C, the researcher observed some learners being involved in compost making. Learners were participating in collecting biodegradable material for compost making. This school would result in advanced environmental practices as compared to other schools. In Case B was a very large water tank reservoir which collects the rainwater that will be used in the dry days especially during the rainy season. In this case, they water their plants using the stored water the whole of the rainy season thereby conserving the tap water.

Compost making is a way of reducing food waste from landfills. In the same case, food waste from the feeding scheme, leftovers, and the peels from vegetables and the food waste from the tuckshop were all thrown in a pit to form compost. Learners were involved in collection of garbage and filling the compost with some grass and soil to form compost. After maturing, the same compost was added to the school garden instead of applying fertilisers. Involving learners in compost making is a good example of good practice as this helps them to understand the essence of applying compost than buying artificial fertilisers thereby promoting sustainable ways of taking care of the natural soils.

During the administration of the questionnaires, the researcher wanted to understand the learners' ideas on environmental protection through carrying out projects. There was a question that was asked in line with the application of project ideas on environmental protection. Learners were asked what they consider to be the main function of trees in the environment. Most learners across the cases were responding that the main function of trees to the environment is to act as carbon sinks. Trees absorb carbon dioxide from the atmosphere, and they use it in their process of photosynthesis thereby producing carbon dioxide. Quite a few learners were able to explain further that this will reduce the amount of carbon dioxide in the atmosphere thereby reducing the rate of global warming. There were some learners who were mentioning a different function of trees. For instance, from Case C, learner G1113 and leaner G0803 from Case A, explained that trees supply oxygen which will be utilised by other organisms that are found in the environment for the process of respiration".

The other response which was given by learners from cases B and D was that trees are important to the environment as their roots bind the soil particles together thereby reducing the environmental degradation. Some other learners were able to give function of trees. For instance, learner G0814 from Case B mentioned that *"trees can be habitats of other organisms such as birds". Learner G1111 from Case C stated that "trees are part of the food chain which enables energy flow in the ecosystem".* By learning acquainted with the great importance of trees to the environment, they will have more practice in their lives even in their communities thereby raising more environmental awareness. As a result, the rate of erosion, climate change and environmental degradation will be reduced.

To gain more information on the learner's ideas to protect the environment, the researcher had to interview the learners. On the interview guide was a question on what can be done to reduce environmental degradation which was mostly answered by the projects carried out in schools. Learners that were interviewed mentioned that the issue of covering the soil with plants such as vegetables which the roots will bind the soil particles and prevent the loss of soils leading to environmental degradation. Learner G1106 from Case C gave a detailed explanation of the school gardening reducing environmental degradation when she mentioned practicing of crop rotation. She explained that *"some plants will leave their nutrients in the soil which can be utilised by the next plant".* The learner gave an example of leguminous plants that were planted in the previous season thereafter they planted rape vegetables which was more productive than before. She suggested that it was due to the ammonia that was left by the leguminous plants. Another learner from Case B (G0821) explained that "by crop rotation there will be no need to add artificial fertilisers which will degrade the environment". The results prove that the experiential learning, thus the hands-on practices in which the learners are involved in enlighten these leaners with more environmental information and awareness.

Table 4.6. Summary of results on projects carried in the schools

Case A	Case B	Case C	Case D
Availability of vegetable garden	Availability of vegetable garden	Availability of vegetable garden	Availability of vegetable garden
Maintenance of the garden by grounds man	Maintenance of the garden done by learners	Maintenance of the garden done by learners	Maintenance of the garden done by learners
Fruit trees planted	Recently planted trees	Old trees in the outskirts not well maintained	Trees around the school providing shade to the learners

	Water harvesting	Compost making	

4.4.2 Theme 2: Environmental Knowledge that the Learners Have Acquired

Environmental knowledge is the amount of information individuals has concerned environmental issues and their ability to understand and evaluate its impact on society and the environment (Vallero, 2021). In this study, the researcher had to collect information on environmental knowledge acquired by the learners. This included the best ways of sustainable use of natural resources and ways to reduce pollution. The researcher also gathered information on the environmental skills that were practiced in schools. Observations, semi-structured interviews as well as questionnaires were administered to outsource as much information as possible from the learners.

4.4.2.1 Category 1: Sustainable Use of Natural Resources

According to Chau et al. (2022), the sustainability of natural resources has become a global issue that requires the focus of recent literature and policymakers. Human societies rely on natural resources available both locally and in other regions of the planet (Tu et al., 2019). Thus, they must be a close monitoring of resources for the current and future generations.

From the questionnaires, the researcher wanted to assess the level of high school learners' knowledge on what sustainability is. She had to ask two questions linked to environmental knowledge on sustainability. The first question was a multiple-choice question to describe what sustainability means from given choices. Thus, question required learners to understand what sustainability is in detail and not just a general idea. Most grade 11 learners from the two cases were able to describe sustainability as to avoid depletion of resources. However, most grade 8 learners failed to give a proper response. They were saying the opposite, responding to sustainability as the exploiting of resources or utilisation of natural resources.

Another question was on selecting the most important activity to ensure the environmental health for future generations. This was answered well by the grade 11 as compared to the grade 8 learners. Their response was that people should learn to live with less and be more efficient users of energy and materials. This implies that learners have

the knowledge on sustainability from other related subjects they will be learning. The more they are in school the more they will understand environmental concepts. There is a need to maintain EE related subjects from early grades so that leaners will be able to apply environmental knowledge beyond the obvious facts known by any layman's person.

To understand further the learners' knowledge on the impact of unsustainable utilisation of resources, the researcher had to ask different questions through the semi-structured interviews. One question was based on the factors or activities that lead to the degradation of the natural environment. A learner G1114 from Case D mentioned that *"unsustainable land use patterns are the root causes of environmental degradation"*. Another learner from Case B, G1117 gave examples of such activities as the global warming due to the excessive exploitation of forest resources such as firewood from natural trees. From the same case, one learner G0822 also mentioned that *"the overexploitation of resources such as coal led to the production of more fumes and gases that lead to climate change".* Some learners mentioned sustainability as a contributing factor to reduce environmental degradation.

One learner expanded this point by explaining that sustainability monitors the rate at which the resources will be used, and this will minimise or avoid the exploitation of the natural resources and therefore less degradation will be experienced. These results indicate that the high school learners from the cases studied were more knowledgeable about the impacts of unsustainable use of natural resources. The more the learners have knowledge on how to manage resources sustainably, the more they can protect their environment from the negative effects such as depletion of natural resources and climate change. Knowledge on sustainability also enables the learners to improve on their ways of lives from ordinary ways to sustainable ways. Such as the use of organic fertilisers than artificial ones, use of renewable sources of energy such as the solar system that uses the resources such as coal which can be depleted.

From the observations, the researcher wanted to understand the learner's capacity to manage their environmental resources sustainably. On the observation schedule the researcher had to observe the sustainable attitudes in all cases that were observed. The attitudes observed were such as energy efficiency, waste reduction, water conservation and green buildings. Most buildings in all cases were well ventilated. This would improve indoor air quality and hence reduce indoor air pollution. Some cases were going an extra

mile in carrying sustainable attitudes. In case B water was conserved in the form of a trench which was dug from the water tap to the banana trees. Water spillage from taps was directed to the trees to avoid water wastage. In case A, most of the buildings were constructed using sustainable non-toxic materials such as bamboo, recycled steel and reclaimed wood.

This is line with the United Nations Sustainable clean water and sanitation goal of sustainability where people are encouraged to ensure availability and sustainable management of water and sanitation for all (Montiel et al., 2021). They also emphasised ensuring universal access to affordable electricity by 2030 meaning investing in clean energy sources such as solar, wind and thermal. Expanding infrastructure and upgrading technology to provide clean energy in all developing countries to encourage growth and a healthy environment. Promoting sustainable attitudes in schools might develop knowledge that will reduce environmental degradation and thereby improve the current environmental standards as well as for the generations to come. High school learners in the four cases observed seemed to be more equipped with enough environmental knowledge that will assist them in decision making in their everyday lives.

Table 4.7 summary of results on sustainability

Case A	Case B	Case C	Case D
Said the opposite of sustainability	Said the opposite of sustainability	Well explained sustainability	Well explained sustainability
Buildings well ventilated	Buildings well ventilated	Buildings well ventilated	Buildings well ventilated
Sustainable non-toxic materials	Trench from tap to banana trees		Solar panels

4.4.2.2 Category 2: Environmental Pollution

According to Valente et al. (2016), environmental pollution is the contamination of the physical and the biological components of the atmospheric system to such an extent that normal environmental processes are adversely affected. Environmental pollution is increasing gradually and causing a serious impact on living organisms including humans. Environmental pollution led to the decline in environmental quality, which is evidenced by loss of vegetation, biological diversity, excessive amounts of harmful chemicals in the ambient atmosphere and in food grains, and growing risks of environmental accidents and threats to life support systems (Rai & Thapa, 2015).

In this study, the researcher wanted to understand the environmental knowledge acquired by the learners that can be linked to human activities and the current environmental problems. From the questionnaire, she had to ask two questions. The first question required the yes on no responses on the fact that individuals are the worst polluters. Most learners across all the four cases denied this statement, their response was a "No". The researcher further asked another question in relation to human activities and environmental pollution which was on ways to ensure a healthy environment. The predominant response expressed suggested the need for the industries contributing to pollution to cease operations, even if it results in job losses. Conversely, the less frequently mentioned viewpoint advocated for individuals to cultivate greater efficiency in their use of energy and materials. However, there were few learners across the four cases who gave the response which was exceptional and more valid. These learners include G0822 and leaner G0814 from Case A, G0809 from Case B, learner G1103 from Case C and leaner G1115 from Case D, the listed learners responded that there is a need to find ways for improved economic development that minimizes pollution. Semi-structured interviews were also carried out to gain more details on learners' acquired knowledge that can be linked to human activities and the current environmental problems. The question which was asked was linked to human activities and the specific environmental problem of climate change. Most learners believed that most human activities lead to climate change. However very few learners were able to explain how the activities lead to climate change. A few learners mentioned that the activities such as industrialization, urbanization and agriculture that have led to the clearance of trees which have reduced the carbon sink in the environment. They also mentioned the burning of fossil fuels when people are travelling by cars, fuels from industries during production

and burning of energy resources in households that these will increase the carbon emissions and thereby resulting in global warming and hence climate change.

Getting this detailed response from a few learners shows that learners are not yet acquainted with the knowledge of dealing with human activities and environmental problems. There is a need for more information to be given to most learners. The researcher also wanted to understand the high school learners' knowledge to identify the impacts of pollution. She had to ask a direct question through the questionnaire about people's health being affected by pollution. Most learners across all cases responded with a yes on this question. The other question was a multiple-choice question was learners had to identify the impact of atmospheric pollution. The common response was acid rain and a very few learners were giving wrong responses such as the blue sky and the rainbow.

The results above reveal that high school learners could identify the impacts of pollution on the environment. This will enable them to minimize these impacts by providing detailed information to the community starting from their own households. Overall, this will increase environmental awareness.

4.4.3 Theme 3: Environmental Awareness carried out to Eradicate Environmental Related Problems

There are many ways in which high school learners can create awareness to reduce the environmental related problems. Environmental awareness aims to develop skills, attitudes, and values, which are necessary to comprehend and appreciate the relationship between people and their socio-economic and biophysical environments (Loubser, 2005). It is believed that environmental problems will be reduced through promotion of environmental awareness (Islamoglu et al., 2017); hence environmental awareness is a pivotal element of the current study. In this study the researcher aimed to understand the environmental awareness programmes that were carried out in high schools.

4.4.3.1 Category 1: Environmental Awareness Campaigns

According to Muller (2021), public awareness of the environment is required to help community groups and individuals to gain a basic understanding of the environment and related issues. From the questionnaires, the first question was aimed on the understanding

of the concept of environmental awareness and environmental awareness campaigns. Learners in Case C gave general responses such as environmental awareness is the gradual understanding of the environmental issues. Another general response from Case B was that environmental awareness is understanding the environment. In Case A the description of awareness campaign was given as the impartation or transferring of knowledge about something so that more people will have ideas of the issues. A few learners in Case A had to give a full description which included the environment and awareness campaigns. They described environmental awareness campaign as the way of encouraging and alerting people about the environment protection. Another leaner from Case A, G0812 was so specific that it enlightens people on how to take care of their environment. Having learners who are aware of the environment creates an atmosphere of knowledge transfer from young people to the community at large.

The researcher had to understand further environmental awareness campaigns through the observations that she carried out. On the observation schedule, the researcher had to observe any environmental programs carried out in schools. The fascinating program observed was that of the environmental campaigns. At Case B, learners were writing posters in a creative way, well designed about the ozone layer depletion day which is commemorated in September of every year. Most of the posters were posted on the school noticeboard carrying more information including the dangers of ozone depletion such as skin cancer. The posters were also carrying solutions to ozone depletion such as tree planting projects. Another form of environmental campaigns was noticed in Case C was one learner presented a poem on the advantages of tree planting during their assembly period. Some learners in this study give the impression of being good at disseminating information about the environment to the other learners thereby creating awareness and environmental protection.

4.4.3.2 Category 2: Environmental Clubs

According to Houmam and Aomar (2023), environmental clubs are a form of environmental education, particularly to catch learners' attention due to their potential to raise awareness and mobilize the younger generation. In this study, the researcher observed that some cases were having environmental clubs during their extra- mural activities time. This was common in three cases, Case A, B and Case D. In Cases B and

Case D, the environmental clubs were observed, but they seemed not to be more effective. In both cases the researcher observed learners on meeting different days. There was no consistency, and they were not focusing on a certain topic. However, in Case A learners would meet on Wednesdays, a specific class to discuss environmental issues and how to solve them. On the particular day they were discussing the floods which were now an environmental problem in Durban. Most of the learners explained that the route cause is climate change caused by human activities such as industrial air pollution. Generally, environmental clubs would allow learners to have time to discuss environmental issues and ways to minimize as well as solving them. This helps to convey environmental information from one learner to another thereby creating awareness in schools.

4.5. DISCUSSION OF FINDINGS

The assessment of the level of environmental awareness and the existence of environmental practices among high school learners in selected schools in Johannesburg central district results were collected. The findings from these results include the environmental actions practiced by high school learners, the environmental knowledge that was adopted to improve environmental awareness and solve the problems related to the environment.

4.5.1 Theme 1: Environmental Activities Carried in Schools

Theme one focuses on the environmental activities carried out in schools to assess the level of environmental awareness and existence of environmental eco-friendly practices among learners in schools. According to Handayani & Ariyanti (2020), environmental awareness is to attend to an environmental issue and its respective action leading to realising a good practice to achieve a sustainable environment. Environmental awareness is a very important factor in the lives of societies whether the advanced or the developing ones, though the need for such awareness in the developing societies tends to be stronger as the relation is significant between the environmental awareness and the comprehensive development which the developing societies strive to achieve (Hart, 2013). Therefore, it is imperative to understand the environmental activities carried out in schools that witness environmental awareness among learners who are the future leaders of our societies. Waste management, energy conservation, gardening, rainwater collection, tree planting,

improving school grounds and compost making are considered as environmental activities (Rosenberg, 2008).

These environmental activities will be further discussed in the following sections as categories that emerged from literature and findings of the current research. Below the researcher discussed the categories in detail and support the findings by literature. The categories that the researcher discussed are waste management, energy conservation and environmental projects as categories that emerged from the above discussed theme. Again, interviews and observations were used to validate the responses of participants through questionnaires.

4.5.1.1 Waste Management

To understand and give meaning to the results of the current research, it is important to reflect on literature regarding waste management. According to Demirbas (2011), waste management is described as a process by which waste is gathered, transported and processed before disposal of any remaining residues. Similarly, Darby et al. (1993) describes solid waste management as the effective supervision and handling, keeping, collection, conveying, treatment and disposal of waste in a manner that safeguard the environment and the public. Darby et al. (1993) added that, solid waste management utilises skills and knowledge from various discipline such as legal, financial, administration among others in the day to day running of waste management issues. Demirbas (2011) suggested that the main reason for managing waste is to ensure a safe environment. Troschinetz & Mihelcic (2009) mentions that some waste management methods involve reuse, recycling, composting and energy generation.

During the observation only two cases from the four cases were involved with the recycling of waste materials. These cases were Cases B and D which had sorting bins, and the trash was taken out for recycling. This implies that only about half of the schools sampled are practicing ways to best manage waste. This behaviour implies that there is an urgent need to raise awareness towards recycling as a means of waste management. This is line with what Mkhonto & Mnguni (2021) suggested towards waste management. The authors suggested that addressing socio-economic topics in environmental education, such as recycling solid waste, is relatively urgent (Mkhonto & Mnguni, 2021). The authors further explained that schools must be involved in waste management initiatives to reduce emergent environmental degradation (Mkhonto & Mnguni, 2021). In another

study by Malik (2016), the authors. They further explained that school learners must be involved in direct practice sorting and recycling waste in the school environment (Malik, 2016).

From the results, it emerged that the schools were involving the community in the waste management process. Community engagement plays a pivotal role in waste management and recycling, as it fosters a sense of responsibility, promotes awareness, and encourages active participation in sustainable waste practices (Davids, 2023). Cases B and D involved the community in waste management by allowing them to come and collect sorted waste for recycling. This is in line with EPA (2018), which emphasise the community exploring environmental issues and being engaged in problem solving and taking action to improve the environment. Fine (1993), further explained that everyone should take responsibility for his or her impact on nature. Kaswan & Rathi (2019) also mentioned that as the community quest to satisfy its needs it should not compromise the quality of the environment.

As mentioned in the presentation results section, one of the cases studied had a waste management policy. The policy was put up on the school noticeboard and code of conduct making it easy for everyone in school to see it and abide, stating that litter was to be disposed only in the provided dustbins. This act from the school enforced the importance of a clean environment and made every learner part of the initiative to keep the school environment clean. The development of the school policy on waste management is line with the South Africa's Nation Waste Management Act of 2008 which makes provision with respect to measures to improve waste practices including treating and safely disposing of waste (Department of Environment, Forestry & Fisheries (DEAFF, 2017).

Another method that schools are using to reduce waste is re-use (Troschinetz & Mihelcic, 2009). In Case A the learners drink from borehole water which is cleaner and safer for drinking. In this case, learners are encouraged to fill in their reusable water bottles. This will reduce the buying of bottled water that will increase trash in the school thereby increasing learners' environmental awareness. Marpa (2020), in their study they carried out in the Philippines mentioned that improper waste management are now being experienced by the inhabitants of the mother earth and they encouraged environmental awareness and practices to be utilised to reduce the problem. Maphosa (2023) suggested that there is a need to focus on waste reduction sitting specific environmental designs

such as cleaner productions and controlling all kinds of wastes and their resultant environmental effects.

In my view, waste management should be a priority for all individuals. Hence, it is important for learners to be exposed to all waste management methods. Some of the methods may also assist with elevating poverty as recycling is another entrepreneurship opportunity and reuse may also assist with cost-saving. According to Matinde et al. (2018), metallurgical wastes can be integrated to form a circular economy model that promotes zero wastes through recycling and reuse of these waste materials as secondary sources of valuable minerals and metals. Having communities, who are mindful of these methods, does not only assist in environmental protection, but also with the sustenance of the economy which is one of the pillars of sustainability. Therefore, the researcher recommended that the DBE makes it a priority to enforce such methods in schools as environmental activities to be carried out in schools and communities at large.

4.5.1.2 Energy Conservation

To get a clear picture of the analysed results, it is crucial to give a highlight of information about energy conservation. According to the literature gathered, energy conservation is the effort to reduce wasteful energy consumption by using fewer energy services (Jaelani et al., 2020). This can be conserved by reducing waste and losses, improving efficiency through technological upgrades, improving operations and maintenance as well as changing users' behaviours (Zaman et al., 2023). Booysen et al. (2021) listed the ways in which energy can be conserved in schools. These include the turning off lights of unoccupied rooms as well as the use of natural light instead of switching on electric lights always. Jaelani et al. (2020) emphasised that energy conservation is important in promoting sustainability towards energy needs. Chung & Rhee (2014) have explained that schools are considered as one of the most important places for applying energy efficiency and conservation to reduce the operating cost, as well as having the opportunity to teach the learners how to become energy efficient citizens. In this study, cases A, B and Case D portray this by using energy saving light such as the LEDs which uses 85% less energy as compared to the original lights. Moreover, in all cases learners are taking advantage of natural sunlight thereby conserving the light energy. Conserving light energy and being energy efficient will reduce electric consumption in general. Lighting accounts for nearly 50% of the electric bill in most schools (Booysen et al., 2021). There is a need

to improve and monitor energy conservation programs in schools to promote sustainability of energy resources.

Renewable and clean sources of energy such as solar energy are increasingly used as a substitute in the load shedding times. According to Gillani et al. (2022), solar energy improves the learning outcomes as well as reducing pollution. They urged the policy makers to focus more on expanding the use of renewable energy resources to reverse the detrimental effects of climate change. In this study, cases A and D are putting an effort to reduce climate change by using renewable sources of energy such as solar panels. According to Chung & Rhee (2014), Schools which save a lot of energy will reduce energy usage thereby reducing global warming. Moreover, use of cleaner and renewable sources of energy such as solar power reduces the accumulation of carbon gases in the atmosphere. This is line with what happened in a large school in the northern part of United Arab Emirates (UAE).

According to Ragab et al. (2022), energy conservation measures were identified including removing the extra lighting, installing motion sensors in classrooms and labs, as well as integrating a Networked Optimization Software with the current HVAC (heating, ventilating and air conditioning) system. The results indicate that the cost of installing motion sensors in classrooms, and labs is approximately AED 20,000 (United Arab Emirates Dirham), which yields an annual energy saving of AED 93,691. Furthermore, with all energy saving measures, a total annual saving of AED 364,000 is anticipated, which is approximately 16% of the annual electricity bill.

Generally, Energy conservation through users' behaviours requires an understanding of household occupants' lifestyle, social and behavioural factors which includes purchasing new energy – efficient appliances or upgrading the building insulation without curtailing economic utility or the level of energy services (Pranav et al., 2022). Since there are currently several increasingly important environmental concerns and threats to the future of society, more energy efficient, and schools can help prevent greenhouse gas emissions and improve the learners' learning environment (Booysen et al., 2021).

4.5.1.3 Environmental Projects

To understand and give meaning to the results of the current research, it is important to reflect on literature regarding environmental projects. Environmental projects are projects that are carried out in schools recommended for environmental protection such as school

gardening, tree planting, compost making and water storage (Maciel et al., 2022). Haller (2017) explained that environmental problems are global in nature, and solving the environmental problems to ensure sustainable development is a topical and important issue. Chaeng et al. (2017) identified the school environmental projects as recycling projects, environmental awareness club, vegetable garden as well as indigenous garden and greening of the school. Carrying out environmental projects in schools will promote ecological development. Hutton & Chase (2017) determined the access to clean drinking water, waste management and energy efficiency as ways to reduce environmental challenges.

The decision making concerning what projects should be done is made by the schools but it must benefit and be an advantage to the learners (Chaeng et al., 2017). In this study, learner participation in some school's learners was partially involved in the school gardening project. For example, in Cases B, C and Case D learners used to seed, water, weed, the garden during specified times per grade. This is the same case as a school located in a city in southern Brazil developed an EE project of a mobile mandala garden (Maciel et al., 2022). The EE practices developed around the garden enabled learners to learn about the environment, planting vegetables and healthy eating from an early stage, stimulating the development of values such as respect, ethics, cooperation and community. This study was innovative and made scientific progress on the creation of a pedagogical tool with potential of being used in environmental education activities (Maciel et al., 2022).

Some school learners were involved in compost making. For instance, learners from Case C participated in collecting biodegradable material for compost making thereby reducing the waste materials in the schools. This is in connection with Waliczek et al. (2016) who explained that compost making was also practiced in the United States for environmental protection. They further explained that food waste is one of the most abundant materials contributing to landfills and they also generate potent greenhouse gases in the atmosphere precipitating global climate change. A study was carried out to measure the relationship between participation in composting program and learners' environmental attitudes, compost knowledge, and compost attitudes. Their results indicated a statistically significant difference between the school with a composting program and the school without a composting program on the variables of environmental attitudes and

composting knowledge. Furthermore, composting attitudes were positively related to environmental attitudes (Waliczek et al., 2016).

Water conservation is also happening in some schools. In this study at Case B was a very large water tank reservoir which collects the rainwater that will be used in the dry days especially during the rainy season. In this case, they water their plants using the stored water the whole of the rainy season thereby conserving the tap water. This is linked to the project which was carried out at a school in northern Mongolia. In the project described here, a training program targeting both teachers and high school learners who focused on hands-on learning in the field and an integrated approach toward conservation of water resources and aquatic ecosystems (Kharthe et al., 2016). Water conservation is of great importance in the environment as it will reduce other environmental problems such as drought. In another study in South Africa, Pamla et al. (2021) examined the persistent drought and water scarcity: household's perceptions and practices in Makhanda. In their study the mentioned that Households in many cities worldwide consume substantial amounts of water but increasing aridity will result in serious water supply challenges in the future (Palma et al., 2021). They further explained that in South Africa, droughts were now a common phenomenon, with severe implications on water supply for urban households (Palma et al., 2021).

In the researcher's view, environmental projects act as a corrective tool to most environmental hazards such as droughts can be reduced their impacts by water storage and erosion to be controlled by tree planting, there is need of carrying environmental projects a school can afford. This will eventually eradicate most environmental challenges.

4.5.2. Theme 2: Environmental Knowledge Acquired by the Learners to Solve Environmental Problems

Theme two focuses on the assessing of the environmental knowledge acquired by the learners to solve the existing and forecasting environmental problems. Vallero (2021) explained environmental knowledge as the amount of information individuals has concerning environmental issues and their ability to understand and evaluate its impact on society and the environment. According to Mohiuddin et al. (2018), global warming, the greenhouse effect, climate change, pollution and acid rain have raised people's

consciousness on environmental awareness and green consumption. For someone to come up with reliable and proper solutions to the arising challenges and problems, that person must be submerged with information. Environmental knowledge is crucial as it has a significant positive effect on environmental attitudes as well as on pro- environmental behaviours (Liu et al., 2014). Mohiuddin et al. (2018) supported Liu's statement when they mentioned that environmental knowledge and awareness have a significant influence on learners' favourable attitudes towards green vehicles. It is particularly important to organise learners, develop sense of ownership, increase their environmental knowledge, and strengthen their capacity to sustain structures for resource management (Primavera et al., 2020).

For the current research, the researcher explained different strategies that learners employed to address environmental issues in their schools as well as in their surroundings.

These ways are discussed as categories and are related to the collected literature. The categories discussed are, reducing carbon emissions and environmental and sustainable ways of reducing environmental degradation that emerged from the above discussed theme. Again, interviews and observation were used to validate the responses of participants through questionnaires.

4.5.2.1 Reducing carbon emissions

It is more than important to reflect the literature of the carbon emissions to understand the results of the current research. According to Gavurova et al. (2021), carbon emissions are the air that allows substances and chemicals to be transported around the world, while increasing pollution and greenhouse gases. Israel et al. (2020) explained pollutants, the components of pollution, as the foreign substances/energies or naturally occurring contaminants and can cause adverse change. Gavurova et al. (2021) mentioned that there are healthy risks posed by greenhouse gas emissions has potentially serious global consequences, there are concerns about the loss of protection of ozone layer and it is very likely that climate change can be expected, which multiplies the environmental threat and has potentially serious global consequences. Due to the above-mentioned negative impacts, a lot of attention is required to reduce the toxic substances that can harm the environment.

In the current study, it is found that school learners are equipped with the knowledge to reduce the carbon emissions that lead to increase in greenhouse gases and hence global

warming. One of the ways they mentioned was recycling. Some learners from all four cases explained that recycling helps to reduce greenhouse gases by reducing energy consumption. They were able to explain how greenhouse gases lead to climate change giving some examples. For instance, one learner from Case A, G0803 explained that using recycled materials will reduce the utilisation of the new materials that also produce excess gas emissions when extracted. Another learner in Case C, G1105 mentioned that people need to practice smart shopping whereby they will be using reusable bags rather than disposable bags that can increase the greenhouse gases. Another learner from Case B, G0821 elaborated this by encouraging customers to buy products from recycling materials such as paper, plastics that also reduce energy consumption. Another learner from Case D, explained the ecological science of climate change in that, the more waste prevention and recycling paper products are promoted it will allow more trees to remain standing, where they can continue to remove carbon dioxide from the atmosphere and hence reduce the climate change.

This is similar to the study of Malik (2016) on human behaviour which contributed to global warming in a major way leading to a significantly add to ill-health and disease. They further explained that there is a need of efforts to support school-aged children in preventative behaviour. In their study they had to identify the effect of school network intervention using reuse, reduce and recycling to improve the preventative behaviour of learners. Their results proved that green living projects such as waste product recycling were established by school learners and perceived to have a positive impact on learners' preventative measures.

Trees were also mentioned to reduce carbon emissions. Learners acquired knowledge that trees absorb carbon dioxide from the atmosphere, and they use it in their process of photosynthesis thereby producing carbon dioxide. Quite a few learners were able to explain further that this will reduce the amount of carbon dioxide in the atmosphere thereby reducing the rate of global warming. Han et al. (2021) explained that cities around the world are promoting tree-planting initiatives to mitigate climate change as this sequesters carbon and mitigates climate change. If climate change is not controlled south Africa can suffer environmentally as a nation. A similar case happened in Indonesia, Parker & Prabawa-Sear (2020), mentioned that environmental problems, of untrammelled exploitation of forests and marine resources, of serious air and water pollution, of population growth and a large and growing middle class set on material prosperity.

Learners in the community studied are surrounded by nature in one way or the other, this will provide an opportunity to assess nature in a more positive way and to become more connected to nature, factors that appear to be fundamental to securing a greener future (Lui et al., 2014). This is in line with what happened in The National Forest in the English Midlands that has developed a model based on a five-point outdoor learning plan, to enable every schoolchild within the Forest area to regularly experience outdoor-based learning within their school curriculum. The project embeds a love for and understanding of trees as well as improving their connection to nature. This can only help them become active citizens as society moves to a green recovery from Covid-19 and equip them to take a positive standpoint in addressing the climate crisis (Rowntree et al., 2022).

Atmospheric pollution was identified as another problem leading to more carbon emissions in the atmosphere. According to Gerden (2018), the increasing emissions of gases, predominantly created during fossil fuels combustion, which cause the warming of the atmosphere and result in harmful climate change effects demanded measures to be taken by non-governmental environmental organisations. However, in this study most learners were using public transport to come to school, and others were even walking to school. This will reduce the combustion and pollution rate in the area. According to Fonseca et al. (2022), environmental pollution in urban areas is mainly due to greenhouse gas emissions from the burning of fuel in the vehicle fleet, which increases in situations of vehicle congestion. This is in line with the United Nations Conference on the Human Environment in Stockholm of 1972 which declared the 26 principles covering a multitude of issues including EE, science and technological assistance (Choy, 2018). The goals of EE were explained to foster clear awareness and to provide every person with the opportunity to acquire knowledge, values, attitudes, commitments, and skills needed to protect and improve the environment (Ollerer, 2015). However, this was a different case at school A, where few learners were being dropped by individual drivers or by their parents which lead to more environmental damage.

The researcher views a clean environment as crucial aspect for a healthy community, where all members of the ecosystem will be acquiring all, they need an altered environment. This includes the animals, human beings as well as plants acquiring clean environmental resources. The ways explained above can be used to formulate policies and provide information that can be used for environmental awareness to combat the adverse effects.

4.5.2.2 Sustainable Ways to Reduce Environmental Degradation

Sustainability refers to the dynamic equilibrium process of interaction between a population and the carrying capacity of its environment, whereby the population achieves full development without causing any negative impact on the carrying capacity of the environment (Ben-Eli, 2015). According to Wiltsey et al. (2012), sustainability is the continued capacity to function at the required level to maintain the desired benefits. Enjoying the benefits of the environment must be maintained to avoid its deterioration. Alaba & Tayo (2014), explained environmental degradation as deterioration of land, flooding, environmental pollution, erosion, earthquakes, water resources through the consumption of assets, for example, air, water, and soil, the destruction of environments and the eradication of wildlife. Now that the background literature of both sustainability and environmental degradation had been highlighted it will give the proper understanding of the sustainable ways that can be applied to reduce environmental degradation.

In this study, sustainability was identified to reduce environmental degradation which may lead to poverty. Sustainability has been said to monitor the rate at which resources are used, thereby minimising exploitation of the natural resources. The environment is more prone to destruction due to the increase in pressures (Gupta et al., 2016), hence there is need for sustainable management of the environment. This is in line with the study of Teane (2021) who conducted a study in the Manyeledi rural village in the North-West province. In this province, like most rural areas, was experiencing environmental degradation caused by the depletion of natural resources, and poor farming practices. The environmental challenges experienced by this community include, among others, the less arable land, changing climatic conditions and poor rainfall. A growing number of Manyeledi households live in abject poverty, where subsistence agriculture is the only source of livelihood. The community lacks the advanced farming skills needed to deal with arid land and an acid soil. Better farming practices can promote sustainability in communities. From this research, one learner from Case B gave an explanation that leguminous plants leave the ammonia components in the soils which can be used by rape leaf plants planted thereafter. This process of crop rotation will minimise the addition of artificial fertilisers which will degrade the environment.

According to the findings of the study, the environment embraces almost all natural resources that must be maintained not only in their quantity but in their natural state as

well. Learners need to understand the state of their environment to implement effective strategies aimed at addressing environmental problems. Acquiring sustainable knowledge creates awareness to the learners on how they can interact with the environment at the same time caring for the future generations.

4.5.3 Theme 3: Environmental Awareness carried out to Eradicate Environmental Related Problems

Theme three focuses on the environmental awareness carried out to eradicate environmental related problems. Prem et al. (2018) explained that there are drastic changes in the environment, including global warming, deforestation, natural calamities (floods, earthquakes, Tsunamis, wildfires, volcanoes), different types of pollutions (air pollution, land pollution, water pollution, sound pollution) that can cause damage to the global environment. Jansen et al. (2013) added that land pollution, air pollution, water pollution, soil pollution and wildlife natural habitat pollution and water pollution are remaining the major challenges that need to be dealt with as a matter of urgency. It is now widely acknowledged that the impact of human activities on the environment is significant and will have serious consequences for future generations (Puri et al., 2020). Therefore, it is imperative to understand the environmental awareness carried out in schools that witness the way out to eradicate environmental related problems.

Environmental awareness will be further discussed in the following sections as categories that emerged from literature and findings of the current research. Below the researcher discusses the categories in detail and supports the findings by literature. The categories that the researcher discusses are environmental campaigns and environmental clubs as categories that emerged from the above discussed theme. Again, interviews and observation were used to validate the responses of participants through questionnaires.

4.5.3.1 Environmental campaigns

To understand and give meaning to the results of the current research, it is important to reflect on literature regarding environmental campaigns. Muller (2021) referred to environmental campaigns as organising and educating the general practice about the importance of understanding our environment's vulnerability and protecting it. According to Rucht (2006), environmental movements and their activities are studied from various

angles, by different methods, and at different levels. This is supported by using different forms of campaigns to reach a wide and various populations. To achieve this, a wider selection of media must be applied and this can be through use of through social media, on radio, posters as well as on television (Sallem, 2018). He further explained that environmental campaigns play a major role in creating awareness about environmental issues and its adverse effects on people and have positive benefits in promoting environmental awareness.

In this study, there are some environmental awareness campaigns that were taking place in high schools to solve environmental problems. The fascinating program observed was that of the environmental campaigns. At Case B, learners were writing posters in a creative way, well designed about the ozone layer depletion day which is commemorated in September of every year. Most of the posters were posted on the school noticeboard carrying more information including the dangers of ozone depletion such as skin cancer. The posters were also carrying the solutions to the ozone depletion such as tree planting projects the environmental campaigns help in imparting knowledge on proper environmental management. This is in line with the study of Teane (2021) where the environmental awareness campaign was launched to impart skills and knowledge that helped the Manyeledi community to deal with the environmental challenges. The training which the project members received through non-formal education developed a heightened sense of awareness, of the need to improve their farming methods to enhance their livelihood sustainability.

Dhanya & Pankajam (2017) conducted a study focusing on environmental awareness among secondary school learners. Dhanya & Pankajam (2017) sampled 300 secondary learners from six government and private schools which are situated in and around Coimbatore district in Tamil Nadu through simple random sampling technique. The findings reveal that there was no significant environmental awareness among secondary school learners (Dhanya & Pankajam, 2017). A similar case was also experienced in Nigeria, many Nigerians do not have knowledge, attitude, consciousness, value and awareness on environment (Abubakar, 2014). The author further explained that the need for EE is essential and compulsory to education system in Nigeria due to discriminate and negative human activities on environment which cause environmental injustice, land degradation and pollution (Abubakar, 2014).

4.5.3.2 Environmental clubs

To ensure a comprehensive explanation of the present results, the researcher provides the contextual information regarding environmental clubs. Siddiky (2019) highlighted that environmental clubs are offered as co-curricular activities in schools to provide an experiential form of learning which supports the formal education practices thereby providing learners with the opportunity to experience the physical environment. According to Mwaura & Muwanika (2018), environmental clubs are defined as voluntary learners' groups promoting participation of learners in learning about and working toward the conservation and sustainability of the environment. Abdela et al. (2020) added that environmental clubs are a platform on which knowledge about the environment is gained and through environmental clubs' environmental awareness is created for future generations. The present study involved the observation of environmental clubs in three distinct cases, namely Case A, B and D. In these cases, this program provides learners with the opportunity to engage in discussions on various environmental issues and strategies to mitigate and resolve them.

According to Abdela et al. (2020), environmental clubs provide programs and activities aimed at motivating individuals to mitigate pollution, engage in tree planting and contribute to environmental conservation through voluntary groups. These clubs actively encourage learners to participate in co-curricular activities focused on learning about and enhancing their environment. This helps to convey environmental knowledge from one learner to another thereby creating awareness in schools. A similar study conducted by Ajiboye & Silo (2008) highlighted the role of School Civic Clubs in enhancing the environmental knowledge, attitudes and actions of Botswana children. Their results demonstrate a notable shift in the learners' knowledge levels and attitudes following their participation in the club activities (Ajiboye & Silo, 2008).

There was a significant difference in the level of knowledge of learners exposed to the environmental club activities and those who are not exposed. In support, Bakers (2008) found that student who took part in environmental activities during college life were more academically successful than those who did not. Based on Muldoon (2008) findings, learners who engaged in peer support programmes developed valuable skills and attributes. In Botma's (2008) study, a relationship between environmental clubs and schools, whereby three academically weak learners became more noticeable as they

demonstrated their abilities. In my own opinion, environmental clubs are important programs that improve the learning skills in most learners. The implementation of environmental clubs in most schools are important as they may lead to an increase in environmental consciousness and thus a reduction in the negative impact of environmental issues.

4.6 CHAPTER SUMMARY

This chapter focused on the analysis and discussions of the results of this research. The results were analysed from the themes which were identified as environmental activities, environmental knowledge acquired by the learners as well as the environmental awareness. Generally, the findings from the research carried out will be used to come up with the implications and contribution of the study as well as recommendations. A summary of the findings will also be discussed in the next chapter.

CHAPTER FIVE

IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

The previous chapter presented the results and findings of the study. The current chapter presents the summary of findings, implications, recommendations, and conclusion that resulted from findings of this research on the level of environmental awareness and practices among high school learners in Johannesburg central district. The conclusion of the current study is based on the rationale, problem statement, purpose, research questions, aim, literature review and findings of the research. The conclusion was discussed based on the recommendations of this research.

5.2 CHAPTER REVIEW

Chapter one the first chapter discusses an overview of the whole study. This research focused on exploring environmental awareness and the related practices in high schools. The first chapter captures the introduction, rationale of study, the problem statement, the aim and objectives of the study, research questions, context, research methodology, trustworthiness, ethical considerations, limitations and delimitation of the study, outline of the chapters and the definition of key terms. Generally, it gives the orientation of the study.

In chapter two, the literature review focuses on the conceptualisation of environmental education and its role in creating environmental awareness, experiential learning and its role in creating environmental knowledge, attitudes, skills and participation as subtopics. This included the environmental experiences in the global world, Africa as well as in South Africa as a nation. The outcomes and benefits of environmental education in schools and the environmental activities carried out in schools were also described and explained. This chapter also reviewed literature from studies conducted by other scholars within the scope of this research. Generally, this was mostly the literature on environmental awareness amongst high school learners', their understanding of the

environmental crisis and the current issues surrounding the environment and EE issues of current concern were reviewed.

In chapter three, the research methodology and procedures followed in data collection were explicitly discussed. The researcher described and explained the types of research paradigms, which encompass positivism, interpretivism, constructivism and critical theory paradigms. The qualitative research was described as the approach and case study as a research design to be applied in this study. Purposive sampling was the method that was used to select schools and learners that took part in the study. The data was collected from four cases and was analysed using thematic analysis.

The fourth chapter focused on the analysis and interpreting data into results and discussions of the findings of the study. Three themes emerged from the analysis of data. The themes were identified as environmental activities carried in schools; environmental knowledge acquired by the learners to solve environmental problems; environmental awareness carried out to eradicate environmental related problems. Chapter five focuses on the summary of findings, implications, contribution, recommendations and conclusion of the study.

5.3 SUMMARY OF THE FINDINGS

The study sought to address the research question concerning the levels of environmental awareness and the presence of environmental practices among high school learners in selected schools within the Johannesburg central district. The key findings are summarised as follows:

The findings reveal that most of the grade 11 learners displayed greater levels of awareness, knowledge on most practices. However, most of the grade 8 leaners had some ideas on practices without much detailed information on awareness and knowledge on environmental protection. This suggests that not all learners were adequately informed about environmental issues. The level seemed to increase as the learners' progressed to a higher grade. This is reflected by the way the grades 11's were responding in a detailed manner whilst the grades 8's was giving the opposite response. It may be noted that as the learners are progressing to higher grades, they will be gaining more information and the more they are taught the more they grasp the concepts.

On energy conservation, it is concluded that light energy is conserved in most schools. Recently, there has been a notable rise in the utilisation of sustainable resources like solar power in many schools. Solar power is a renewable energy source, akin to hydro-electric power. Additionally, there has been a considerable shift towards the use of energy-efficient appliances, which consume less energy. This transition aims to mitigate environmental impacts, such as global warming, caused by the excessive burning of fossil fuels. Most learners, despite grades, are aware of the ways of conserving light energy such as switching of lights in unoccupied rooms and using the natural light instead of switching on the lights. It is also concluded that renewable and clean sources of energy such as solar energy are increasingly used as a substitute of the electric energy however, the deep knowledge and awareness on how to conserve the energy in general has been acquired by few learners from the grade 11 class.

This concludes that there is still a lot of work to be done on environmental awareness on energy conservation in high schools. There are environmental projects that are carried out in schools that are recommended for environmental protection. These include school gardening, tree planting, compost making and water storage. The learner participation in these projects was according to the schools, it is concluded that school gardening and tree planting are the projects carried out in most schools. However, the learner participation in projects in these schools was partial. This is revealed by the limited activities carried out by learners such as weeding, seeding and watering of plants. The learner participation generally is limited when it comes to real gardening. This is due to the fact that learners must be acquainted with all the information from the beginning thus beds preparation, planting seeds and not only maintenance of plants grown by other people so that they can establish their own gardens even at their homes thereby raising awareness even in their communities. However, when it comes to the learner knowledge towards environmental protection and gardening was not distinguished much by the grades. In this category even learners in grade 8 were giving detailed information.

On environmental awareness, it is concluded that some environmental awareness campaigns are taking place in high schools to solve environmental problems. These are in the form of posters or pluck cards with environmental information and are used to commemorate some environmental days. The learners have knowledge, and they value the environment. However, the number of learners involved in campaigns is not as significant as compared to the number of learners in schools. It is also concluded that only

a few learners in schools have time to discuss environmental issues and ways to solve them during environmental clubs. This will not have much impact since a greater number of learners are not part of the club.

On waste management, the findings revealed that it would depend on the school policies and the provision of disposal bins for waste disposal of waste. It is concluded that only about half of the schools are practicing ways to better waste management and there is an urgent effort needed to maintain the proper environment. This behaviour was portrayed by learners from different grades. The practice of waste management was at school level. In general, the afore mentioned contributions will enhance the comprehension, advancement, or refinement of this research regarding environmental awareness and the promotion of environmental practices in high schools.

This study was anchored in the experiential learning theory framework. Experiential learning begins with learners' engagement with their communities and local environments, aiming to apply their experiences to address real-life issues affecting these communities (Yanniris, 2021). Kolb's learning cycle, rooted in John Dewey's assertion that learning should be grounded in experience, forms the basis of this theory (Miettinen, 2000). Kolb's theory of experiential learning elucidates how knowledge is generated through experience (Kolb, 1984). Experienced learners impart environmental awareness skills to others, leading to the dissemination of knowledge and enhancing understanding. Additionally, Dewey's principle of continuity posits that all experiences influence future experiences and decisions (Dewey, 1938). This is evidenced by how learners carry forward information on awareness through posters and presentations during assemblies, thereby influencing others. According to Choy (2018), experiential learning-based environmental education enables learners to design pro-environmental actions and contribute to solving environmental problems. The rise in alternative energy sources such as solar power indicates solutions being provided for issues like load shedding.

Experiential learning helps in acquainting knowledge on environmental protection. As the learners will be carrying out the activities or observing old people carrying out the activities, they will be more knowledgeable. It is concluded that a few schools are involved in water conservation and composting in terms of projects carried out in schools. It is concluded that the environment is more prone to destruction due to increase in pressures and therefore sustainability is identified to reduce environmental degradation.

Most grade 11 learners knew what sustainability means whereas most of the grade 8 learners were giving an opposite response. It is also concluded that some of the high school learners were more knowledgeable about the impacts of unsustainable use of natural resources. The more the learners have knowledge on how to manage resources sustainably, the more they can protect their environment from the negative effects such as depletion of natural resources and climate change.

The experiential learning process, in general, fosters field events and active participation, enabling learners to deepen their environmental awareness. For example, visiting industrial sites to assess pollution levels and observe machinery usage equips learners with firsthand experiences and insights into environmental preservation. School learners are equipped with the knowledge to reduce the carbon emissions that lead to increase in greenhouse gases and hence global warming and air pollution. Recycling, reducing; reuse, tree planting and reducing the amount of combustion are some of the ways in which learners are well versed with. Learners are aware that walking to school and using public transport will save the environment. It is concluded that most learners have enough knowledge on how to protect the environment from the carbon emissions but however, their impact is just a drop in an ocean as much of the carbon emissions are from industries.

5.4 IMPLICATIONS OF THE STUDY

Environmental degradation is a growing concern worldwide due to the negative impacts it is having to the natural environment. There is a growing need for people to be aware of their actions towards the environment, to gain awareness on how to mitigate environmental issues while benefiting from the environment. Environmental awareness is an effort directed at reducing the effects of anthropocentric activities on the environment (Omoogun et al., 2016). Schools have been identified as one of the entry points to instil environmental awareness for a better improvement of the management of the natural environment. Maleficio (2018) stated that the school environment gives more emphasis on environmental awareness in a consistent way. Islamoglu et al. (2017) supported Maleficio's statement when he mentioned that the place and building in which education takes place constitutes good habitual materials.

The public's perception of environmental conservation through education is one of the most influential changes in society in improving construction and enhancing human

capacity in addressing environmental issues and development (Bennett et al., 2017). Determining the level of environmental awareness and related practices among high school learners and assessing the learners' knowledge is important in coming up with solutions for the improvement of the environment. This includes:

Sustainable use of resources environmental awareness includes understanding and appreciating the natural world to the extent of preserving the available resources so that they can be used by future generations (Thomsen, 2013). Sustainability is a process suggested to improve the quality of human life within the limitations of the global environment (Mensah & Castro, 2004). Through sustainability, learners will be more environmentally conscious to the extent that they can even spread awareness on how to improve the human quality life to residential homes. This may include using less water, recycling and use of energy-efficient appliances. The habits that the learners will adopt will sink into their minds for good and will assist them to be a part of the better environmentally friendly environment and more active generation.

Environmental protection- The environment provides resources such as clean air, water and soil as well as plants and animals. Environmental awareness plays a crucial role in safeguarding the environment from harm and degradation (Nikolaou et al., 2021). However, effective environmental protection demands additional resources and entails certain risks and limitations (Panayoutou et al., 2016). On the flip side, it also stimulates the emergence of new industries and fosters the development of innovative technologies, which could ultimately enhance economic performance (Nikolaou et al., 2021). Healthy mindset- teaching our younger generation about the environment at an earlier stage such as high school will create a good habit when it comes to environment. It will give them the knowledge that is necessary for understanding what will be happening in their surroundings (Farrington et al., 2012). Once the children are given an insight, they will be ready to be part of the global fight for environmental preservation.

In schools, environmental awareness is achieved by hosting events and activities, celebrating days dedicated to the environment, integrating themes into their curriculum as well as leading by example. The environmental activities mentioned above yield positive outcomes for the environment, including heightened environmental awareness, acquisition of factual knowledge, shifts in learners' mind-sets, development of problem-solving skills and motivation for learners to inspire others.

5.5 CONTRIBUTION OF THE STUDY

The study exploring levels of environmental awareness in schools offers significant contributions to South African communities in various aspects, including scientific knowledge and social impact. Environmental awareness facilitates an understanding of how to interact with the global environment, promoting the preservation of humanity on Earth. For example, heightened awareness may lead to scientific strategies aimed at reducing carbon emissions in industries, thus mitigating global warming.

Furthermore, environmental awareness helps mitigate natural phenomena such as droughts, floods, and air pollution-related health issues. By enlightening society with potential solutions, such as reducing carbon footprints in power stations and improving rainwater harvesting systems, environmental hazards can be minimized. This study might provide knowledge to the learners that they can use to explore current societal and economic challenges and devise solutions. For instance, learners may propose strategies for solar power storage to address energy shortages, as local battery storage systems can store surplus solar energy.

Moreover, promoting environmental awareness encourages environmentally friendly behaviour and fosters social connections. Learners engaging in environmentally protective behaviour not only contribute to sustainability but also establish connections with various communities, experts and organizations, enriching their knowledge and social networks. This study aimed to answer the research question on the levels of environmental awareness and the existence of environmental practices among learners in selected high schools. The above explained are the most benefits of study.

5.6 RECOMMENDATIONS

The research findings have led to several recommendations:

The Department of Education must consider having environmental education as a subject on its own especially in high schools where qualified teachers will teach learners more on environmental issues and how to deal with them. Having environmental education as topics to be learnt in subjects such as science and geography is inadequate for effective learning to take place.

Promote the use of recent technological ways in disseminating environmental information. High school learners of todays' generation are always on social media forms such as twitter, Facebook, TikTok to just mention a few. If such forms of media are used to disseminate environmental information it will spread at a faster rate. More learners will be more equipped with environmental knowledge and the detrimental impacts of certain poor environmental practices. This will promote greater environmental awareness in schools.

All schools should draw up policies which promote environmental awareness and good practices. For example, the waste management policies which will improve proper waste disposal and encourage the practices such as the recycling, reuse and reduce that are environmentally friendly. They can also have a policy that will promote a deeper understanding of environmental matters. For instance, the policy that promotes experiential learning to all practical subjects. This will encourage learners to put into practice whatever they learn in class such as tree planting activities, gardening and compost making.

The department of education must be involved, maybe through monitoring the high school's commemoration of environmental days. If all high school learners are involved in such events, environmental awareness in schools will also increase. On environmental days such as the World Environmental Day, The International Day for the preservation of the Ozone layer, World Wetlands Day, learners will be saturated with the environmental facts, impacts and how to solve them. If this becomes an annual event in schools, learners will end up putting the facts into practice and they end up coming up with ways to reduce the negative impacts.

Other external organisations such as the Wildlife and Environmental Society South Africa (WESSA), Earth life Africa, Conservation South Africa and the Wildlife Conservation Trust can be involved to be part of the environmental commemoration programme commemoration in schools. For instance, people from city parks can be part of the tree planting day commemoration giving more information on tree planting and giving practical instructions of the process. This will instil more knowledge in learners. These organisations can also visit schools for a general

educational showcase where they will have the opportunity to educate learners about, sustainability use of resources, environmental protection, effects of pollution on the environment and even the conservation techniques.

School assembly times can also be utilised to maximise environmental awareness in schools. This can be done through presentations such as speeches on environmental issues, poems as well as words of encouragement to good environmental practices. The department of education can implement the policy of teaching environmental matters at lower grades and having a specific subject on EE. Now that nature is experiencing a lot of environmental problems increasing year after year, the matters of EE must be considered in a serious way. A curriculum which embraces conservation activities, environmental practice and environmental awareness can be initiated as early from the grade R up to the higher grades. This will increase the consciences of learners' environmental knowledge.

Teaching methods to be used in schools must be learner -centred and not teacher- centred especially when it comes to the environmental issues. Learners must put into practice whatever they will be taught. Experiential learning must be implemented to get a greater understanding of the environmental issues. To have effective results on sustainability use of natural resources, the community must be involved. Engaging the community in the environmental campaigns, taking part in providing environmental related speeches, or even involving them in activities such as clean up campaigns offering some incentives or coupons to those who participate might encourage the learners to learn more about the environmental issues.

5.7 CONCLUSIONS OF THE STUDY

This study explored environmental awareness and practices in high schools in the Johannesburg central district. The purpose of this study was to explore the level of environmental awareness and the existence of environmental practices among high school learners. Data was collected using questionnaires, semi-structured interviews and observation. The nonprobability sample methods, quota sampling and purposive sampling, were applied to select learners to be interviewed. Observations were also made to collect further information on the environmental awareness in schools. The researcher had to seek permission from the department of education before she collected

the data. The collected data was analyzed using thematic analysis. The results had proven that most schools involve their learners in waste management, energy conservation and environmental projects. Environmental campaigns are also happening in schools as well as the environmental clubs. The recommendations that were given include increasing awareness using social media. Generally, learners from the grade 11 class displayed greater levels of awareness and knowledge in most practices. However, most of the grade 8 learners had some ideas only on practices built lesser levels of awareness and knowledge. This implies that the more learners they gain environmental knowledge and awareness. The significance of this study is that it helps the learners to acquire sustainable ways of safeguarding the environment and discourage further deterioration.

REFERENCES

Abdela, A., Dejene, Y., Fekade, M., Kassa, R., & Saleh, M. (2020). Soil stabilization using waste plastic materials. *Open Journal of Civil Engineering, 10*(1), 55–68. https://doi.org/10.4236/ojce.2020.101006

Abdullah, M. (2018). Waqf, sustainable development goals (SDGs) and maqasid al-shariah. *International Journal of Social Economics*, *45*(1), 158-172.

Abenu, A., Yusufu, F. A., & Sahabo, M. M. (2023). Smallholder Farmers' Perceptions on Drivers of Land Degradation and its Impact on their Livelihoods in the Kuje Area Council of Abuja, Nigeria. *Journal of Applied Sciences and Environmental Management*, *27*(6), 1203-1206.

Ablak, S., & Yesiltas, E. (2020). Secondary school students' awareness of environmental education concepts. *Review of international geographical education online,10*(3),445-466. https://doi.org/10.33403/rigeo.745951

Abrahams, C., & Everrat, D. (2019). City Profile: Johannesburg, South Africa. *Environment and Urbanization ASIA, 1092,* 255-270. https://doi.org/10.1177/0975425319859123

Abubakar, A. (2014). A brief look at general and environmental education in Nigeria. *Marmara Coğrafya Dergisi* (30), 1–12. https://doi.org/10.14781/mcd.62389

Acharya, T. (2013). Inducible clindamycin resistance (D test): Principle, procedure and interpretation. *Microbe Online*. https://microbeonline.com/inducible-clindamycin-resistance-d-test-principle-procedure-and-interpretation/

Acharya, T. (2013). Inducible clindamycin resistance (D test): Principle, procedure and interpretation. *Microbe Online*. https://microbeonline.com/inducible-clindamycin-resistance-d-test-principle-procedure-and-interpretation

Adler, J. M., & Clark, L. A. (2019). Incorporating narrative identity into structural approaches to personality and psychopathology. *Journal of Research in Personality, 82,* 103857. https://doi.org/10.1016/j.jrp.2019.103857

Admasu, P., & Kaynata, G. (2017). Seroprevalence of camel brucellosis in Yabello District of Borena Zone, Southern Ethiopia. *Journal of Veterinary Medicine and Research, 4*(10), 1115.

Ajibike, W. A., Adeleke, A. Q., Mohamad, F., Bamgbade, J. A., Nawi, M. N. M., & Moshood, T. D. (2021). An evaluation of environmental sustainability performance via attitudes, social responsibility and culture: A mediated analysis. *Environmental Challenges, 4*, 100161. https://doi.org/10.1016/j.envc.2021.100161

Ajiboye, J. O., & Silo, N. (2008). Enhancing Botswana children's environmental knowledge, attitudes, and practices through the school civic clubs. *International Journal of Environmental & Science Education, 3*(3), 105–114.

Alaba, S. O., & Tayo, O. K. (2014). A study of the effectiveness of socio-drama learning package in promoting environmental knowledge and behaviour of secondary school students in Osun State, Nigeria. *Mediterranean Journal of Social Sciences, 5*(23), 1325. https://doi.org/10.5901/mjss.2014.v5n23p1325

Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism vs interpretivism. *Global Academic Journal of Humanities and Social Sciences, 2*(3), 39–43. https://doi.org/10.36348/gajhss.2020.v02i03.001

Amrullah, F., & Nurcahyo, H. (2021). Implementation of environmental-based schools in the Adiwiyata program: A literature review. In *6th International Seminar on Science Education (ISSE 2020)* (pp. 15-20). Atlantis Press. https://doi.org/10.2991/assehr.k.210326.003

Anbalagan, G. & Shanthi, K. (2015). A Study on Environmental Awareness and Related Practices Among the High School Students at Madurai District, Tamil Nadu. *Indian Streams Research Journal, 5*(9), 1-9.

Ardoin, N.M., Bowers, A.W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. *Biological conservation, 241*, 108224.

Asenahabi, B. M. (2019). *Basics of research design: A guide to selecting appropriate research design*. *International Journal of Contemporary Applied Researches, 6*(5), 76-89.

Avery, O. T., Macleod, C. M., & McCarty, M. (1944). Studies on the chemical nature of the substance inducing transformation of pneumococcal types: induction of transformation by a desoxyribonucleic acid fraction isolated from pneumococcus type iii. *The Journal of experimental medicine*, *79*(2), 137–158. https://doi.org/10.1084/jem.79.2.137

Babbie, E. (2007). *The practice of social research* (11th Eds). Thompson Wadsworth, Belmont.

Badampudi, D., Fotrousi, F., Cartaxo, B., & Usman, M. (2022). Reporting consent, anonymity and confidentiality procedures adopted in empirical studies using human participants. *e-Informatica Software Engineering Journal*, *16*(1), 220109. https://doi.org/10.37190/e-Inf220109

Baker, N. R. (2008). Chlorophyll fluorescence: A probe of photosynthesis in vivo. *Annual Review of Plant Biology*, *59*, 89–113. https://doi.org/10.1146/annurev.arplant.59.032607.092759

Balyamujura, H. N., & Van Schalkwyk, H. D. (2010). Optimisation of different land use. *Agricultural Economics Association of South Africa (AEASA)*, *36*(4), 1–12.

Banda, R. K., Mubita, P., Moonga, G., & Meki, C. D. (2021). Bacteriological Quality and Heavy Metal Analysis of Packaged Water Produced in Lusaka, Zambia and Associated Quality Control Measures. *Frontiers in public health*, *9*, 620700. https://doi.org/10.3389/fpubh.2021.620700

Banks, S. C., & Piggott, M. P. (2022). Non-invasive genetic sampling is one of our most powerful and ethical tools for threatened species population monitoring: A reply to Lavery et al. *Biodiversity and Conservation*, *31*(2), 723–728. https://doi.org/10.1007/s10531-022-02377-x

Barraza, J. F., & Chen, V. J. (2006). Thoughts on Kaizen and its Evolution: Three Different Perspectives and Guiding Principles. *International Journal of Lean Sigma 2*(4), 288-308.

Bayat, R., Ashrafi, K., Motlagh, M. S., Hassan and, M. S., Daroudi, R., Fink, G., & Künzli, N. (2019). Health impact and related cost of ambient air pollution in Tehran. *Environmental research*, *176*, 108547.

Beck, J. S. (2011). *Cognitive Behaviour Therapy: Basics and Beyond* (2nd Ed.). Guilford press.

Bell, G. D., Halpert, M. S., Ropelewski, C. F., Kousky, V. E., Douglas, A. V., Schnell, R. C., & Gelman, M. E. (1999). Climate assessment for 1998. *Bulletin of the American Meteorological Society, 80*(5s), S1–S48.

Ben-Eli, M. (2015). *Sustainability: Definition and five core principles*. The Sustainability Laboratory. https://www.sustainabilitylabs.org

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., & Wyborn, C. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological conservation*, *205*, 93-108.

Blaikie, N. (2007). *Approaches to social enquiry: Advancing knowledge* (2nd ed.). Polity.

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative market research: An international journal, 19*(4), 426-432.

Boesten, J., & Scanlon, H. (2021). Gender, transitional justice and memorial arts: Global perspectives on commemoration and mobilisation. In *Gender, Transitional Justice and Memorial Arts: Global Perspectives on Commemoration and Mobilization* (pp. 1-274). Taylor and Francis Inc. https://doi.org/10.4324/9781003174462

Bogner, F. X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *The Journal of environmental education*, *29*(4), 17-29.

Booysen, M. J., Samuels, J. A., & Grobbelaar, S. S. (2021). LED there be light: The impact of replacing lights at schools in South Africa. *Energy and Buildings*, *235*, 110736.

Borden, R. (1977). "Richard Borden Interview, March 6, 1977". *Boone and Crockett Club Oral History Project*. 2. https://scholarworks.umt.edu/booneandcrockett_oralhistory/2

Borg, W. R., & Gall, J. P. (1992). *Educational research.* White Plains, NY: Longman.

Bosah, V. O. (2013). Environmental education in Nigeria: Issues, challenges and prospects. *Mediterranean Journal of Social Sciences, 4*(15), 159–165. https://doi.org/10.5901/mjss.2013.v4n15p159

Botma, G. J. (2008). Poles apart: Mapping the field of arts journalism in South Africa. *Critical Arts: A Journal of South-North Cultural Studies*, *22*(1), 83-100.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development.* Sage Publications, Inc.

Bradburn, N. M., Sudman, S., & Wansink, B. (2004). *Asking questions: The definitive guide to questionnaire design--For market research, political polls, and social and health questionnaires* (2nd ed.). Jossey-Bass.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://eprints.uwe.ac.uk/11735

Brown, M. E., & Dueñas, A. N. (2020). A medical science educator's guide to selecting a research paradigm: building a basis for better research. *Medical Science Educator, 30*(1), 545-553.

Bryman, A., Becker, S., & Sempik, J. (2008). Quality criteria for quantitative, qualitative and mixed methods research: A view from social policy. *International journal of social research methodology, 11*(4), 261-276.

Buckingham, A., & Saunders, P. (2004). *The survey methods workbook: From design to analysis*. Cambridge: Polity

Cáceres, M., Nussbaum, M., & Ortiz, J. (2020). Integrating critical thinking into the classroom: A teacher's perspective. *Thinking Skills and Creativity*, *37*, 100674. https://doi.org/10.1016/j.tsc.2020.100674

Callus, A. M. (2019). Being an inclusive researcher: seeking questions, raising answers. *Disability & Society, 34*(7-8), 1241-1263.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of research in nursing: JRN, 25*(8), 652–661. https://doi.org/10.1177/1744987120927206

Carson, S. H. (2011). Creativity and psychopathology: A shared vulnerability model. *The Canadian Journal of Psychiatry, 56*(3), 144-153.

Casalo, L. V., & Escario, J. J. (2018). "Heterogeneity in the association between environmental attitudes and pro-environmental behaviour. A multilevel regression approach", *journal of cleaner production, 175,* 155-163. https://doi.org.10.1016/j.jclepro,2017.11.37

Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in pharmacy teaching and learning, 10*(6), 807-815.

Casula, M., Rangarajan, N., & Shields, P. (2021). The potential of working hypotheses for deductive exploratory research. *Quality & Quantity, 55*(5), 1703-1725.

Chaturvedi, A., Kumari, R., & Singh, S. (2014). Environmental awareness through education. *Shaikshik Parisamvad (An International Journal of Education), 4*(2), 9–13.

Chau, T. T. T., Gehlen, M., & Chevallier, F. (2022). A seamless ensemble-based reconstruction of surface ocean p CO 2 and air–sea CO 2 fluxes over the global coastal and open oceans. *Bio geosciences*, *19*(4), 1087-1109.

Cheang, C. C., So, W. M. W., Zhan, Y., & Tsoi, K. H. (2017). Education for sustainability using a campus eco-garden as a learning environment. *International Journal of Sustainability in Higher Education*, *18*(2), 242-262.

Chirisa, I., & Matamanda, A. R. (2022). Science communication for climate change disaster risk management and environmental education in Africa. In *Research anthology on environmental and societal impacts of climate change* (pp. 636–652). IGI Global. https://doi.org/10.4018/978-1-7998-9209-0.ch033

Cho, Y., & Park, K. S. (2023). Designing immersive virtual reality simulation for environmental science education. *Electronics*, *12*(2), 315.

Choy, Y. K. (2018). From Stockholm Declaration to Millennium Development Goals: The United Nation's journey to environmental sustainability. In K. Roy & S. Kar (Eds.), *Developmental state and Millennium Development Goals: Country experiences* (pp. 209–256). World Scientific Publishing Co. https://doi.org/10.1142/9789813235281_0010

Chung E., & Milkoreit M. (2021). Who are your people? The effect of political ideology and social identity on climate-related beliefs and risk perceptions. *Politics Groups Identities,* 1–21. https://doi.org/10.1080/21565503.2021.1992287

Chung, M. H., & Rhee, E. K. (2014). Potential opportunities for energy conservation in existing buildings on university campus: A field survey in Korea. *Energy and Buildings*, *78*, 176-182.

Cleland J. A. (2017). The qualitative orientation in medical education research. *Korean journal of medical education*, *29*(2), 61–71. https://doi.org/10.3946/kjme.2017.53

Clemens, M. A., & Kremer, M. (2016). The new role for the World Bank. *Journal of Economic Perspectives*, *30*(1), 53-76.

Cluzel, D., Boulvais, P., Iseppi, M., Lahondère, D., Lesimple, S., Maurizot, P., & Ulrich, M. (2020). Slab-derived origin of tremolite–antigorite veins in a supra-subduction ophiolite: the Peridotite Nappe (New Caledonia) as a case study. *International Journal of Earth Sciences*, *109*, 171-196.

Cohen, M. A., Eliashberg, J., & Ho, T. H. (2000). An analysis of several new product performance metrics. *Manufacturing & Service Operations Management*, *2*(4), 337-349.

Connelly, L. M. (2016). Trustworthiness in qualitative research. *Medsurg nursing*, *25*(6), 435.

Corbin, J., & Strauss, A. (2008). Basics of qualitative research. London: SAGE Publications Ltd.

Costanza, R., Daly, L., Fioramonti, L., Giovannini, E., Kubiszewski, I., Mortensen, L. F., & Wilkinson, R. (2016). Modelling and measuring sustainable wellbeing in connection with the UN Sustainable Development Goals. *Ecological Economics, 130*, 350–355. https://doi.org/10.1016/j.ecolecon.2016.07.009

Cotrim, H., Granja, C., Carvalho, A. S., Cotrim, C., & Martins, R. (2021). Children's understanding of informed assents in research studies. *Healthcare, 9*(7), 871. MDPI. https://doi.org/10.3390/healthcare9070871

Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches.* Fifth edition. Los Angeles, SAGE.

Dalu, M. T. B., Cuthbert, R. N., Chari, L. D., Manyani, A., Masunungure, C., & Dalu, T. (2020). Is awareness on plastic pollution being raised in schools? Understanding perceptions of primary and secondary school educators. *Sustainability*, *12*(17), 6775. https://doi.org/10.3390/su12176775

Damoah, B., & Adu, E. O. (2022). Environmental Education in South African Schools: The Role of Civil Society Organizations. *Research in Social Sciences and Technology*, *7*(3), 1-17.

Damoah, B., & Omodan, B. I. (2022). Determinants of effective environmental education policy in South African schools. *International Journal of Educational Research Open, 3*(2), 100206. https://doi.org/10.1016/j.ijedro.2022.100206

Danilo, B., Perrot, L., Mara, K., Botton, E., Nogué, F., & Mazier, M. (2019). Efficient and transgene-free gene targeting using Agrobacterium-mediated delivery of the CRISPR/Cas9 system in tomato. *Plant cell reports*, *38*(4), 459–462. https://doi.org/10.1007/s00299-019-02373-6

Darby, J. L., Snider, K. E., & Tchobanoglous, G. (1993). Ultraviolet disinfection for wastewater reclamation and reuse subject to restrictive standards. *Water environment research*, *65*(2), 169-180.

Darmawan, M. D., & Dagamac, N. H. (2021). Situation of environmental education in senior high school programs in Indonesia: Perspectives from the teachers of Palembang. *Interdisciplinary Journal of Environmental and Science Education*, *17*(3), e2241.

Davids, Z. (2023). *Public Opinion concerning the Feasibility of South Africa meeting its greenhouse gas emission targets*. (Master dissertation). University of Cape Town. Retrieved from http://hdl.handle.net/11427/39344

Dawadi, S. (2020). Parental involvement in national EFL test preparation. *RELC Journal: A Journal of Language Teaching and Research*, *51*(3), 427-439.

DeCarlo, M. (2018). Scientific Inquiry in Social Work. https://scientificinquiryinsocialwork.pressbooks.com/chapter/7-1-types-of-research

Demirbas, A. (2011). Waste management, waste resource facilities and waste conversion processes. *Energy Conversion and Management*, *52*(2), 1280-1287.

Denzin, N. K. (1989). Interpretive biography. SAGE Publications Inc., https://doi.org/10.4135/9781412984584

Department of environmental affairs, forestry and fisheries. (2017). Green schools programme speech. Retrieved from https://www.gov.za/speeches/south-african-green-schools-programme-launched-limpopo-25-apr-2017-0000

Dewey, J. (1897). The psychology of effort. *The Philosophical Review*, *6*(1), 43-56.

Dewey, J. (1983). *Experience and education*. Peter Smith Publisher, Incorporated.

Dhanya, C. H., & Pankajam, R. (2017). Environmental awareness among secondary school students. *International Journal of Research Granth Aalayah*, *5*(5), 22-26.

Dlamini, S. Q. (2017). *Solid waste management in South Africa: exploring the role of the informal sector in solid waste recycling in Johannesburg* (Doctoral dissertation). University of the Witwatersrand, South Africa.

Dodson, S. I., Arnott, S. E., & Cottingham, K. L. (2000). The relationship in lake communities between primary productivity and species richness. *Ecology*, *81*(10), 2662-2679.

Dougherty, B. P., Smith, B. A., Carson, C. A., & Ogden, N. H. (2021). Exploring the percentage of COVID-19 cases reported in the community in Canada and associated case fatality ratios. *Infectious Disease Modelling, 6*, 123-132.

Dube, O. P. (2013). Climate change and sustainable development in Botswana: Towards a framework for adaptation. In J. Palutikof, S. L. Boulter, A. J. Ash, M. Stafford Smith, M. Parry, M. Waschka, & D. Guirtart (Eds.), *Climate adaptation futures* (pp. 215-226). Wiley & Sons.

Duenas, M. B. (2020). A Medical Science Educator's Guide to Selecting a Research Paradigm: Building a Basis for Better Research. *Medical Science Educator, 30*(1), 545-553.

Dyment, J. E. (2005). Green school grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical & Environmental Education*, *14*(1), 28-45.

Edsand, H. E., & Broich, T. (2020). The impact of environmental education on environmental and renewable energy technology awareness: Empirical evidence from Colombia. *International Journal of Science and Mathematics Education*, *18*(4), 611-634.

Elser, J. (2006). Biological stoichiometry: a chemical bridge between ecosystem ecology and evolutionary biology. *The American Naturalist, 168*(S6), S25-S35.

Eneji, C. V. O., Onnoghen, U. N., Etim, A. E., & Effiong, G. (2019). Environmental education and waste management behaviour among undergraduate students of University of Calabar, Nigeria. *Journal of Education and Practice, 10*(24), 222–288. https://doi.org/10.7176/JEP

Engemann, K., Pedersen, C. B., Arge, L., Tsirogiannis, C., Mortensen, P. B., & Svenning, J. C. (2019). Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. *Proceedings of the national academy of sciences*, *116*(11), 5188-5193.

Eten, S. (2015). Indigenising Africa's Environmental Education through a Development Education Discourse for Combating Climate Change. *Policy & Practice: A Development Education Review*, (21), 105-122.

Eten, S. (2015). The prospects of development education in African countries: Building a critical mass of citizenry for civic engagement. *Policy & Practice: A Development Education Review*, (20), 136–151.

Ezimah, M. O. A. (2021). Sustainable development: The North-South relation. *East African Scholars Journal of Education, Humanities and Literature, 4*(4), 196-201. https://doi.org/10.36349/easjehl.2021.v04i04.008

Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2012). *Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance: A critical literature review*. University of Chicago Consortium on Chicago School Research.

Fine, M. (1993). [Ap] parent involvement: Reflections on parents, power, and urban public schools. *Teachers College Record*, *94*(4), 1-19.

Fleming, J., & Zegwaard, K. E. (2018). Methodologies, methods and ethical considerations for conducting research in work-integrated learning. *International Journal of Work-Integrated Learning, 19*(3), 205-213.

Flick, U. (2014). Mapping the field. *The SAGE handbook of qualitative data analysis, 1*, 3-18.

Fonseca, E. L., Morgado, S. M., Caldart, R. V., & Vicente, A. C. (2022). Global genomic epidemiology of Escherichia coli (ExPEC) ST38 lineage revealed a virulome associated with human infections. *Microorganisms*, *10*(12), 2482.

Fullan, M. (2016). *The New Meaning of Educational Change* (5th ed.). Teacher college press.

Gavurova, B., Megyesiova, S., & Hudak, M. (2021). Green growth in the OECD countries: A multivariate analytical approach. *Energies*, *14*(20), 6719.

George, T. (2022). What is a focus group? | Step-by-step guide & examples. *Scribbr*. https://www.scribbr.co.uk/author/tegan/page/5/

Gerden, T. (2018). The adoption of the Kyoto Protocol of the United Nations Framework Convention on Climate Change. *Contributions to Contemporary History 58*(2). https://ojs.inz.si/pnz/article/view/297/1028

Gericke, N., Hudson, B., Olin-Scheller, C., & Stolare, M. (2018). Powerful knowledge, transformations, and the need for empirical studies across school subjects. *London Review of Education*, *16*(3), 428–444. https://doi.org/10.18546/LRE.16.3.06

Gevorgyan, S., & Adanalyan, A. (2009). A comparison of ecological education and sustainable development education. In A. Gil, L. Stelljes, & O. Borysova (Eds.), *Addressing global environmental security through innovative educational curricula* (pp. 57–61). Springer.

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International journal of psychology*, *49*(3), 141-157.

Gikonyo, J. M., Agwata, J. F., & Anyango, S. O. (2022). Assessing the factors influencing effectiveness of environmental programmes in secondary schools in Muranga County, Kenya. *International Journal of Educational Policy Research and Review*, *9*(4), 88-96.

Gikonyo, J. M., Anyango, S. O., & Agwata, J. F. (2021). Assessing the Influence of School Environmental Programmes on the Environmental Attitudes and Behaviour Among Secondary School Students in Muranga County, Kenya. *Advances in Social Sciences Research Journal*, *8*(8), 438–454. https://doi.org/10.14738/assrj.88.10654

Gilbert, C. M. (2019). *Barriers to Implementation of Environmental Education in Secondary Schools in Molo, Nakuru County, Kenya* (Doctoral dissertation), Kenyatta University.

Gilbertson, K., Ewert, A., Sikander, P., & Bates, T. (2022). *Outdoor education: Methods and strategies*. Human Kinetics.

Gillani, M., Niaz, H. A., Farooq, M. U., & Ullah, A. (2022). Data collection protocols for VANETs: a survey. *Complex & Intelligent Systems*, *8*(3), 2593-2622.

Gilmartin-Thomas, J. F., Liew, D., & Hopper, I. (2018). Observational studies and their utility for practice. *Australian prescriber*, *41*(3), 82–85. https://doi.org/10.18773/austprescr.2018.017

Göbel, B. (2022). Environmental education and its challenges to foster attitudes. *Biosphere Reserves Management,* 1-9. https://doi.org/10.13140/RG.2.2.14295.14244

Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your "house." *Administrative Issues Journal: Connecting Education, Practice, and Research, 4*(2), 12-26. https://doi.org/10.5929/2014.4.2.9

Greenwood, D. J., & Levin, M. (2007). *Introduction to action research*. SAGE Publications, Inc., https://doi.org/10.4135/9781412984614

Gunawan, J. (2015). Corporate social disclosures in Indonesia: Stakeholders' influence and motivation. *Social Responsibility Journal*, *11*(3), 535-552.

Gupta, A., Gupta, R., & Singh, R. L. (2016). Microbes and Environment. *Principles and Applications of Environmental Biotechnology for a Sustainable Future*, 43–84. https://doi.org/10.1007/978-981-10-1866-4_3

Gupta, S., Stamatoyannopoulos, J. A., Bailey, T. L., & Noble, W. S. (2007). Quantifying similarity between motifs. *Genome biology*, *8*, 1-9.

Halder, N. (2012). Encouraging teaching and presentation skills. *The clinical teacher, 9*(4), 253-257. https://doi.org/10111/j.1743-498X.2012.00603.x

Haller, C. R. (2017). Sustainability and sustainable development: The evolution and use of confused notions. In D. G. Ross (Ed.), *Topic-driven environmental rhetoric* (1st ed., pp. 21). Routledge. https://doi.org/10.4324/9781315442044

Hammerberg, K. K. (2016). Qualitative research methods: When to use them and how to judge them. *Human Reproduction, 31*(3), 498–501. https://doi.org/10.1093/humrep/dev334

Han, K., Xiao, A., Wu, E., Guo, J., Xu, C., & Wang, Y. (2021). Transformer in transformer. *Advances in neural information processing systems*, *34*, 15908-15919.

Handayani, A. S., & Ariyanti, I. (2020). *Kemandirian belajar matematika siswa SMP disaat pandemi COVID-19*. Proceedings of the Konferensi Nasional Pendidikan I, FKIP – Universitas Muhammadiyah Banjarmasin.

Handl, G. (2012). Declaration of the United Nations conference on the human environment (Stockholm Declaration), 1972 and the Rio Declaration on Environment and Development, 1992. *United Nations Audiovisual Library of International Law*, *11*(6), 1-11.

Hangel, N., Schönweitz, F., McLennan, S., Fiske, A., Zimmermann, B. M., & Buyx, A. (2022). Solidaristic behaviour and its limits: A qualitative study about German and Swiss residents' behaviours towards public health measures during COVID-19 lockdown in April 2020. *SSM-Qualitative Research in Health*, *2*, 100051. https://doi.org/10.1016/j.ssmqr.2022.100051

Hannagan, T. (2006). Leadership and environmental assessment in further education. *Journal of further and higher education*, *30*(4), 325-335.

Harper, C., & Snowden, M. (2017). *Environment and society: Human perspectives on environmental issues*. Routledge.

Harry, B., & Lipsky, M. (2014). Qualitative research on special education teacher preparation. In M. McCray, T. Brownell, & B. Lignugaris/Kraft (Eds.), *Handbook of research on special education teacher preparation* (pp. 445-460). Routledge.

Hart, R. A. (2013). *Children's participation: The theory and practice of involving young citizens in community development and environmental care*. Routledge.

Hasan, A., Elmualim, A., Rameezdeen, R., Baroudi, B. & Marshall, A. (2018). An exploratory study on the impact of mobile ICT on productivity in construction projects. *Built Environment Project and Asset Management, 8*(3), 320-332. https://doi.org/10.1108/BEPAM-10-2017-0080.

Hebe, H. (2019). Locating the Position of Environmental Education in the South African School Curriculum: The Case of Grade R. *Eurasia Journal of Mathematics, Science and Technology Education, 15*(9), em1750. https://doi.org/10.29333/ejmste/108486

Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social science & medicine*, *292*, 114523. https://doi.org/10.1016/j.socscimed.2021.114523

Hennink, M., Hutter, I. & Bailey, A. (2020). *Qualitative Research Methods.* SAGE Publications Limited, Thousand Oaks.

Hens, H. (1992). IEZ Annex 14: Condensation and energy. *Journal of thermal insulation, 15*(3), 261-273.

Heritage, J. (2010). *Conversation analysis: Practices and methods*. In D. Silverman (Ed.), *Qualitative research: Theory, method, and practice* (3rd ed.). Sage Publications.

Higginbottom, G. (2004). Sampling issues in qualitative research. *Nurse Researcher, 12*(1), 7–19. https://doi.org/10.7748/nr2004.07.12.1.7.c5927

Hoggart, R. (1978). *The Richard Hoggart Papers*. University of Illinois at Urbana-Champaign. Retrieved from https://digital.library.illinois.edu/collections/p15847coll69494

Houmam, L., & Aomar, I. (2023). Effects of school-based environmental clubs: Fostering environmental awareness and strengthening eco-citizen behaviours among students. *Journal of Law and Sustainable Development, 11*(12), e1775. https://doi.org/10.55908/sdgs.v11i12.1775

Hutchison, Y. (2021). 6 Calling everything into question. *Gender, Transitional Justice and Memorial Arts: Global Perspectives on Commemoration and Mobilization.*

Hutton, G., & Chase, C. (2017). Water supply, sanitation, and hygiene. In C. N. Mock, R. Nugent, O. Kobusingye, & et al. (Eds.), *Injury prevention and environmental health*

(3rd ed., Chapter 9). The International Bank for Reconstruction and Development/The World Bank. https://doi.org/10.1596/978-1-4648-0522-6_ch9

Immergut, E. M., & Bohle, D. (2018). *Introduction to research methods*. Seminar materials, European University Institute.

In, J., & Lee, S. (2017). Statistical data presentation. *Korean Journal of Anesthesiology, 70*(3), 267–276. https://doi.org/10.4097/kjae.2017.70.3.267

Indraratna, P., Biswas, U., McVeigh, J., Mamo, A., Magdy, J., Vickers, D., Watkins, E., Ziegi, A., Liu, H., Cholerton, N., Li, J., Holgate, K., Fildes, J., Gallagher, R., Ferry, C., Jan, S., Briggs, N., Schreier, G., Redmond, S. J., & Ooi, S. (2022). A smartphone-based model of care to support patients with cardiac disease transitioning from hospital to the community (TeleClinical Care): Pilot randomized controlled trial. *JMIR mHealth and uHealth, 10*(2), e32554. https://doi.org/10.2196/32554

International Union for The Conservation Of Nature (IUCN). (1971). Education and the environment. *Papers of the Nevada Conference of 1970 and the Zurich Conference of 1971*. Morges: IUCN Publication Series.

Irwin, P. (1990). The concept of environmental education and the development of environmental education in South Africa. *Southern African Journal of Environmental Education, 11*, 3-7.

Islamoglu, H., Kabakci Yurdakul, I., & Ursavas, O. F. (2021). Pre-service teachers' acceptance of mobile-technology-supported learning activities. *Educational Technology Research and Development, 69*(2), 1025–1054. https://doi.org/10.1007/s11423-021-09955-6

Islamoglu, T., Goswami, S., Li, Z., Howarth, A. J., Farha, O. K., & Hupp, J. T. (2017). Post-synthetic tuning of metal-organic frameworks for targeted applications. *Accounts of Chemical Research, 50*(4), 805–813. https://doi.org/10.1021/acs.accounts.6b00577

Israel, B., Gorski, J., Lothian, N., Severson-Baker, C., & Way, N. (2020). *The oilsands in a carbon-constrained Canada: The collision course between overall emissions and national climate commitments* (pp. 39-44, Rep.). Pembina Institute. https://doi.org/10.2307/resrep22096.9

Jacobs, B. (1999). *Categorical logic and type theory* (Vol. 141). Elsevier. https://doi.org/10.1016/C2009-0-26345-4

Jaelani, A., Fauzi, H., & Zaqiyah, Q. Y. (2020). Penggunaan media online dalam proses kegiatan belajar PAI di massa pandemi COVID-19. *Journal IKA Ikatan Alumi PGSD UNARRS,* *8*(1), 12–24. https://ejournal.annadwahkualatungka.ac.id/index.php/aktualita/article/view/161

Jansen, A., Moses, M., Mujuta, S. C., & Yu, D. (2013). Multifacet poverty: Absolute, relative and subjective poverty in South Africa. *Paper presented at the Economic Society of South Africa Biennial Conference*, University of the Free State, Bloemfontein, South Africa.

Jarvie, M. E. (2016). Brundtland report. *Encyclopedia Britannica*. https://www.britannica.com/topic/Brundtland-Report

Jorgenson, S. N., Stephens, J., & White, B. (2019). Environmental Education in Transition: A Critical Review of Recent Research on Climate Change and Energy Education. *The Journal of Environmental Education, 50*(3), 160-171. https://doi.org/10.1080/00958964.2019.1604478

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of advanced nursing*, *72*(12), 2954-2965.

Kanene, K. M. (2016). The impact of environmental education on the environmental perceptions/attitudes of students in selected secondary schools of Botswana. *European Journal of Alternative Education Studies*, *0*(0). https://doi.org/10.46827/ejae.v0i0.183

Karafil, B., & Oguz, A. (2019). Examining factors affecting student engagement in English preparatory classes according to student opinions. *Üniversitepark Bülten, 8*(2), 117.

Karthe, D., Reeh, T., Walther, M., Niemann, S., & Siegmund, A. (2016). School-based environmental education in the context of a research and development project on integrated water resources management: Experiences from Mongolia. *Environmental Earth Sciences, 75*(18), 1286. https://doi.org/10.1007/s12665-016-6030-2

Karthe, D., Reeh, T., Walther, M., Niemann, S., & Siegmund, A. (2016). School-based environmental education in the context of a research and development project on integrated water resources management: experiences from Mongolia. *Environmental Earth Sciences, 75*(18), 1286.

Kaswan, M. S., & Rathi, R. (2019). Analysis and modelling the enablers of green lean six sigma implementation using interpretive structural modelling. *Journal of cleaner production, 231*, 1182-1191.

Kathari, S., & Tangirala, A. K. (2020). Scalar correlation functions for model structure selection in high-dimensional time-series modelling. *ISA Transactions, 100*, 275–288.

Katri, I. (2020). The protection of trans rights in Israel. In I. C. Jaramillo Sierra (Ed.), *Trans rights and wrongs: A comparative study of legal reform concerning trans persons* (Ius Comparatum - Global Studies in Comparative Law). Springer Publishing. https://ssrn.com/abstract=3907143

Ketlhoilwe, M. J. (2013). Governmentality in environmental education policy discourses: a qualitative study of teachers in Botswana. *International Research in Geographical and Environmental Education*, *22*(4), 291–302. https://doi.org/10.1080/10382046.2013.826545

Khenisa, B. (2016). *The impact of mineral extraction on local economic development of mining towns: A Marikana perspective* (Master's dissertation). University of the Witwatersrand.

Kim, J. (2011). Philosophy of Mind (3rd ed.). Routledge. https://doi.org/10.4324/9780429494857

Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education, 6*(5), 26–41. https://doi.org/10.5430/ijhe.v6n5p26

Kolb, A. Y., & Kolb, D. A. (2009). Experiential learning theory: A dynamic, holistic approach to management learning, education and development. In S. J. Armstrong & C. V. Fukami (Eds.), *The SAGE handbook of management learning, education and development* (pp. 42–68). SAGE Publications Ltd. https://doi.org/10.4135/9780857021038.n3

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

Koppelaar, R. H. E. M., Pamidi, S., Hajosi, E., Herreras, L., Leroy, P., Jung, H. Y., Concheso, A., Daniel, R., Francisco, F. B., & Parrado, C., et al. (2023). A digital product passport for critical raw materials reuse and recycling. *Sustainability, 15*(1405). https://doi.org/10.3390/su15021405

Korotkova, T. S., & Zakirova, D. I. (2021). Environmental education and education for sustainable development: General and special. *Bulletin of Turan University, 1*(89), 110–115.

Korsgaard, C. M. (2018). *Fellow creatures: Our obligations to the other animals*. Oxford University Press.

Koshy, V. (2005). *Action research for improving practice: A practical guide*. Paul Chapman Publishing.

Kretzer, M. M., Ali, A. A., & Schweiger, S. (2023). Environmental education in African countries and its implementation in Lesotho. In W. Leal Filho, I. R. Abubakar, I. da Silva, R. Pretorius, & K. Tarabieh (Eds.), *SDGs in Africa and the Middle East region: Implementing the UN sustainable development goals – Regional perspectives*. Springer. https://doi.org/10.1007/978-3-030-91260-4_103-1

Kristjánsson, Á., Heimisson, P. R., Róbertsson, G. F., & Whitney, D. (2013). Attentional priming releases crowding. *Attention, Perception & Psychophysics, 75*, 1323-1329.

Kumar, A., Roberts, D., Wood, K. E., Light, B., Parrillo, J. E., Sharma, S., & Cheang, M. (2006). Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical care medicine, 34*(6), 1589-1596.

Kurt, Y. (2022). Corporate Social Responsibilities in Air Transport: A Research Agenda on the Effects of the COVID-19 Pandemic. In: Kiracı, K., Çalıyurt, K.T. (eds). *Corporate Governance, Sustainability, and Information Systems in the Aviation Sector* (Vol. 1, pp.53–71). Springer. https://doi.org/10.1007/978-981-16-9276-5_4

Kwon, D., Kim, H., Kim, J., & Park, J. (2019). A survey of deep learning-based network anomaly detection. *Cluster Computing, 22*(1), 949–961. https://doi.org/10.1007/s10586-017-1117-8

Kyburz-Graber, R. (2012). Socio-scientific views on environment and health as challenges to science education. In A. Zeyer & R. Kyburz-Graber (Eds.), *Science | Environment | Health – Towards a renewed pedagogy for science education* (pp. 31–48). Springer.

Labadi, S. (2017). UNESCO, world heritage, and sustainable development: International discourses and local impacts. In P. Gould & A. Pyburn (Eds.), *Collision or collaboration: Archaeology encounters economic development* (pp. 45–60). Springer. https://doi.org/10.1007/978-3-319-44515-1_4

Lagendijk, D. G., & Gusset, M. (2008). Human–carnivore coexistence on communal land bordering the Greater Kruger Area, South Africa. *Environmental management*, *42*, 971-976.

Laiphrakpam, M., Aroonsrimorakot, S., & Shanker, A. R. (2019). Environmental education and awareness among students in India, Japan and Thailand for sustainable development. *Interdisciplinary Research Review, 14*(2), 48-53.

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care, 4*(3), 324–327. https://doi.org/10.4103/2249-4863.161306

Lewin, K. (1948). *Resolving Social Conflicts, Selected Papers on Group Dynamics* (1935-1946). New York: Harper.

Lincoln, Y. S., & Guba, E. G. (1988). Criteria for assessing naturalistic inquiries as reports. *ERIC*. https://files.eric.ed.gov/fulltext/ED297007.pdf

Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the novice. *Qualitative research journal*, *19*(3), 259-270.

Liu, E. K., He, W. Q., & Yan, C. R. (2014). White revolution" to "white pollution" – agricultural plastic film mulch in China. *Environmental Research Letter, 9*, 091001 https://doi.org/10.1088/1748-9326/9/9/091001

Loubser, J. A. (2005). Unpacking the expression" Indigenous Knowledge Systems". *Indilinga African Journal of Indigenous Knowledge Systems*, *4*(1), 74-88.

Ma, J. J., & Ma, Y. X. (2022). The Discussions of Positivism and Interpretivism. *Global Academic Journal of Humanities and Social Sciences, 4*, 10-14. https://doi.org/10.36348/gajhss.2022.v04i01.002

Ma, J., & Ma, Y. (2022). The discussions of positivism and interpretivism. *Global Academic Journal of Humanities and Social Sciences, 4*(1), 10-14. https://doi.org/10.36348/gajhss.2022.v04i01.002

Maas, M. K., Vasilenko, S. A., & Willoughby, B. J. (2018). A Dyadic Approach to Pornography Use and Relationship Satisfaction Among Heterosexual Couples: The Role of Pornography Acceptance and Anxious Attachment. *Journal of sex research*, *55*(6), 772–782. https://doi.org/10.1080/00224499.2018.1440281

Maciel, K. F. K., Fuentes-Guevara, M. D., da Silva Gonçalves, C., Mendes, P. M., de Souza, E. G., Corrêa, L. B. (2022). Mobile mandala garden as a tool of environmental education in an early childhood school in Southern Brazil. *Journal of Cleaner Production, 331*, 129913. https://doi.org/10.1016/j.jclepro.2021.129913

Magaldi, D., & Berler, M. (2020). Semi-structured interviews. In V. Zeigler-Hill & T. K. Shackelford (Eds.). *Encyclopedia of personality and individual differences* (pp. 4825–4830). Springer. https://doi.org/10.1007/978-3-319-24612-3_857

Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *All Ireland Journal of Teaching and Learning in Higher Education*, *8*(3), 3351–33514.

Mahirah, K., Nazatul, F. H., & Mohd, A. S. R. (2020). Tourists' preferences for preservation of the world heritage site Stadthuys, Malacca. *Journal of Environmental Management and Tourism, 11*(2), 281-289.

Maleficio, J. (2018). Green schools Alliance: How to Cultivate Environmental Awareness in Schools. Retrieved from https://www.greenschoolsalliance.org/blogs/60/628

Malik, T. (2016). School children's understanding and attitude towards environment. *International Journal of Research in Economics and Social Sciences, 6*(12), 44-50.

Maphosa, C. (2023). *Perceptions of teachers on the implementation of the waste management hierarchy within secondary schools* (Doctoral dissertation). North-West University, South Africa.

Marin-Gonzalez, F., Moganadas, S.R., Paredes-Chacin, A. J., Yeo, S.F., & Subramaniam, S. (2022). Sustainable local development consolidated framework for cross-sectional cooperation via systematic approach. *Sustainability, 14*(11), 6601.

Marpa, E. P. & Juele, M. H. R. (2016). Environmental Awareness and Practices among High School Students: Basis for Disaster Preparedness Program. *Applied Mechanics and Materials, 848,* 240-243.

Marpa, E. P. (2020). Navigating environmental education practices to promote environmental awareness and education. *International Journal on Studies in Education, 2*(1), 45-57.

Marpa, E. P., & Juele, M. H. R. (2016). Environmental awareness and practices among high school students: Basis for disaster preparedness program. *Applied Mechanics and Materials*, *848,* 240-243.

Marques, R., & Xavier, C. R. (2020). The challenges and difficulties of teachers in the insertion and practice of environmental education in the school curriculum. *International Journal on Social and Education Sciences, 2*(1), 49–56.

Mashaba, E. K., Maile, S., & Manaka, M. J. (2022). Learners' Knowledge of Environmental Education in Selected Primary Schools of the Tshwane North District, Gauteng Province. *International journal of environmental research and public health*, *19*(23), 15552. https://doi.org/10.3390/ijerph192315552

Matías, L., Godoy, O., Gómez-Aparicio, L., & Pérez-Ramos, I. M. (2018). An experimental extreme drought reduces the likelihood of species to coexist despite increasing intransitivity in competitive networks. *Journal of Ecology*, *106*(3), 826–837. https://doi.org/10.1111/1365-2745.12962

Matinde, E., Simate, G. S., & Ndlovu, S. (2018). Mining and metallurgical wastes: a review of recycling and re-use practices. *Journal of the Southern African institute of mining and metallurgy*, *118*(8), 825-844.

Maxwell, J. A. (2012). A realist approach for qualitative research. *Sage, 13*(4). Thousand Oaks, CA. https://doi.org/10.1177/1468794113483

Mazhar, S. A., Anjum, R., Anwar, A. I., & Khan, A. A. (2021). Methods of data collection: A fundamental tool of research. *Journal of Integrated Community Health, 10*(1), 6–10. https://doi.org/10.24321/2319.9113.202101

Mazungunye, P. P. (2022). *Industrialization for economic transformation: Economy-wide impacts of agro-processing development in Tanzania* (Doctoral thesis). Stellenbosch University.

Mensah, A. M., & Castro, L. C. (2004). Sustainable resource use & sustainable development: a contradiction. *Center for Development Research, University of Bonn*, *1*, 22. https://doi.org/10.1002/bse.2004

Meyer, J. J. (2020). *Exploring the Conceptual Framework and Knowledge Base of Nature-based Experiential Education* (Doctoral dissertation), Montana State University.

Michael, K. L., Hungund, S. S., & Sriram K. V. (2024). Factors influencing the behaviour in recycling of e-waste using integrated TPB and NAM model. *Cogent Business & Management, 11*(1), 2-24.

Miettinen, R. (2000). The concept of experiential learning and John Dewey's theory of reflective thought and action. *International Journal of Lifelong Education, 19*(1), 54-72.

Miles, M. B. (1994). Qualitative data analysis: An expanded sourcebook. *Thousand Oaks*.

Miller, J., Cantor, A., Zachariah, P., Ahn, D., Martinez, M., & Margolis, K. G. (2020). Gastrointestinal symptoms as a major presentation component of a novel multisystem inflammatory syndrome in children that is related to coronavirus disease 2019: a single center experience of 44 cases. *Gastroenterology, 159*(4), 1571-1574.

Mitra, A. (1998). Status of coastal pollution in West Bengal with special reference to heavy metals. *Journal of Indian Ocean Studies, 5*, 135–138.

Mkhonto, B., & Mnguni, L. (2021). The impact of a Rural School-Based Solid Waste Management Project on learners' perceptions, attitudes and understanding of recycling. *Recycling*, *6*(4), 71. https://doi.org/10.3390/recycling6040071

Mohiuddin, M., Al Mamun, A., Syed, F. A., Mehedi Masud, M., & Su, Z. (2018). Environmental knowledge, awareness, and business school students' intentions to purchase green vehicles in emerging countries. *Sustainability*, *10*(5), 1534.

Mokhele, M. L. (2011). Integrated environmental teaching in South Africa: An impossible dream? *Perspectives in Education, 29*(4), 78-86. https://doi.org/10.38140/pie.v29i4.1720

Montiel, I., Cuervo-Cazurra, A., Park, J., Antolín-López, R., & Husted, B. W. (2021). Implementing the United Nations' sustainable development goals in international business. *Journal of International Business Studies*, *52*(5), 999.

Morelli, J. (2011). Environmental sustainability: A definition for environmental professionals. *Journal of Environmental Sustainability, 1*(1), Article 2. https://doi.org/10.14448/jes.01.0002

Moser, A., & Korstjens, I. (2017). Series: Practical guidance to qualitative research. Part 1: Introduction. *The European journal of general practice*, *23*(1), 271–273. https://doi.org/10.1080/13814788.2017.1375093

Muldoon, R. (2008). Recognising and rewarding the contribution and personal development of peer supporters at university. *Journal of Further and Higher Education*, *32*(3), 207-219.

Muller, S. M. (2021). The dangers of performative scientism as the alternative to anti-scientific policymaking: A critical, preliminary assessment of South Africa's Covid-19 response and its consequences. *World Development, 140*, 105290. https://doi.org/10.1016/j.worlddev.2020.105290

Munna, A. S., & Kalam, M. A. (2021). Teaching and learning process to enhance teaching effectiveness: a literature review. *International Journal of Humanities and Innovation (IJHI)*, *4*(1), 1-4.

Mutz, M., & Müller, J. (2016). Mental health benefits of outdoor adventures: Results from two pilot studies. *Journal of adolescence*, *49*, 105-114.

Mwaura, F. M., & Muwanika, F. R. (2018). Providing irrigation water as a public utility to enhance agricultural productivity in Uganda. *Utilities Policy*, *55*, 99-109.

Negi, A. S., Kumar, J. K., Luqman, S., Shanker, K., Gupta, M. M., & Khanuja, S. P. S. (2008). Recent advances in plant hepatoprotectives: a chemical and biological profile of some important leads. *Medicinal research reviews*, *28*(5), 746-772.

Nepi, L. (2019). Ethical issues concerning the informed consent process in paediatric clinical trials: European guidelines and recommendations on minor's assent and parental permission. *BioLaw Journal-Rivista di BioDiritto*, 53–63.

Nieuwenhuis, J. (2010). Social justice in education revisited. *Education Inquiry, 1*(4), 269–287. https://doi.org/10.3402/edui.v1i4.21946

Nikander, P. (2008). Working with transcripts and translated data. *Qualitative research in psychology*, *5*(3), 225-231.

Nikolaeva, I. (2008). Between nouns and adjectives: A constructional view. *Lingua, 118*(7), 969–996. https://doi.org/10.1016/j.lingua.2006.07.003

Nikolaou, I. E., Jones, N., & Stefanakis, A. (2021). Circular economy and sustainability: the past, the present and the future directions. *Circular Economy and Sustainability*, *1*, 1-20.

Nikolopoulou, K., & Zacharis, G. (2023). Blended learning in a higher education context: Exploring university students' learning behaviour. *Education Sciences, 13*(5), 514.

Nkambwe, M., & Essilfie, V. N. (2012). Misalignment between Policy and Practice: Introducing Environmental Education in School Curricula in Botswana. *Educational Research Review, 7*, 19-26.

Nkoana, E. M. (2020). Exploring the effects of an environmental education course on the awareness and perceptions of climate change risks among seventh and eighth grade learners in South Africa. *International Research in Geographical and Environmental Education*, *29*(1), 7-22.

Nomura, K. (2009). Perspective on education for sustainable development: Historical development of environmental education in Indonesia. *International Journal of Educational Development, 29*, 621-627. https://doi:10.1016/j.ijedudev.2008.12.002

Norman, M., Gilboa, T., Ogata, A. F., Maley, A. M., Cohen, L., Busch, E. L., & Walt, D. R. (2020). Ultrasensitive high-resolution profiling of early seroconversion in patients with COVID-19. *Nature biomedical engineering, 4*(12), 1180-1187.

Ntanos, S., Kyriakopoulos, G., Skordoulis, M., Chalikias, M., & Arabatzis, G. (2019). An application of the new environmental paradigm (NEP) scale in a Greek context. *Energies*, *12*(2), 239.

Ocansey, F. (2006). Gender Differences in adolescent students' knowledge, attitudes and practices on HIV/AIDS in Ghana. *Gender behaviour Journal, 4*(1). https://doi.10.4314/gab.v4i1.23346

Ollerer, K. (2015). Environmental education – the bumpy road from childhood foraging to literacy and active responsibility. *Journal of Integrative Environmental Sciences*, *12*(3), 205–216. https://doi.org/10.1080/1943815X.2015.1081952

Ollerer, V., Croux, C., & Alfons, A. (2015). The influence function of penalized regression estimators. *Statistics, 49*(4), 741-765.

Omoogun, A. C., Egbonyi, E.E., & Onnoghen, U.N. (2016). From Environmental Awareness to Environmental Responsibility: Towards a Stewardship Curriculum. *Journal of Educational Issues, 2*(2), 60-72.

Otinga, C. S., & Ngigi, S. (2018). Media and environmental awareness in Kenya: A case of TV. *New Media and Mass Communication, 67*, 1–6. https://doi.org/10.7176/NMMC.VOL671-6

Pace, T. W., Negi, L. T., Adame, D. D., Cole, S. P., Sivilli, T. I., Brown, T. D., Issa, M. J., & Raison, C. L. (2009). Effect of compassion meditation on neuroendocrine, innate immune and behavioral responses to psychosocial stress. *Psychoneuroendocrinology, 34*(1), 87–98. https://doi.org/10.1016/j.psyneuen.2008.08.011

Pacho, T. (2015). Exploring participants' experiences using case study. *International Journal of Humanities and Social Science, 5*(4), 44-53.

Paglia, E. (2021). The Swedish initiative and the 1972 Stockholm Conference: the decisive role of science diplomacy in the emergence of global environmental governance. *Humanities and Social Sciences Communications*, *8*(1), 1-10.

Pamla, A., Thondhlana, G., & Ruwanza, S. (2021). Persistent droughts and water scarcity: households' perceptions and practices in Makhanda, South Africa. *Land, 10*(6), 593.

Panayiotou, G. P., Kalogirou, S. A., & Tassou, S. A. (2016). Evaluation of the application of Phase Change Materials (PCM) on the envelope of a typical dwelling in the Mediterranean region. *Renewable Energy*, *97*, 24-32.

Park, Y., Konge, L., & Artino, A. R. (2020). The Positivism Paradigm of Research. *Academic medicine: journal of the Association of American Medical Colleges, 95*(5). http://dx.doi.org/10.1097/ACM.0000000000003093

Parker, L., & Prabawa-Sear, K. (2020). *Environmental education in Indonesia: creating responsible citizens in the global south?* (p. 280). Taylor & Francis

Passarelli, A. M., & Kolb, D. A. (2020). *The learning way: Learning from experience as the path to lifelong learning and development*. Experience Based Learning Systems, LLC.

Patel, M., & Patel, N. (2019). Exploring Research Methodology. *International Journal Research Methodology Review, 6*, 48-55.

Patton, M. Q. (2014). Qualitative research & evaluation methods: Integrating theory and practice. Sage publications.

Pawar, R., Gavade, V., Patil, N., Mali, V., Girwalkar, A., Tarkasband, V., & Lakshminrusimha, S. (2021). Neonatal multisystem inflammatory syndrome (MIS-N) associated with prenatal maternal SARS-CoV-2: a case series. *Children, 8*(7), 572.

Pham, L. (2018). *A review of key paradigms: Positivism, interpretivism and critical inquiry* (pp. 1–7). The University of Adelaide. https://doi.org/10.13140/RG.2.2.13995.54569

Potsi, A. (2013). *Pre-primary education from the perspective of the capability approach: An empirical investigation into teachers' beliefs and self-reported practices* (Doctoral dissertation). Universitaets bibliothek Bielefeld.

Powers, W. R. (2005). *Transcription techniques for the spoken word*. Rowman Altamira.

Pranav, S., Lahoti, M., Shan, X., Yang, E.-H., & Muthukumar, G. (2022). "Economic input-output LCA of precast corundum-blended ECC overlay pavement, *Resources, Conservation and Recycling, 184*, 106385. *(3) (PDF) Carbon Neutrality: A Review*. Available from: https://www.researchgate.net/publication/370822806_Carbon_Neutrality_A_Review [accessed Sep 09 2024].

Pratt, M. G. (2009). From the editors: For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research. *Academy of management journal*, *52*(5), 856-862.

Prem, A., Pretko, M., & Nandkishore, R. M. (2018). Emergent phases of fractonic matter. *Physical Review B*, *97*(8), 085116. https://doi.org/10.1103/PhysRevB.97.085116

Prem., H. A. (2019). What is the importance of environment in points? Retrieved from https://www.quora.com/profile/Harika-Prem-A

Prihantoro, C.R. (2014). The perspective of curriculum in Indonesia on environmental education. *International Journal of Research Studies in Education, 4*. https://doi/10.5861/IJRSE.2014.915

Primavera, R., Kevadiya, B. D., Swaminathan, G., Wilson, R. J., De Pascale, A., Decuzzi, P., & Thakor, A. S. (2020). Emerging Nano- and Micro-Technologies Used in the Treatment of Type-1 Diabetes. *Nanomaterials (Basel, Switzerland)*, *10*(4), 789. https://doi.org/10.3390/nano10040789

Priya, A. (2021). Case study methodology of qualitative research: Key attributes and navigating the conundrums in its application. *Sociological Bulletin*, *70*(1), 1–14. https://doi.org/10.1177/0038022920970318

Punzalani, C. H. (2020). Evaluating the environmental awareness and practices of senior high school students: basis for environmental education program. *Aquademia, 4*(1), ep200012. https://doi.org/10.29333/aquademia/8219

Puri, N., Eric, A., Coomes, H. H., & Gunuratne, K. (2020). Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. *Human vaccines & immunotherapeutics*, *16*(11), 2586-2593. https://doi/10.1080/21645515.2020/1780846

Quayson, A. (2019). Modern African literary history: nation-and-narration, orality, and diaspora. *Journal of the African Literature Association*, *13*(1), 131-152.

Ragab, K. M., Orhan, M. F., Saka, K., & Zurigat, Y. (2022). A Study and Assessment of the Status of Energy Efficiency and Conservation at School Buildings. *Sustainability*, *14*(17), 10625.

Rahman, M. S. (2017). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language "testing and assessment" research: A literature review. *Journal of Education and Learning, 6*(1), 102–112.

Rai, N., & Thapa, B. (2015). A study on purposive sampling method in research. *Kathmandu: Kathmandu School of Law, 5*(1), 8-15.

Ramdhani, M. A., & Ramdhani, A. (2014). Verification of research logical framework based on literature review. *International Journal of Basic and Applied Science*, *3*(2), 1-9.

Reamer, F. G. (2012) Codes of ethics. In M. Gray, J. Midgley and S. A. Webb (eds) *The SAGE Handbook of Social Work*, 299–315. Los Angeles: Sage. https://doi.org/10.4135/9781446247648.n20

Reddy, C. P. (2017). Environmental education in teacher education: A viewpoint exploring options in South Africa. *Southern African Journal of Environmental Education, 33*(1), 117. https://doi.org/10.4314/sajee.v33i1.9

Rehman, A. A., & Alharthi, K. (2016). An introduction to research paradigms. *International Journal of Educational Investigations, 3(8), 51-59.*

Remus, H. E. (1984). Authority, consent, law: Nomos, physis, and the striving for a 'given'. *Studies in Religion/Sciences Religieuses, 13*(1), 5-18.

Robert K.Y. (2014). Case Study Research Design and Methods. *Canadian Journal of Program Evaluation, 30*(1), 108-110.

Roberts, R. C. (2003). *Emotions: An essay in aid of moral psychology*. Cambridge University Press.

Robinson, J. O. (2013). Environmental education and sustainable development in Nigeria: Breaking the missing link. *International Journal of Education and Research, 1*(5), 1-6.

Rogayan, D. V. Jr., & Nebrida, E. E. D. (2019). Environmental awareness and practices of science students: Input for ecological management plan. *International Electronic Journal of Environmental Education, 9*(2), 106-119.

Rogayan, D. V., Jr., & Nebrida, E. E. D. (2019). Environmental awareness and practices of science students: Input for ecological management plan. *International Electronic*

Journal of Environmental Education, 9(2), 106–119. https://files.eric.ed.gov/fulltext/EJ1219420.pdf.

Roome, N. (1992) Developing Environmental Management Strategies. *Business Strategy and the Environment, 1*, 11-24. https://doi.org/10.1002/bse.3280010104

Rose, J., & Johnson, C. W. (2020). Contextualizing reliability and validity in qualitative research: Toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of leisure research, 51*(4), 432-451.

Rosenberg, A. (2008). *Darwinian reductionism: Or, how to stop worrying and love molecular biology*. University of Chicago Press.

Rowntree, L. C., Nguyen, T. H., Kedzierski, L., Neeland, M. R., Petersen, J., Crawford, J. C., & Kedzierska, K. (2022). SARS-CoV-2-specific T cell memory with common TCRαβ motifs is established in unvaccinated children who seroconvert after infection. *Immunity*, *55*(7), 1299-1315.

Rucht, D. (2006). Social movements challenging neo-liberal globalization. In *Civil society: Berlin perspectives* (Vol. 2, pp. 189). Berghahn Books.

Sakarya, S., Güney, M., Akıncı Demirbaş, E., & Çakmak, A. (2023). University students' awareness profile on environmental sensitivity and global climate change. *Environment, Development and Sustainability*, 1–21. https://doi.org/10.1007/s10668-023-04003-4

Saleem, S. M. (2018). Modified Kuppuswamy scale updated for the year 2018. *Paripex - Indian Journal of Research, 7*(3), 217-218.

Sallee, M. W., & Flood, J. T. (2012). Using qualitative research to bridge research, policy, and practice. *Theory into practice, 51*(2), 137-144.

Samuelson, M. (2010). Making home on the Indian Ocean rim: Relocations in South African literatures. In *Indian Ocean Studies* (1st ed., pp. 20). Routledge. https://doi.org/10.4324/9780203867433

Sandelowski, M. (1995). Sample size in qualitative research. *Research in nursing & health, 18*(2), 179-183.

Sanders, S. (2018). *An investigation into the state of environmental education and the use of technology in environmental education in Gauteng, South Africa* (Master's dissertation). University of Johannesburg, South Africa.

Sa-ngiemjit, M., Mas, M. A. M., & Alonso, A. V. (2022). Student's awareness of the environment in Mallorca (Spain) on education for sustainable development (ESD). *Springer-Verlag*, Berlin, Heidelberg.

Sansom, M., & Avery, N. (2014). Briefing: Reuse and recycling rates of UK steel demolition arisings. In *Proceedings of the Institution of Civil Engineers - Engineering Sustainability*, *167*(3), 89–94. Thomas Telford Ltd.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & quantity*, *52*(4), 1893–1907. https://doi.org/10.1007/s11135-017-0574-8

Savin-Baden, M., & Howell, M. C. (2013). *Qualitative Research: The Essential Guide to Theory and Practice* (1st ed.). Routledge. https://doi.org/10.4324/9781003377986

Schudel, I., Le Roux, C., Lotz-Sisitka, H., & Loubser, C. P. (2008). Contextualising learning in advanced certificate in education (Environmental Education) courses: Synthesising contexts and experiences. *South African Journal of Education, 28*(4), 1-14. https://doi.org/10.15700/saje.v28n4a208

Schwartz, S. H. (2012). An overview of the Schwartz theory of basic values. *Online readings in Psychology and Culture*, *2*(1), 11.

Sechelski, A. N., & Onwuegbuzie, A. J. (2019). A call for enhancing saturation at the qualitative data analysis stage via the use of multiple qualitative data analysis approaches. *The Qualitative Report, 24*(4), 795-821.

Sharma, C. (2020). Need of Ethical Values and Professional Ethics in Teaching Proffession: A Study. *Editorial Board*, *9*(6).

Shields, P. M., & Tajalli, H. (2006). Intermediate theory: The missing link in successful student scholarship. *Journal of public affairs education, 12*(3), 313-334.

Sholahuddin, A., Susilowati, E., Prahani, B. K., & Erman, E. (2021). Using a cognitive style-based learning strategy to improve students' environmental knowledge and

scientific literacy. *International Journal of Instruction, 14*(4), 791-808. https://doi.org/10.29333/iji.2021.14445a

Siddiky, M. R. (2019). Developing co-curricular activities and extra-curricular activities for all-round development of the undergraduate students: A study of a selected public university in Bangladesh. *Pakistan Journal of Applied Social Sciences, 10*(1), 61-82.

Siggelkow, N. (2007). Persuasion with case studies. *Academy of management journal. 50*(1), 20-24

Sigurgeirsson, B., & Baran, R. (2014). The prevalence of onychomycosis in the global population–a literature study. *Journal of the European Academy of Dermatology and Venereology*, *28*(11), 1480-1491.

Singh, R. L., & Singh, P. K. (2017). Global environmental problems. In *Principles and applications of environmental biotechnology for a sustainable future* (pp. 13–41). Springer. https://doi.org/10.1007/978-981-10-1866-4_2

Singh, R. L., & Singh, P. K. (2017). Global environmental problems. *Principles and applications of environmental biotechnology for a sustainable future*, 13-41.

Sobus, J. R., Wambaugh, J. F., Isaacs, K. K., Williams, A. J., McEachran, A. D., Richard, A. M., & Newton, S. R. (2018). Integrating tools for non-targeted analysis research and chemical safety evaluations at the US EPA. *Journal of exposure science & environmental epidemiology*, *28*(5), 411-426.

Spriggs, C. M. (2023). Early Intervention Family Perspective: A Qualitative Narrative Study on the Transition to Teleintervention Coaching Sessions (Doctoral dissertation, National University).

Stebbins, R. A. (2001). *Exploratory research in the social sciences*. SAGE Publications Inc.

Sutton, J., & Austin, Z. (2015). Qualitative research: Data collection, analysis, and management. *The Canadian journal of hospital pharmacy*, *68*(3), 226.

Synder, H. (2019). Literature Review as a Research Methodology: An Overview and Guidelines. *Journal of Business Research, 104*, 333-339.

Tang, K. (2024). Climate change education in Indonesia's formal education: a policy analysis. *npj Climate Action* 3, 57. https://doi.org/10.1038/s44168-024-00143-z

Taylor, T. L., Hawton, K., Fortune, S., & Kapur, N. (2009). Attitudes towards clinical services among people who self-harm: systematic review. *The British journal of psychiatry: the journal of mental science*, *194*(2), 104–110. https://doi.org/10.1192/bjp.bp.107.046425

Teane, F. M. (2021). Environmental awareness-using non-formal education to impart skills and knowledge to improve crop yield: the case of Manyeledi community, South Africa. *International Research in Geographical and Environmental Education*, *30*(4), 299-313.

Tenny, S., Brannan, J. M., & Brannan, G. D. (2022). Qualitative study. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK470395/

Thomsen, C. (2013). Sustainability (World Commission on Environment and Development definition). In S. O. Idowu, N. Capaldi, L. Zu, & A. D. Gupta (Eds.), Encyclopedia of corporate social responsibility. Springer. https://doi.org/10.1007/978-3-642-28036-8_531

Thornberg, R., & Dunne, C. (2019). Literature review in grounded theory. In The SAGE Handbook of Current Developments in Grounded Theory (pp. 206-221). SAGE Publications Ltd. https://doi.org/10.4135/9781526485656

Tilbury, D. (2004). Environmental Education for Sustainability: A Force for Change in Higher Education. In P. B. Corcoran, & A. E. J. Wals (Eds.), *Higher Education and the Challenge of Sustainability: Problematics, Promise and Practice* (pp. 97-112). Netherland: Kluwer Academic. https://doi.org/10.1007/0-306-48515-x_9

Tipton, M. J., Harper, A., Paton, J. F., & Costello, J. T. (2017). The human ventilatory response to stress: rate or depth. *The Journal of physiology*, *595*(17), 5729-5752.

Tobin, G. A., & Begley, C. M. (2004). Methodological rigour within a qualitative framework. *Journal of advanced nursing*, *48*(4), 388-396.

Transfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British journal of management*, *14*(3), 207-222.

Trollip, H., & Boulle, M. (2017). Challenges associated with implementing climate change mitigation policy in South Africa. Energy Research Centre, University of Cape Town.

Troschinetz, A. M., & Mihelcic, J. R. (2009). Sustainable recycling of municipal solid waste in developing countries. *Waste management*, *29*(2), 915-923.

Tu, Y., Ortiz, A., Gollub, R. L., Cao, J., Gerber, J., Lang, C., & Kong, J. (2019). Multivariate resting-state functional connectivity predicts responses to real and sham acupuncture treatment in chronic low back pain. *NeuroImage: Clinical*, *23*, 101885.

Turabian, J. L. (2018). Notes for a theory of multimorbidity in general medicine: The problem of multimorbidity care is not in practice, but in the lack of theoretical conceptualization. *Journal of Public Health and General Medicine, 1*(1), 1-7.

Umuhire, M. L., & Fang, Q. (2016). Method and application of ocean environmental awareness measurement: lessons learnt from university students of China. *Marine pollution bulletin*, *102*(2), 289-294.

United Nations. (1992). *Convention on Biological Diversity*. United Nations Treaty Series, 1760, 79. https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-8&chapter=27&clang=_en

Uralovich, K.S., Toshmamatovich, T.U., Kubayeyich, K.F., Sapaev, I.B., Saylaubaeyna, S.S., Beknazarova, Z.F., & Khurramov, A. (2023). A primary factor in sustainable development and environmental sustainability is environmental education. *Caspian Journal of Environmental Sciences, 21*(4), 965-975.

Urrahman, D., Winanto, R., & Widyatama, T. (2024). Customer churn prediction in the case of telecommunication company using support vector machine (SVM) method and oversampling. *Journal of Student Research Exploration, 2*(2), 65-79.

Valente, N. A., & Andreana, S. (2016). Peri-implant disease: what we know and what we need to know. *Journal of periodontal & implant science*, *46*(3), 136-151.

Vallero, D. A. (2021). *Environmental systems science: Theory and practical applications*. Elsevier.

van der Ploeg, F., & de Zeeuw, A. J. (1992). *International aspects of pollution control*. (Reprint series / CentER for Economic Research, 97). Unknown Publisher.

Van Warmelo, N. J. (2024). The classification of cultural groups. In *The Bantu-speaking peoples of Southern Africa* (1st ed., pp. 29). Routledge. https://doi.org/10.4324/9781032709499

Varpio, L., Paradis, E., Uijtdehaage, S., & Young, M. (2020). The Distinctions Between Theory, Theoretical Framework, and Conceptual Framework. *Academic medicine: journal of the Association of American Medical Colleges*, *95*(7), 989–994. https://doi.org/10.1097/ACM.0000000000003075

Velempini, K., Martin, B., Smucker, T., Ward Randolph, A., &Henning, J. E. (2018). Environmental education in southernAfrica: A case study of a secondary school in the OkavangoDelta of Botswana. *Environmental Education Research, 24*(7), 1000-1016. https://doi.org/10.1080/13504622.2017.1377158

Villegas, C. (2024). Variational propensities: development and ultimate causes. *Synthese, 203*(5), 143.

Waliczek, M., Kijewska, M., Rudowska, M., Setner, B., Stefanowicz, P., & Szewczuk, Z. (2016). Peptides labeled with pyridinium salts for sensitive detection and sequencing by electrospray tandem mass spectrometry. *Scientific Reports*, *6*(1), 37720.

Watson, V., & Odendaal, N. (2013). Changing planning education in Africa: The role of the association of African planning schools. *Journal of Planning Education and Research*, *33*(1), 96-107.

Whiteman, G., & Cooper, W. H. (2000). Ecological embeddedness. *Academy of management journal*, *43*(6), 1265-1282.

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International management review*, *15*(1), 45-55.

Williamson, V., Stevelink, S. A., & Greenberg, N. (2018). Occupational Moral Injury and Mental Health: Systematic Review and Meta-Analysis. *The British Journal of Psychiatry, 212*(6), 339-346.

Wiltsey, S., Kimberly, J., Cook, N., Calloway, A., Castro, F., & Charns, M. (2012). The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science, 7,* 17. https://doi.org/10.1186/1748-5908-7-17

Yangambi, M. (2021). Teacher Professional Development and student achievement in a developing country. *Creative Education, 12*, 2283-2300.

Yanniris, C. (2021). Education for Sustainability, Peace and Global Citizenship: An Integrative Approach. *Education Sciences*, *11*(8), 430. https://www.doi.org/10.3390/educsci11080430

Yin, S., Ding, S. X., Xie, X., & Luo, H. (2014). A review on basic data-driven approaches for industrial process monitoring. *IEEE Transactions on Industrial electronics*, *61*(11), 6418-6428.

Zaman, J., Yu, K., & Lee, J.C. (2023). Individual differences in stimulus identification, rule induction, and generalization of learning. *Journal of Experimental Psychology: Learning, Memory and Cognition, 49*(6), 1004. https://www.doi.10.1037/xlm0001153

Zelenika, I., Moreau, T., Lane, O., & Zhao, J. (2018). Sustainability education in a botanical garden promotes environmental knowledge, attitudes and willingness to act. *Environmental education research*, *24*(11), 1581-1596.

Zsóka, Á., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behaviour and everyday pro-environmental activities of Hungarian high school and university students. *Journal of cleaner production, 48*, 126-138.

Appendix A: Registration Letter

61661481 Unisa Registration

M mandd@unisa.ac.za
To Shorai Prisca Machiridza

1844

PARAYIWA S P MS
98 GLADIOLI AVENUE
LENASIA EXT 2
1827

STUDENT NUMBER : 61661481
ENQUIRIES : mandd@unisa.ac.za
-FAX : (012) 429-4150
DATE : 2024-01-31

Dear student

Your application for registration for the study units as indicated on your registration form has been received.

Please note that you are not yet registered and that your registration for the indicated study units can only be finalised on receipt of the prescribed minimum initial payment. In order to have your registration activated, a further amount of R 17,965.00 is required before the appropriate closing date for registration. The full fees for the study unit(s) below amount to R 17,965.00 .

DFENE96 MEd - Environmental Education (Dissertation)

To authorise credit card or EFT/SWIFT payments, please use the following web address:
www.unisa.ac.za/paymentinfo

For bank deposits (excluding foreign students), you can make payments at any branch of First National Bank (FNB) in the Republic of South Africa. Complete the deposit slip as follows:
* Credit - Unisa Student Deposits - The first eight blocks are for the student number. If the student number consists of only 7 digits, then an "0" must be filled in for the first digit of the student number.
* Leave one block open and then fill in the number 5400374721.
* Bank account number: Unisa Student Deposits

Access your study material on the Unisa website after temporary registration. Please visit the following link: https://registration.unisa.ac.za/info/ to download your study materials.

Kindly be aware that the documents listed below have not yet been received. Your registration will be finalised only upon receipt of the outstanding fees and documents.

Prof MM Sepota
Acting Registrar

Appendix B: Ethics Clearance Certificate

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2022/06/08

Ref: **2022/06/08/61661481/10/AM**
Name: Ms SP Machiridza
Student No.:61661481

Dear Ms SP Machiridza

Decision: Ethics Approval from 2022/06/08 to 2025/06/08

Researcher(s): Name: Ms SP Machiridza
E-mail address: parayiwasho@gmail.com
Telephone: +27788739877

Supervisor(s): Name: Prof S. Shava
E-mail address: shavas@unisa.ac.za
Telephone: 0124294782

Title of research:

Environmental awareness and related practices among high school students in selected schools around Johannesburg central district.

Qualification: MEd Environmental Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2022/06/08 to 2025/06/08.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2022/06/08 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2025/06/08**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:
The reference number **2022/06/08/61661481/10/AM** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof Mpine Makoe
ACTING EXECUTIVE DEAN
qakisme@unisa.ac.za

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Appendix C: Editor Letter

M&T

M&T Professional writing and Editing

CERTIFICATE OF PROOFREADING

THIS IS TO ACKNOWLEDGE THAT THE THESIS ENTITLED

AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT

WRITTEN BY

SHORAI PRISCA PARAYIWA

HAS BEEN PROOFREAD AND EDITED AND RETURNED TO THE AUTHOR ON

01 SEPTEMBER 2024

I can confirm that the standard of language use meets the stringent requirements for the award of a senior degree.

PHILANI DIKENS MOYO
M&T PROFESSIONAL WRITING AND EDITING

Appendix D: Approval Letter to Conduct Study from Gatekeepers (Department of Education)

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	**04 July 2022**
Validity of Research Approval:	**08 February 2022– 30 September 2022** **2022/261**
Name of Researcher:	**Machiridza S.P**
Address of Researcher:	**98 Gladioli Avenue**
	Lenasia Ext 2
	Lenasia
Telephone Number:	**078 873 9877**
Email address:	**parayiwasho@gmail.com**
Research Topic:	**Environmental awareness and related practices among high school students in selected schools around Johannesburg central district.**

Type of qualification	**Master of Education**
Number and type of schools:	**8 Secondary Schools**
District/s/HO	**Johannesburg Central**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

04/07/2022

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below are met. Approval may be withdrawn should any of the conditions listed below be flouted:

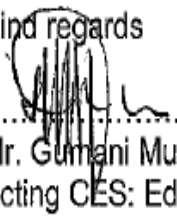
Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.

14. *On completion of the study, the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
15. *The researcher may be expected to provide short presentations on the purpose, findings, and recommendations of his/her research to both GDE officials and the schools concerned.*
16. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a summary of the purpose, findings, and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



.....

Mr. Gumani Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 04/07/2022

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

Appendix E: Consent Forms/Letters

Request to the School Principal

Request for permission to conduct research at (name of school)

Title of the title of your research: **AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT**

Date 11 May 2022

The principal

…….
Department of education

Dear ma'am

I, shorai Prisca Machiridza am doing research under supervision of soul shava, a professor in the Department of education towards a Med at the University of South Africa. We are inviting you to participate in a study entitled Environmental awareness and related practices among high school students in selected schools around Johannesburg central district.

The aim of the study is to explore the level of environmental awareness and the existence of environmental practices among high school learners in selected schools in Johannesburg Central District.

Your school has been selected by Simple random sampling that was used for the selection of schools in Johannesburg central district.

The study will entail recruiting participants from among the students currently enrolled at your school. I would need help to identify the teachers that are the class tecahers of the grades that I will be working with in the study. The class tecahers will assist in sending parental consent letters in order to gain parental permission to interview ther children. The interviews should take at least thirty minutes and at most two hours.

Only two grades from your school will take part in the survey, that is, grade 8 and grade 11. These learners will be randomly selected the 8 schools, 50 learners will be involved from Each

School. Per school only two grades will be involved. Per grade 25 of the learners will be selected. Learning areas will be identified. For example, learners taking group A or group B subjects especially the grade 11 class. Afterwards learners will be identified by arranging their names in alphabetical order. Depending on the number of learners in that grade 1 every certain number of learners will be selected. For instance, if there are 100 learners 1 in every 4 learners will be selected to get a total of 25 learners.

The benefits of this study are environmental awareness motivates learners since it involves interaction. Learners are engaged in some academic activities which motivate learners learning even other subjects. Through environmental practices teachers combine subject areas such as maths, science and arts into enriched subject which helps in improvement of academic standards in other subjects.

Environmental awareness involves experiential learning which constructs knowledge, skills, and value from direct experiences. Environmental awareness increases the experiential outdoor activities which result in learners being attached to the real world. Practicing such activities always increase learners' knowledge and skills that will assist in solving environmental issues and coming up with solutions ways to maintain the health state of the environment and sustainability.

This study promotes critical and creative thinking. Learners are involved in research activities and carrying experiments which enable them to build their own environmental knowledge. Learners can apply such knowledge in decision making or even by-passing environmental policies in their mere future.

Environmental awareness practices promote exposure of the learners to the natural environment, involving learners in the natural environment enable them to foresee the dangers of the protected environment for example cutting down trees reduces the amount of oxygen. This in turn will lead to a healthy environmental state.

Potential risks are that personal information is gathered and will be analysed. Participants are directly involved. Some participants are children under the age of 18 and may be vulnerable.

There will be no reimbursement or any incentives for participation in the research.

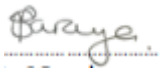
Feedback procedure will entail, I will provide a link to a website or social media page and post the findings on that website once the study has been completed.

Another way is to arrange meetings with the stakeholders. In our case arrange meetings with the school's management specifically to give them an appropriate face to face presentation on

the findings. A copy of the finished dissertation will be sent afterwards for their personal reference, library or to disseminate the information to the other stakeholders such as the members of the community.

I can also facilitate workshops with the community giving them feedback on the findings.

Yours sincerely



Shorai Prisca Machiridza

Researcher

Consent letter to Parent

PARENTAL CONSENT FOR MINORS TO PARTICIPATE IN A RESEARCH PROJECT

Dear Parent

Your child is invited to participate in a study entitled.

I am undertaking this Environmental awareness and related practices among high school students in selected schools around Johannesburg central district study as part of my master's research at the University of South Africa. The purpose of the study is to collect important information that could promote environmental awareness in schools and improve the positive environmental practices among high school learners and the possible benefits of the study are the improvement of the environmental management. I am asking permission to include your child in this study because she was randomly selected from the list of the class she belongs to. I expect to have 24 other children participating in the study from her class.

If you allow your child to participate, I shall request him/her to take part in an interview. The interviews will be conducted after school. It will take a minimum of 30 minutes to 1hour for each participant to be interviewed.

Any information that is obtained in connection with this study and can be identified with your child will remain confidential and will only be disclosed with your permission. His/her responses will not be linked to his/her name or your name or the school's name in any written or verbal report based on this study. Such a report will be used for research purposes only.

There are no foreseeable risks to your child by participating in the study. This may lead to some negative consequences. However, there are the measures that will be taken if injury or harm attributable to the study occurs. The consequences may include:

Psychological harm: the participants may have stress of guilt or embarrassment may arise from thinking or talking about one's own behaviour or attitudes on environmental awareness. For instance, the participant may be one of those who practice unnecessary tree cutting activities without replacing them. The participant may have the guilty feeling arising when completing questionnaire.

Social harm: The research can result in significant negative impact upon personal relations. For example, the research can damage the relationship between a participant and another learner. This can happen in a way that those who have positive attitudes towards the environmental awareness will socialise on their own segregating the ones with negative attitudes. Such participants may end up losing respect or even labelled in a negative way thereby affecting the participants in their social lives.

Economic harm: this can affect the schools involved in the long run. They include loss of income and any other financial losses due to reduction of their enrolment as a consequence of participation in the research. For instance, if a school is known of having the bad results on environmental education and awareness learners may not prefer to enrol in such schools. Less learners result in less income hence a negative economic impact towards the school.

Loss of confidentiality: in most research involving participants, confidentiality of identifiable information is expected to be given out. This information must be kept safely unless the investigator is allowed to release the information. In the event that such kind of information is accidentally released the participant will lose their confidentiality. For confidentiality's sake, your name will not be recorded anywhere and no one, apart from the researcher and identified members of the research team, will know about your involvement in this research. You have the right to insist that your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your child will receive no direct benefit from participating in the study; however, the possible benefits to education are the increase engagement in experimental outdoor activities, which result in learners being attached to the real world. This will enhance your child's understanding when she/he is learning in class theoretically. Environmental awareness engage the natural environment that can help you to see the human impacts on the environment and the best way that will lead to environmental sustainability in the community. Neither your child nor you will receive any type of payment for participating in this study.

Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly, you can agree to allow your child to be in the study now and change your mind later without any penalty.

The study will take place during regular classroom activities with the prior approval of the school and your child's teacher. However, if you do not want your child to participate, an alternative activity will be available.

In addition to your permission, your child must agree to participate in the study and you and your child will also be asked to sign the assent form which accompanies this letter. If your child does not wish to participate in the study, he or she will not be included and there will be no penalty. The information gathered from the study and your child's participation in the study will be stored securely on a password locked computer in my locked office for five years after the study. Thereafter, records will be erased. There will be no reimbursement or any incentives for participation in the research.

If you have questions about this study, please ask me or my study supervisor, Dr NP Shabalala, Department of Science and Technology Education, College of Education, University of South Africa. My contact number is +2778 8739 877 and my e-mail is 61661481@mylife.unisa.ac.za. The e-mail of my supervisor is eshabapn@unisa.ac.za. Permission for the study has already been given by the Gauteng Department of Basic Education and the Ethics Committee of the College of Education, UNISA.

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. You may keep a copy of this letter.

Name of child:

Sincerely

_____ _____ _____

Parent/guardian's name (print) Parent/guardian's signature: Date:

_____ _____ _____

Researcher's name (print) Researcher's signature Date:

Assent letter form child

11 May 2022

Title: **AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT**

DEAR PROSPECTIVE PARTICIPANT

My name is shorai Prisca Machiridza and I am doing research under the supervision of Soul Shava a professor in the Department of education towards an Med at the University of South Africa. We are inviting you to participate in a study entitled Environmental awareness and related practices among high school students in selected schools around Johannesburg central district.

This study is expected to collect important information that could promote environmental awareness in schools and improve positive environmental practices among high school learners. You are invited because you were randomly selected from the list of grade 8 learners in your school.

I obtained your contact details from your teacher (name of teacher). She gave me the contacts of the 25 learners in your class who are going to be part of this study.

The study involves interviews. Semi structured questions will be asked during the interview. This allows respondents time to open about sensitive issues.

The interviews will be conducted after school. It will take a minimum of 30 minutes to 1hour per each participant to be interviewed. Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written assent form for participants younger than 18 years old.

Being involved in the study, you can benefit from the increase engagement in experimental outdoor activities, which result in learners being attached to the real world. This will enhance your understanding when you are earning in class theoretically. Environmental awareness engage the natural environment that can help you to see the human impacts on the environment and the best way that will lead to environmental sustainability in the community.

Participation in this study may lead to some negative consequences. However, there are the measures that will be taken if injury or harm attributable to the study occurs. The consequences may include:

Psychological harm: the participants may have stress of guilt or embarrassment may arise from thinking or talking about one's own behaviour or attitudes on environmental awareness. For instance, the participant may be one of those who practice unnecessary tree cutting activities without replacing them. The participant may have the guilty feeling arising when completing questionnaire.

Social harm: The research can result in significant negative impact upon personal relations. For example, the research can damage the relationship between a participant and another learner. This can happen in a way that those who have positive attitudes towards the environmental awareness will socialise on their own segregating the ones with negative attitudes. Such participants may end up losing respect or even labelled in a negative way thereby affecting the participants in their social lives.

Economic harm: this can affect the schools involved in the long run. They include loss of income and any other financial losses due to reduction of their enrolment as a consequence of participation in the research. For instance, if a school is known of having the bad results on environmental education and awareness learners may not prefer to enrol in such schools. Less learners result in less income hence a negative economic impact towards the school.

Loss of confidentiality: in most research involving participants, confidentiality of identifiable information is expected to be given out. This information must be kept safely unless the investigator is allowed to release the information. In the event that such kind of information is accidentally released the participant will lose their confidentiality.

For confidentiality's sake, your name will not be recorded anywhere and no one, apart from the researcher and identified members of the research team, will know about your involvement

in this research. You have the right to insist that your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

The anonymous data that the researcher is going to collect may be used to come up with a research report that may be submitted for publication, but individual participants will not be identifiable in such a report.

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet in the researcher's office for future research or academic purposes. Most likely the data will be stored electronically in a spreadsheet or database on a password protected computer. The information collected will be destroyed after five years. Hard copies will be shredded and the electronic copies will be deleted from the hard drive through the use of relevant software programmers.

Participants are not going to be compensated financially due to lack of resources. Compensation will be in kind, most probably as gift cards as a token of appreciation.

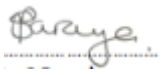
If you would like to be informed of the final research findings, please contact Shorai Prisca Machiridza on +2778 8739 877 and my e-mail is 61661481@mylife.unisa.ac.za. The findings are accessible for the next five years.

Should you require any further information please contact the researcher about any aspect of this study.

Should you have concerns about the way in which the research has been conducted, you may contact Dr NP Shabalala on the email address eshabapn@unisa.ac.za

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.



Shorai Prisca Machiridza

Consent/assent to participate in this study (Return slip)

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunities to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the interview.

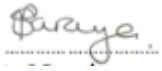
I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print) _____

_____ _____

Participant Signature Date

Researcher's Name & Surname (please print) Shorai Prisca Machiridza



May 13, 2022

Researcher's signature Date

Appendix F: Observation guide

Title: **AN EXPLORATION OF SCHOOL LEARNERS' ENVIRONMENTAL AWARENESS AND PRACTICES AT THREE HIGH SCHOOLS IN THE JOHANNESBURG CENTRAL DISTRICT.**

Introduction

The researcher will observe environmental activities that will be carried in schools. This will include reuse, reduce and recycle, sustainable attitudes an energy saving projects. The researcher will observe if learners have knowledge about recycling, sorting the garbage, have any items or crafts made from homemade products. The researcher will also check if the learners are engaged in energy saving projects so as to reduce the amount of energy they use. The researcher will assess if there are sustainable attitude carried out at school such as the school garden and any tree planting activities. All these will make the researcher understand the position of the learners and will make it possible for her to come up with recommendations on the ways of increasing environmental awareness in schools.

The checklist and comments

Date ……

Class……

Observation	
Reduce, reuse and recycling	
Energy saving	
Sustainable attitudes	

Duration……..

Conclusion……
……
……
……
……

Appendix G: Questionnaire Guide

SECTION A: LEARNER'S DEMOGRAPHIC INFORMATION

Gender:

Grade:

SECTION B: LEARNER'S RELATONSHIP TO THE NATURAL ENVIRONMENT

1. Do you know of problems in your environment? Yes / No
2. Do you care about nature? Yes / No
3. Are you involved in any environmental conservation projects? Yes / No
4. Do you value the environment? Yes/ No
5. Are the environment and nature important to you? Yes/No
6. Individual people are the worst polluters Yes/No
7. People's health has already been affected by pollution Yes/No

SECTION C: LEARNER'S KNOWLEDGE ABOUT THE ENVIRONMENT AND ITS PROBLEMS /ISSUES

Instruction: please indicate your response by cycling the relevant answer.

1. Cutting trees can lead to :
    a) Accumulation of carbon dioxide in the atmosphere
    b) Reduction of oxygen in the atmosphere
    c) More fresh air in the atmosphere
    d) More rainfall
2. Atmospheric pollution leads to :
    a) Acid rain
    b) Cloud formation
    c) Rainbow
    d) Blue sky
3. Sustainable use of natural resources means:
    a) Exploiting natural resources
    b) Utilising natural resources
    c) Avoid the depletion of resources

d) Depleting natural resources

4. Who should be responsible for making sure we have a healthy environment?
    a) Industry
    b) Government
    c) Environmental groups
    d) Individuals
5. The single most important thing that will make sure the environment is healthy for future generation is if:
    a) The polluting industries shut down even if people lose their jobs.
    b) New technologies can be found to solve our problems.
    c) People learn to live with less and be more efficient users of energy and materials.
    d) We find a way to have economic development continue in a way that minimises pollution.

SECTION E: ENVIRONMENTAL AWARENESS AT SCHOOLS

8. What is environmental awareness?

    ……
    ……
    ……
    ……

9. What do you think can be done in protecting our school environment?

    ……
    ……
    ……
    …….

10. What is recycling? name at least three items you can recycle?

    ……
    ……
    ……
    ……..

11. What do you think can be done to conserve energy at school level??

……
……
……
…….

12. What do you with a piece of trash where there is no trash can near you?

……
……
……

13. What are the important areas of environmental education which need to be taught at your school?

……
……
……
…….

14. Describe and explain any project where a park, schoolyard, playground, etc. was designed in order to enhance environmental education?

……
……
……
…….

15. What do you consider to be the main function of trees in our environment?

……
……
……
……

Appendix H: Interview Guide

1. What do you understand by the term natural environment?
2. What are the factors / activities that lead to the degrading of the natural environment?
3. What can be done to reduce the environmental pollution?
4. Climate change is one of the environmental problems. Do you believe that human activities contribute to climate change? If so, what should we do about?