PERCEPTIONS OF TEACHERS AND LEARNERS ON SOLID WASTE MANAGEMENT IN UMLAZI DISTRICT SCHOOLS

By

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DECLARATION

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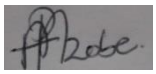

JULY 2023

DATE

Princess Farida Mzobe

DEDICATION

I declare this work to the creator, His Son Jesus Christ who died for my sins so that I may be free. He freed me indeed. This work shows my freedom through Him who give me strength every day of my life. To my dear fiancé Mfanafuthi Prosper Mchunu who allowed me to do my study even if I did not have enough time for him, but did not complain,

My late mother Thulisile Eunice Mzobe: I never had a chance to be raised by her due to early death. My late grandfather Thembinkosi Albert Mzobe who had always encouraged me to study and to become someone better one day in life; my grandmother Thembi Rosewiter Mzobe and my mother-in-law Anastasia Ngenzeni Mchunu who always behind me, teaching me to persevere even if I felt like giving up. To my sons Mlondi and Lunga as they did not spend enough time with their mother because of being busy with study.

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- The principals of the schools sampled teachers and learners for opening their doors for me and provide the necessary information I needed to complete this study.

- My friends who were there for me all throughout.

ABSTRACT

This study looked at how teachers and learners in secondary schools perceived solid waste management. There is not much research on the extent to which learners in South Africa are aware of, knowledgeable about or practise solid waste management. The principles, aims and targets of the South African government about solid waste management were examined in reviewing the literature on solid waste management awareness, knowledge and behaviours among learners. This study used waste management theory and following a qualitative approach, adopted a case study design to explore the perception of teachers and learners on solid waste management in the Umlazi District, Kwa-Zulu Natal. By using focus group interviews, observation, face-to-face interviews and photovoice, data were collected from three secondary schools and three teachers, teaching Life Sciences and 18 learners in Grade 10. The findings showed that the teachers and learners were obviously aware of concerns with solid waste and waste management practices in their schools and local environment. It was also appeared the school teachers and learners had an acute awareness that poor waste management would have a negative impact on the school environment as well as on them as individuals. Furthermore, the findings revealed that there was minimal awareness of effective solid waste management practices. Good waste solid waste management practices activities were minimal in both the school and home environment. The critical recommendations of the study is that the Department of Basic Education need to intensify the research on proper solid waste disposal to better understand the needs of teachers and learners with regard to environmental matters such as solid waste management.

Key Words: solid waste management, awareness, knowledge, understanding, practices, Umlazi District, Kwa-Zulu Natal.

I-ABSTRACT

Lolu cwaningo luhlole izinga lokubona othisha nabafundi ngokuphathwa kwemfucuza eqinile ezikoleni zamabanga aphezulu. Kwatholakala kuphela inani elilinganiselwe lezifundo ezihlola ukuqwashisa kwabafundi bezikole, ulwazi kanye nomkhuba wokuphathwa kwemfucuza eqinile eNingizimu Afrika. Izincwadi zabuyekezwa zibhekene nokuqwashisa okuqinile kokuphathwa kwemfucuza, ulwazi kanye nemikhuba yokufunda ezikoleni futhi kwaxoxwa ngazo esandleni sezimiso, izinhloso kanye nemigomo kaHulumeni waseNingizimu Afrika maqondana nokuphathwa kwemfucuza eqinile. Lolu cwaningo lusebenzise ithiyori yokuphathwa kwemfucuza futhi ngokulandela indlela yekhwalithi, lwamukela umklamo wocwaningo lwecala ukuhlola umbono wothisha nabafundi ngokuphathwa kwemfucuza eqinile ezifundeni zase-Ulmazi, Kwa-Zulu Natal. Ngokusebenzisa izingxoxo zeqembu ezigxile, ukubuka, ingxoxo yobuso nobuso kanye ne-photovoice, idatha yaqoqwa ezikoleni ezintathu zamabanga aphezulu nothisha abathathu, ukufundisa i-Life Sciences kanye nabafundi abayishumi nesishiyagalombili ebangeni le-10. Okutholakele ocwaningweni kukhombise ukuthi othisha nabafundi ngokusobala bayazi ngokukhathazeka ngemfucuza eqinile kanye nemikhuba yokuphathwa kwemfucuza ezikoleni zabo nasezindaweni zendawo. Kwaphinde kwabonakala ukuthi othisha bezikole kanye nabafundi babenolwazi olubukhali lokuthi ukungaphathwa kahle kwemfucuza kuzoba nomthelela omubi emvelweni wesikole kanjalo nakomuntu ngamunye. Ngaphezu kwalokho okutholakele kuveze ukuthi ukuqwashisa okuvelele nokho kwakungabonakali ezifundweni imikhuba eqinile yokuphatha imfucuza. Imfucuza enhle eqinile yokuphathwa kwemfucuza imisebenzi yayincane kokubili esikoleni nasendaweni yasekhaya. Izincomo ezibucayi zocwaningo ukuthi umnyango wezemfundo kuzodingeka uqinise ucwaningo mayelana nokulahlwa kwemfucuza eqinile efanele ukuze uqonde kangcono izidingo zothisha nabafundi ezindabeni zemvelo ezifana nokuphathwa kwemfucuza eqinile. Amagama asemqoka: ukuphathwa kwemfucuza eqinile, ukuqwashisa, ulwazi, ukuqonda, imikhuba, Isifunda sase-Umlazi, Kwa-Zulu Natal.

ABSTRAK

Hierdie studie het die vlak van persepsie van onderwysers en leerders oor vasteafvalbestuur in sekondêre skole ondersoek. Slegs ‘n beperkte aantal studies is gevind om skoolleerders se bewustheid, kennis en praktyk van vasteafvalbestuur in Suid-Afrika te evalueer. Literatuur is hersien wat handel oor vasteafvalbestuursbewustheid, kennis en praktyke van skoolleerders en bespreek aan die hand van die beginsels, doelwitte en teikens van die Suid-Afrikaanse Regering ten opsigte van vaste afvalbestuur.Hierdie studie het afvalbestuursteorie gebruik en na aanleiding van ‘n kwalitatiewe benadering ‘n gevallestudie-ontwerp aangeneem om die persepsie van onderwysers en leerders oor vasteafvalbestuur in Ulmazi-distrikte, KwaZulu-Natal, te ondersoek. Deur gebruik te maak van gefokusde groeponderhoude, waarneming, aangesig-tot-aangesig-onderhoud en fotostem, is data van drie sekondêre skole en drie onderwysers, wat Lewenswetenskappe en agtien leerders in graad 10 onderrig, ingesamel. Die studiebevindinge het getoon dat die onderwysers en leerders uiteraard bewus was van kommer oor vaste afval en afvalbestuurspraktyke in hul skole en plaaslike omgewing. Dit het ook geblyk dat die skoolonderwysers en leerders ‘n skerp bewustheid het dat swak afvalbestuur ‘n negatiewe impak op die skoolomgewing sowel as op hulle as die individu sou hê. Verder het die bevindinge aan die lig gebring dat prominente bewustheid egter nie sigbaar was in die leerders se vaste-afvalbestuurspraktyke nie. Goeie afval vaste afval bestuurspraktyke aktiwiteite was minimaal by beide die skool en huis omgewing. Die kritiese aanbevelings van die studie is dat die departement van onderwys die navorsing oor behoorlike vullisverwydering sal moet verskerp om die behoeftes van onderwysers en leerders ten opsigte van omgewingsake soos vaste afvalbestuur beter te verstaan. Sleutelwoorde: bestuur van vaste afval, bewustheid, kennis, begrip, praktyke, Umlazi-distrik, KwaZulu-Natal.

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LIST OF ACRONYMS AND ABBREVIATIONS

3Rs: Reduce, Reuse-Use and Recycle

ANC: African National Congress

DBE: Department of Basic Education

DEA: Department of Education Affairs

EE: Environmental Education

EEASA: Environmental Education Association of South Africa

EEPI: Environmental Education Policy Initiative

ESD: Education for Sustainable Development

FET: Further Education and Training

IEEP: International Environmental Education Programme

KZN: Kwa-Zulu Natal

NEAC: National Environmental Awareness Council

NECC: National Education Coordinate Committee

NGO: Non-Governmental Organisations

NWMS: National Waste Management Strategy

OEA: Organisation of Environmental Education

SDGs: Sustainable Development Goals

SGB: School Governing Body

SWM: Solid waste management

UN: United Nations

UNEP: United Nations Environmental Programme

UNESCO: United Nation Education Scientific and Culture of Organisations

WMT: Waste Management Theory

WSSD: World Summit for Sustainable Development

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

The aim of this study is to evaluate the perceptions of solid waste management in township secondary schools in KwaZulu-Natal. The research was carried out in three public secondary schools in Chesterville, in the Umlazi District of KwaZulu-Natal. The schools were selected according to their different quintile rankings and according to their Grade 12 results. All South African public ordinary schools, according to Heystek, and Minnaar (2015), are divided into five classes, known as quintiles, primarily for the purpose of allocating financial resources. The “poorest” quintile is quintile 1, while the “least poor” quintile is quintile 5. There are no-fee schools in quintiles 1, 2 and 3, but there are fee-paying schools in quintiles 4 and 5. I selected Government Secondary School, which is in quintile 4, Sukuma Sakhe (pseudonym) Secondary School, which is in quintile 3, and Bofela (pseudonym) Secondary School, which is in quintile 5.

Increased awareness of environmental degradation on a global and local level has led to the need to aid people in changing their habits (Ackerman & Stanton, 2015). As a result, education is regarded as one of the most important tools for saving the environment through growing people’s knowledge, skills, attitudes, and environmentally beneficial behaviour (Kaare, 2014). Since the 1970s, a series of international meetings and documents have stressed environmental education (EE) as a tool for dealing with the growing trend of environmental concerns. This prompted the Stockholm Conference on the Human Environment (UN, 1972), Belgrade Charter (UNESCO, 1976), Tbilisi Declaration (UNESCO, 1978), Brundtland Report (WCED, 1987), Rio Earth Summit (UN Conference on Environment and Development, 1992), and Johannesburg Summit (Dooley, 2002).

At the United Nations Conference on Human Environment in Stockholm, for instance, the necessity of EE was acknowledged and emphasised (UN, 1972). The government of South Africa’s initiative to incorporate EE into school curricula is commendable (Zurbrügg et al., 2018). South Africa’s economy is strongly reliant on the country’s natural resources and environment (Joshua & Bekun, 2020).

Natural and man-made environmental problems, such as pollution, biodiversity loss, poor sanitation, a lack of clean and safe water, land degradation brought on by subpar agricultural methods, and unsustainable methods of resource extraction, like mining for minerals and overfishing, pose a threat to the environment's ability to support life (Ministry of Education and Vocational Training, New Zealand, 2016).These problems are exacerbated by population pressures, poor farming practices and a high pace of urbanisation (Johnson-Pynn & Johnson, 2015; Stelmack et al., 2018). As a result, education is seen as critical for increasing awareness and finding solutions to these problems.

1.2 BACKGROUND TO THE PROBLEM

One of the most urgent problems in today's world is environmental degradation. Above all other factors, the desire to save our environment has taken primacy (Michael, 2015). As a result, solid waste is posing a threat to natural resources not only in developing nations but also in affluent nations. Indeed, the production of municipal solid waste (MSW) is one of the most important environmental challenges of the modern era (Pattnaik & Reddy, 2017). Domestic solid waste, or garbage produced by households, industrial and commercial solid waste, or building and demolition waste, and marine solid waste, or waste produced by coastal areas and the water, are all types of solid waste (Jin et al., 2016).

However, solid waste management (SWM) is a massive task that falls primarily on the shoulders of local governments and necessitates organisational competence as well as collaboration between the commercial and public sectors (Michael, 2015). The need to manage this growing solid waste in a way that is environmentally friendly, commercially viable and socially acceptable manner is important (Kaufman et al., 2018). Even though environmental management is essential for public health, in most industrialised and emerging cities, particularly in African countries, SWM is inadequate (Michael, 2015). As a result, proper management, collection, and disposal of MSW are critical for maintaining a clean and healthy environment (Pattnaik & Reddy, 2017). Furthermore, as the world's population and urbanisation grow, so does the amount of waste produced annually (Hassan, 2016).

The types and amounts of solid waste produced do not merely accurately reflect the lives and living standards of the local populace. Urbanisation has an effect on the overall rate of solid waste generation in several countries throughout the world. However, there are still problems with the collecting, dumping and disposal of MSW (Hassan, 2016). Africa's issue with managing solid waste has gotten worse as a result (Hufane, 2015). The main causes of trash generation are population growth, consumerism, wealth and technology (Kaufman et al., 2018).

In Somalia, for instance, a country facing significant poverty, some people perceive waste as a potential source of income. However, wealthier nations recognise the need to address the waste issue in order to mitigate its consequences. Mere acknowledgment of the waste problem does not deter individuals from littering (Shahmoradi, 2016). The objective of waste management theory is to prevent the adverse impact of garbage on both the environment and human health.

1.3 RATIONALE FOR THE STUDY

This study was undertaken to ensure teachers and learners are aware of the importance of having a safe and healthy environment around them. This research has the potential to help schools improve their SWM methods while also motivating teachers and learners to become involved. This research is valuable to a variety of stakeholders, including cleaners, learners, teachers, and garbage collectors, in gaining a better knowledge of the benefits of adopting best practices and cost-effective environmental solutions.

Undertaking a study on SWM at schools is crucial for several reasons. Firstly, schools serve as vital hubs of activity, generating substantial amounts of waste on a daily basis. By investigating and implementing effective waste management strategies within educational institutions, we can promote sustainable practices and instil environmental awareness among students, who are the future custodians of our planet. Additionally, addressing SWM at schools can have numerous benefits, such as reducing pollution, conserving resources, and creating a clean and healthy learning environment. By examining current waste management practices, identifying areas for improvement, and proposing innovative solutions, this study can contribute to the development of SWM frameworks that can be replicated in schools and educational

settings worldwide. Ultimately, this research will foster a culture of environmental responsibility, empower students to become agents of change and contribute to the broader goal of building a greener and more sustainable future.

1.4 THEORETICAL FRAMEWORK

A theoretical framework is required to aid the study in producing accurate and desirable results by serving as a lens through which the investigation is viewed (Lens, 2014). the waste management theory (WMT) was determined to be the best fit for this research. The WMT provides information about the subject, including conceptual waste assessments, waste activities and a holistic view of waste management goals. The idea behind WMT is that it will prevent waste from hurting human health and the environment (Lagbas & Habito, 2015). It is founded on the concept that the way we characterise a goal dictates how we should behave to attain it, implying that the definition of sustainable waste management is crucial.

To design the most effective SWM system, the correct theoretical foundation must be established. The solid waste management theory (Popov, 2004) includes the following ideas:

- The purpose of solid waste management is to keep garbage out of people's homes and out of the environment.
- Resource conservation is the primary goal of solid waste management.
- In order to avoid manufacturing solid waste, we shall manufacture useful goods.
- Solid waste management's goal is to turn waste into non-waste.

Solid Waste Management's practical values are thus: (Popov et al. 2004)

- Providing conceptual answers by discussing waste and concepts.
- Providing a basis for selecting and integrating waste management alternatives, as well as how and when to do so.
- Foreseeing the results of solid waste management measures.

- Assisting legislators in prescribing waste-related activities.

This theory was used to provide an account of an in-depth examination of waste, waste activities, and a holistic perspective of SWM's functions and aims in this study.

1.5 STATEMENT OF THE PROBLEM

The issue investigated in this study was the growing problem of unlawful solid waste disposal in township secondary school. As a school teacher, I have experienced a rapid expansion in population density and school activities in the township secondary school which is accompanied by a considerable increase in the volume of solid waste generated from surrounding manufacturing and consuming activities. Despite rising garbage output, the township's municipal officials appear unable to organise proper waste collection and disposal within their boundaries. As a result, Chesterville urban settlements face an escalating solid waste problem that is becoming unsolvable and posing a health and environmental hazard to the schools in the district.

A quick walk around Chesterville reveals evident signs of the solid waste problem, such as garbage accumulation, excessive street litter, plugged drains and water bodies and sinking gutters. Despite the concerned parties, institutions and individuals, the solid waste situation in township schools continues to deteriorate, creating a health and environmental risk.

In light of the aforementioned, one may claim that managed solid waste disposal in uncontrolled sites is the most typical method used in the poor countries and is a result of a lack of both technical and financial resources. Due to its lack of environmental protection and public health benefits, this disposal approach is unsatisfactory from both a social and environmental standpoint (McDougall et al., 2021). Leachate pollution of surface and groundwater, migration of flammable gases, odours and breeding of disease vectors are all frequent outcomes. Dump sites present both present and future health problems and offer particularly terrible living circumstances for scavengers (McDougall et al., 2021).

Despite the many problems associated with it, the majority of developing countries still dispose of their solid waste by dumping, in part because people are not aware of the health risks associated with waste dumping and/or because they accept the status

quo because they lack the resources to change it or because there is a lack of political will at all levels of government to protect and improve public health and the environment. The act of disposing of solid trash in a way that harms the environment and people's health is known as "illegal dumping" (Hanvajanawong et al., 2022).

Furthermore, even though trash removal and disposal are both publicly subsidised and regulated, the environmental costs connected with the growing solid waste situation tend to fall disproportionately on the poor. This study will be done to pave the way toward a better understanding of the opinions, difficulties and issues linked to solid waste management in township secondary schools.

1.6 PURPOSE, AIMS AND OBJECTIVES OF THE STUDY

1.6.1 Purpose

The purpose of this study was to find out how teachers and learners perceive incorporating SWM into their classroom curriculums. The research proposes ways for teachers and learners to cope with the problem's associated with knowledge gap, importance and severity, as well as efforts to reduce waste. Waste collection in the area under study is not well-planned and does not reach all the schools, among other issues.

Illegal dumping has resulted from irregular collection (which is done once a week). Inadequate waste management (open burning of uncollected rubbish and dumping waste along the Mekong River's bank) has resulted in health and environmental problems. The major goal of the study is to encourage teachers and learners to adopt new habits to reduce solid waste production while improving recycling, reusing and reducing. As a result, prior to implementing an environmental policy, it is critical to examine school perceptions in order to make modifications and improve the chances of a successful implementation of proper solid waste disposal.

1.6.2 Main Research Question

What are the perceptions of teachers and learners towards the management of solid waste in township secondary school in Umlazi District?

1.6.3 Sub-Questions

- What role do learners and teachers play in solid waste management at schools?
- What are the existing strategies towards management of solid waste in schools?
- What are the challenges that are faced by school regarding solid waste disposals?
- How can township school improve solid waste disposals?

1.6.4 Aim and Objectives

The aim of the study is to investigate the perception of teachers and learners toward solid waste management in selected township schools.

Objectives:

- To determine role of teachers and learners waste management in schools.
- To explore existing strategies for solid waste management in township secondary school.
- To explore challenges that are faced by schools regarding solid waste disposal.
- To determine how township schools can improve solid waste disposal.

1.7 SIGNIFICANCE OF THIS STUDY

Sustainable waste management seeks to protect the environment and human health while simultaneously preserving resources (Kirama & Mayo, 2016). The avoidance of waste-related problems in the future, such as “clean” cycles and low-maintenance landfills (Brunner, 2013), as well as socially acceptable waste management methods, are further goals (Wilson et al., 2007). One of the most important prerequisites is the availability of low-cost trash management services. Collection, transportation, treatment, recycling and disposal are all steps in the SWM process, and decisions must be included in plans that comprise a number of interconnected activities in order

to achieve these goals (Al Sabbagh et al., 2012). Decision-makers therefore anticipate cost-effective waste management that takes into account societal, economic, technological, and environmental factors (Barton et al., 1996).

Solid waste management has become one of South Africa's most critical issues. Budgetary constraints, system complexity and multidimensionality, as well as ineffective organisation, are the key difficulties that local municipal authorities encounter in SWM (Dlamini, 2017). The principal agencies responsible for the efficient and effective handling of solid waste are local municipalities South African government (Serge Kubanza & Simatele, 2020). In order to achieve recycling targets, local governments often promote a decrease in domestic solid waste production and encourage citizens to take responsibility for their trash rather than relying on municipal waste services (Dlamini, 2017).

Despite South Africa's environmental laws and regulations, particularly in relation to MSW management, garbage reduction through recycling and community engagement has received little attention (Dlamini, 2017). In South Africa, efficient management of MSW, as well as garbage minimisation, has proven to be a difficult task. This is contingent on environmental laws and regulations being enforced, institutional capacity being appropriate, local governments cooperating and collaborating, and greater community involvement among its members, as well as public awareness (Department of Environmental Affairs, 2012).

In South African cities, recycling has become a significant part of solid waste management through community participation. For instance, the role of informal waste collectors in recycling and solid waste management in Johannesburg is becoming more and more significant (Serge Kubanza & Simatele, 2019). By promoting environmental sustainability and job generation, such community involvement benefits the environment and the economy (Gutberlet, 2010). Politicians have not done much to incorporate informal solid waste management systems into their policies and strategies, despite the fact that community engagement in solid waste management through recycling aids in the promotion of socioeconomic development, environmental sustainability, and solid waste management in South Africa (Dhokhikah et al., 2015). This circumstance has led local administrations in South African cities to undervalue the value of community involvement in SWM.

Solid waste recycling informally employs thousands of people in low-income metropolitan areas, despite efforts by South African authorities to incorporate informal garbage pickers into SWM systems (Dias et al., 2012). In 2016, the Department of Environmental Affairs projected that between 18 000 and 100 000 garbage pickers work in South African cities (Serge Kubanza & Simatele, 2019).This shows that, with regard to the amount of solid waste created, community members are capable of handling it. Decision-makers in South Africa must recognise community participation as a way to improve SWM efficiency and achieve long-term waste reduction (Scheinberg, 2012).

1.8 RESEARCH METHODS AND DESIGN

1.8.1 Research Approach

The researcher uses a qualitative research approach to collect data through focus groups, observation, photovoice and interviews. In qualitative research, a study is based on interpretative concepts, which are frequently generated and derived from ongoing practice (Scotland, 2015).The types of reasoning that are employed in this study are both inductive and deductive research approaches. Reasoning is the act of making predictions, constructing explanations and drawing conclusions based on prior information and assumptions (Saunders et al., 2015).

1.8.2 Research Design

The structure that informs data collecting and analysis decisions is known as research design (Anderson, 2013). For this study, assessment research with a case study method is the most suited research design. “...case studies are methods of inquiry used in many areas, notably assessment, where the researcher conducts an in-depth investigation of the case; often, a programme, event, activity, procedure and one or more participants (Creswell, 2014, p. 14). The case for this research is township secondary schools. By focusing on a schools in a single district rather than being generic, the case study is regarded as an acceptable technique for establishing knowledge of the phenomena under study, that is, solid waste management.

This study used three township secondary schools as case studies. As the researcher interacts with numerous people, this technique aims to analyse the phenomenon of

interest by gathering different perspectives (Maree, 2008). This method aids the researcher in gaining a better knowledge of the dynamics of SWM in these schools.

1.8.3 Research Methods

In this study, I want to find out how secondary schools teachers and learners feel about including SWM in their classrooms. Research is not performed in a vacuum, according to the literature; research is viewed through a particular lens (Kivunja & Kuyini, 2017). It is carried out with a certain mind-set and created with unique methods and procedures (Henning et al., 2004). One data collection method used in this study is the interview where, at each school, I interviewed one teacher who was teaching Life Sciences. I used a semi-structured interview guide where teachers were asked questions based on SWM in schools. Some of the questions that were asked are which general solid waste do you have more in the school? How do you get rid of solid waste in school? Observation was also used to collect data, I observed one lesson for each school. During observation, I noted how teachers integrated environmental content during the lesson, knowledge of the subject, involvement of learners during the lesson, teaching material and assignment or activity that was given to the learners at the end of the lesson. Photovoice and focus groups were also used to collect data. During focus groups, I used photovoice as a tool to collect information that was said by learners and questions were asked based on SWM in their school and how they perceived it.

1.8.4 Data Analysis and Interpretation

Observation, checklists and interview guidelines are tools used to obtain qualitative data. Preparing, organising, minimising, condensing and displaying data obtained during study is what data analysis entails (Creswell & Poth, 2018). Data from qualitative research can be analysed in a variety of ways. One of the most common types of qualitative research analysis is thematic analysis. Its main goal is to find, analyse and interpret meaning patterns in qualitative data.

Thematic analysis is used since it is versatile and easy to use (Clarke et al., 2015). It may be used in a variety of theoretical and epistemological contexts, including interpretivism, which is the paradigm that frames the current study. Thematic analysis summarises the major aspects of a dataset and provides a detailed explanation of the

data (Braun et al., 2017). To analyse data, thematic analysis employs both inductive and deductive reasoning. Categories of meaning and connections between categories are formed from the facts in inductive ‘bottom up’ reasoning (Saunders et al., 2015). The researcher’s query and larger theoretical assumptions promote deductive ‘top down’ reasoning analysis (Saunders et al., 2015).

1.9 DELIMITATIONS OF THE STUDY

Limitations of the study relate to the potential weaknesses of the study. The limitations of this study might be that learners generally do not have much background of Environmental Education/Education for Sustainable Development, as it is not a separate subject in their curriculum this must be taken into consideration as it might result in the possibility of the interview questions being unclear to them. The study involved three teachers who teach Life Sciences classes to Grade 10, the study did not consider other subjects and grades in the schooling system. The study was limited to three schools. The study was a case study, thus its conclusions cannot be applied to all teachers, but they can provide researchers with an idea of how to to incorporate solid waste in their lessons.

The study employed a qualitative approach and convenience sampling for both the sites and the participants. Therefore, a limitation of the study is that the findings cannot be generated to all the secondary schools in the Chesterville area. Interpretation of the findings might be limited to only the sampled Grade 10 teachers and learners of schools that took part in this study.

1.10 DEFINITIONS OF KEY CONCEPTS

Environmental education: is described as a major concept in this study. It is “education that helps individuals become more aware about their environment and develop responsible environmental behaviour and skills so that they can improve the quality of the environment” (Nordstrom, 2008; UNESCO, 1978, p. 165).

Education for sustainable development: is defined by the National Curriculum Council for England and Wales as “education that enables people to develop knowledge, values and skills to participate in decision-making about how they do

things individually and collectively, both at local and global levels that will improve the quality of life" (Aaronson et al., 1998, p. 3).

Environmental literacy: is defined as a person's ability to perceive and comprehend the state of environmental systems, as well as the actions required to manage, repair, or improve those systems (Roth, 1992).

Landfilling: A landfill is an engineered pit, particularly designed for receiving compacted solid waste and equipped with specific covering, so that the waste can be disposed of (Qasim, 2017).

Solid waste: is described as a material or item that has been wasted or that must be disposed of as a result of human or animal activity (Cheremisinoff & Heinemann 2003).

Solid waste management: is defined as "the regulation of solid waste formation, storage, collection, transportation, processing and disposal in conformity with the best principles of public health, economics, engineering and conservation (Makwara & Snodia, 2013). Aesthetics, environmental considerations and public opinion are all taken into consideration. All administrative, financial, legal, planning, and engineering tasks involved in the settlement of all solid waste problems are included in solid waste management" (Tchobanoglous et al., 1993, p. 7).

1.11 CHAPTER OUTLINE

This research is divided into five sections, each of which is described in detail below.

Chapter 1: In this chapter, I have discussed the background of the study including the problem statement, rationale for the study, aim, objective, research questions, study area, the study's methodology, limitations and delimitations.

Chapter 2: In this chapter, I have discussed concepts used, a brief history of environmental education internationally, the history of EE in South Africa, the relationship between EE and ESD, international perceptions on integrating of EE in school, integrating EE and ESD in secondary schools in South Africa, environmental education as a cross-curriculum topic and the importance of SWM in schools. Strategies employed in SWM, MSW management, gaps to be filled by this study, theoretical framework and conclusion are discussed.

Chapter 3: The methodological strategy and technique used to collect data for the research are discussed in Chapter 3. It examines the qualitative and qualitative approaches to environmental education/environmentally sustainable development research as the two major paradigms. The creation of the research instruments, the study's data sources, and a thorough explanation of how the fieldwork was done is covered in this chapter.

Chapter 4: This section addresses and interprets the information gathered through interviews, observations, photovoice and focus group interviews.

Chapter 5: The outcomes of the research are discussed in this last chapter of the research in light of the study's goals and objectives. The chapter also draws implications from the study's key results and identifies topics for further investigation.

1.12 SUMMARY

This chapter included background of the study, problem statement, objectives, limitations and delimitations, research methodology and research design, significant of the study, definition of concept and chapters outlines. The next chapter reviews the literature on solid waste management.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review, according to Hebe (2009), is a method of exploring printed and unpublished source materials on a phenomenon. In this chapter, the researcher analysed relevant literature and studies that can be used to manage solid waste, which is primarily produced in and around schools.

According to the study of Suttibak and Nuttivatanon (2008), the authors examined preconception about environmental problem in cities particularly that of urban disposal of waste. They found that learners' ideas were dominated by what they perceived, without regarding existing interactions and that learners were unaware of the fundamental rule of reduce, reuse and recycling which is key to achieving sustainable solid waste management. This chapter examines the key terms or concepts used in environmental education; a brief history of EE internationally; history of EE in South Africa; the relationship between EE and ESD; internal perception on integrating EE in school; African perspectives on integrating EE/ESD in secondary school in South Africa; potential ways of integrating EE in the curriculum; initiatives and challenges of teaching EE/ESD around the world; and importance of solid waste management in the country. The theoretical framework used for this investigation then serves as the chapter's ending.

2.2. DEFINITION OF KEY TERMS AND CONCEPTS USED IN THIS CHAPTER

Solid waste management: "MSW management" is defined by the European Union (EU) (2018) as "waste collected by or on behalf of municipal authorities, or directly by the private sector not on behalf of municipal authorities, such as business or private non-profit organisation" (p. 10). Although equivalent garbage from businesses, offices and other institutions is also included, it is primarily created by households. Bulky waste is encompassed within the waste category, while excluding municipal sewage network trash, construction waste and demolition debris (EU, 2018).

Sustainable development and education for sustainable development. Sustainable development: Sustainable development is defined by the National Curriculum Council for England and Wales as “education that enables people to develop knowledge, values and skills to participate in decision-making about how they do things individually and collectively, both at local and global levels that will improve the quality of life” (Aaronson et al., 1998, p. 3).

Education for Sustainable Development: “ESD is a fundamentally about values, with respect at the centre: respect for others, including those of present and future generations, for different and diversity, for the environment, for the resources of the planet we inhabit. Education enables us to understand ourselves and others and our links with the wider natural and social environment, and this understanding serves as a durable basis for building respect.” (United Nations 2004, p. 4). “The school curriculum should pass on enduring values and help learners to be responsible and caring citizens capable of contributing to just society. It should develop their awareness and understanding of, and respect for, the environments in which they live, and secure their commitment to sustainable development at a personal, local, national and global level” (Scott, 2002, p. 53).

Waste management: waste management refers to the “collection, transportation, processing, recycling or disposal of waste materials” (Mugambwa & Kizito, 2009, p.69). It is important to recognise that the waste management strategies used in this study vary between established and developing nations, urban and rural areas and residential and industrial producers. The volumes and types of garbage produced by these various sources of waste, according to Tai (2007), support the use of various waste management techniques. Therefore, it suggests that procedures that work in one situation could not work in another. To choose an effective approach, it is crucial to evaluate the context of the waste source.

Landfill: Landfilling is the least desired approach in the waste hierarchy and should only be used as a last resort (DEA, 2011). Focusing on waste diversion from landfills is one of the NWMS’s strategic objectives in order to reduce the need for building new landfills or enlarging existing ones (DEA, 2011). Waste management in South Africa remains significantly reliant on landfilling because the few alternative waste treatment solutions are more expensive than landfill charges (Naidoo et al., 2015). Ninety

percent of the rubbish produced in South Africa is reportedly dumped there. Because landfilling is so inexpensive in South Africa, there has not been much motivation to develop alternative waste treatment methods (Godfrey & Oelefse, 2017).

2.3 BRIEF HISTORY OF ENVIRONMENTAL EDUCATION INTERNATIONALLY

Since the International Conference on the Human Environment in Stockholm in 1972, when a request for a UN Environmental Education Programme (UNEP) was filed, EE has evolved into a global phenomenon. The UNEP was established as a result of the first worldwide meeting on EE, which was held in Stockholm in 1972 (Blignaut 1992; Schleircher 1989).

As stated during the Belgrade Conference in 1975, EE requires both global and local thought and should focus on man's interaction with the biosphere. The Belgrade Charter was created to serve as a global foundation for EE, and the International Environmental Education Programme (IEEP) was founded in 1975. The framework's aims are as follows:

- to increase knowledge of and concern for the connection of the rural and urban economies, societies and politics.
- to give each person the knowledge, principles, outlook, dedication and abilities necessary to save and enhance the environment.
- to encourage individuals, communities, and society to adopt new environmental behavioural patterns (Bornmann 1997; DEA&T 2001; Hungerford 1990; Schleicher 1989).

The Belgrade Charter's global viewpoint and aspirations are related to the formulation and implementation of school environmental policies and management plans in Kwa-Zulu Natal in this study. Its goal is to serve as a catalyst for local environmental action by instilling new environmental behaviours in individuals, communities and society as a whole. This is accomplished, among other things, by increasing environmental awareness and providing opportunities for learners to acquire environmental knowledge and skills through curriculum integration and school-based EE processes, as well as resource management and environmental problem-solving.

Schleicher (1989) asserts that at the Munich conference shortly after the Belgrade Charter, it was emphasised that the social sciences should coordinate the various environmental points of view in order to prevent the one-sided factual-functional interpretation that the natural sciences tend to adopt.. A case for humanities involvement was advanced in Tbilisi in 1997, claiming that ethical, cultural and economic factors influence environmental interpretation and attitudes. As a consequence, environmental knowledge, attitude, skills, and involvement were all given equal weight, and the guidelines agreed upon were as follows:

- EE must encompass the natural and built environments, as well as technological and social elements.
- Its approach should be interdisciplinary, and it should address both local and global challenges.
- It must enable the learner to make decisions and accept the results of those decisions, as well as participate in the planning of the learning experience.

The first intergovernmental meeting on EE took place at the Tbilisi Conference in 1977 in Georgia (the former Soviet Union). Guidelines for expanding the use of EE in formal and informal education were written while 66 member nations were present. Then, a study based on 11 principles with a concise set of goals for EE in formal education was published (Bornmann 1997). It was the first time that a global discussion and agreement on the necessity of EE, as well as stated aims and objectives that could be reached in every country, had taken place (Braus 1995).

The following are the objectives set forth in the Tbilisi Conference Declaration (1978):

- Awareness: to promote greater awareness of the overall environment and its initiatives among social groups and individuals.
- Knowledge: to help individuals and social groups develop a broad range of experiences with the environment and its issues, as well as a fundamental understanding of them.

- Attitudes: to foster a sense of environmental values and emotions among individuals and social groups, as well as the desire to actively contribute to environmental conservation and progress.

- Capabilities: to help individuals and social groups develop the capacity to identify and address environmental concerns.

- Participation: allowing individuals and social groups to take an active role in tackling environmental challenges at all levels (Hungerford 1990).

2.4 HISTORY OF EE INTERNATIONALLY

According to Loubser et al. (2014), the history of EE can be traced back to ancient Egypt, Greece, India and China. In order to prevent soil erosion, these authors provide examples of how the tenth Pharaoh of Egypt's eighteenth dynasty instructed farmers to avoid planting their crops along the vegetated Nile River banks. This demonstrates that EE was being practised in Egypt long before the word "EE" was coined. The practice of sustainable agriculture and replanting has also been around for more than 3 000 years in China (Irwin & Lotz-Sisitka, 2005). In contrast, Theophrastus, an Aristotelian student who is regarded as the father of ecology, was the first person in Greece to recognise the fundamentals of ecology in the fourth century BC. At the time, he unsuccessfully pushed for a type of integrated environmental management (Melville, 2010).

Jean-Jacques Rousseau suggested in his novel from 1762 that education should have an emphasis on the environment. He also contributed to the creation of programmes like Nature Study (UNESCO, 1978). Given that our educational system now places some emphasis on the environment, it would appear that Rousseau's views in his novel had some influence. Similar to this, physicist Louis Agassiz advised his students to study directly from nature rather than through books (Loubser et al., 2014). The points made by Agassiz are relevant to today's view of education, which includes environmental knowledge.

Immediately following World War II's conclusion, the first environmental organisations were established. The International Union for the Conservation of Nature (ICUN), founded in 1948, was one of the newly established organisations. The following year,

1949, UNESCO and ICUN partnered, and together they played a very important role in ensuring that EE was widely acknowledged around the world (Loubser, 2014). The growth of EE accelerated in the late 1960s and early 1970s (Mathenjwa, 2014), and in 1972, it reached a turning point following the Stockholm-based United Nations conference on the environment. At this meeting, the UNEP was established, becoming the first UN organisation with a headquarters outside of Europe and North America (Loubser et al., 2014). The first worldwide EE workshop was organised by UNESCO and UNEP in Belgrade, Yugoslavia, in 1975. The first intergovernmental conference on EE was held in Tbilisi, Georgia, the year after the workshop. The meeting led to the development of the goals, objectives and guiding principles for EE, all of which are still in use today. The 12 principles collectively referred to as the Tbilisi Principles of EE, which unambiguously indicate what EE should cover, were among the innovations that came out of the meeting (Loubser et al., 2014), namely, to:

- think about the environment as a whole, both natural and man-made, technological and social;
- be an ongoing process that lasts a lifetime, starting in preschool and extending through all official and informal stages of education;
- be multidisciplinary in its approach, using the distinct material of each subject to enable a holistic and fair viewpoint;
- examine important environmental concerns from local, national, regional and global perspectives to provide students with an understanding of the environmental circumstances in different countries;
- accentuate the historical context while concentrating on the present and future environmental conditions;
- encourage local, national, and international collaboration in the prevention and resolution of environmental issues;
- explicitly consider environmental aspects in plans for development and growth;
- enable learners to have a role in planning their learning experiences and provide opportunity for making decisions and accepting their consequences;

- relate environmental awareness, information, problem-solving abilities and values clarification to all ages, with a focus on early years and the learner's local community;

- assist students in learning the signs and true causes of environmental issues;

- emphasise the need for developing critical thinking and problem-solving abilities due to the complexity of environmental problems; and

- use a variety of learning methods and instructional strategies to teach/learn about and from the environment, placing appropriate emphasis on hands-on activities and first-hand experience.

Following the creation of these principles, a number of international commissions were established, and they compiled studies that determined people's perceptions of the environment and EE in the 1980s (Loubser et al., 2014). One of the commissions that had the most impact on the development of EE was the one described in the Bruntland Report about the World Commission on Environment and Development (WCED), "*Our Common Future*." The Bruntland study also contributed to the idea of sustainable development, in which "environmental conservation and economic growth are considered as interconnected ideas," according to Zwelibanzi (2016, p. 44).

Additional EE forums continued to emerge, with non-governmental organisations dominating most of them (NGOs). The Earth Summit that followed in 1992 produced a convention on EE for sustainable societies (Zwelibanzi, 2016). The multinational gathering of NGOs and social movements attended the Rio de Janeiro, Brazil-hosted 1992 Earth Summit. The treaty created during the summit established the NGOs' Forum Principles, which are standards for just and sustainable communities. The following are some of the EE principles for just and sustainable communities, according to Loubser et al. (2014):

- Education is the right of all; we are all learners and educators.

- EE, whether formal, non-formal or informal, should be grounded, and innovative thinking should occur in any place or time, promoting the transformation and construction of society.

- EE is both individual and collective. It aims to develop local and global citizenship with respect for self-determination and sovereignty of nations.

- EE is not neutral but is value-based. It is an act of social transformation.

- EE must involve a holistic approach and thus an interdisciplinary focus in the relation between human beings, nature and the universe.

- EE must stimulate solidarity, equality and respect for human rights involving democratic strategies and an open climate of cultural interchange.

- EE should treat critical global issues, their causes and interrelationship in a systematic way and within their social and historical context. Fundamental issues in relation to development and environment, such as population, health, peace, human rights, democracy, hunger, degradation of flora and fauna, should be perceived in this manner.

- EE must facilitate equal partnerships in the processes of decision-making at all levels and stages.

- EE must recover, recognise, respect, reflect and use indigenous history and local cultures, as well as promote cultural, linguistic and ecological diversity. This implies acknowledging the historical perspective of native peoples as a way to change ethnocentric approaches, as well as the encouragement of bilingual education.

- EE should empower all peoples and promote opportunities for grassroots democratic change and participation. This means that communities must regain control of their own destinies.

- EE values all different forms of knowledge. Knowledge is diverse, cumulative and socially produced and should not be patented or monopolised.

- EE must be designed to enable people to manage conflicts in just and humane ways.

- EE must stimulate dialogue and cooperation among individuals and institutions in order to create new lifestyles which are based on meeting everyone's basic needs, regardless of ethnic, gender, age, religious, class, physical or mental differences.

- EE requires a democratisation of the mass media and its commitment to the interests of all sectors of society. Communication is an inalienable right and the mass media must be transformed into one of the main channels of education, not only by disseminating information on an egalitarian basis, but also through the exchange of means, values and experiences.

- EE must integrate knowledge, skills, values, attitudes and actions. It should transform every opportunity into an educational experience for sustainable societies.

- Education must help develop an ethical awareness of all forms of life with which humans share this planet, respect of all life cycles and impose limits on human's exploitation of other forms of life.

In 2002, the UN hosted the World Summit for Sustainable Development (WSSD) in Johannesburg, South Africa. This summit continued to discuss and emphasise the importance of education in eradicating global poverty, inequality, and promoting environmentally sustainable development (Loubser et al., 2014). The necessity for socio-ecological, political and economic transformation was emphasised at the 2002 world summit, according to Zwelibanzi (2016).To further the global adoption of EE, advocates must continue to form partnerships with many global stakeholders. Several initiatives have been launched, such as the partnership between EE and UNESCO, UNEP and various departments of education of different countries; these are aiding in the dissemination of information about a sustainable future during various seminars and conferences held in various locations around the world (Loubser et al., 2014).

One of the most important advancements in the development of EE in various nations throughout the world was the development of EE from a global perspective. Many nations, including China, England, Kenya, Colombia, Mexico, Argentina and New Zealand, among others, now include EE in their school curricula.

2.5 HISTORY OF ENVIRONMENTAL EDUCATION IN SOUTH AFRICA

According to Irwin (1990), interest in EE in South Africa began in the 1960s and was sparked by state agencies and non-governmental conservation organisations. Although EE was heavily focused on various conservation movements that helped to educate people about nature at the time, it was not part of the curriculum. According to Irwin (2003), attempts to incorporate EE into the curriculum prior to 1989 were unsuccessful. Despite not being covered in the curriculum, there were EE measures implemented, like as teaching people about soil erosion and nature preservation. The Tbilisi Principles of 1977, the Belgrade Charter of 1975, and the Brundtland Report all supported the majority of such measures.

Treverton College in Mooi River, Natal, hosted the nation's inaugural EE conference there in 1982 (Melville, 2007). The Environmental Education Association of South Africa (EEASA) was established during this five-day conference. According to many authors, including De Lange (2004) and Loubser et al. (2014), EEASA has been instrumental in the growth of EE in South Africa ever since it was established. In accord, Melville (2007) goes on to say that EEASA has been in charge of publishing the *Environmental Education Bulletin* since 1985 and the *Southern African Journal of Environmental Education* since 1984. The growth and development of EE in general have been greatly influenced by the publications the EEASA has produced.

Loubser et al. (2014) assert that the provincial conservation agencies and NGOs have also made significant contributions to the advancement of EE in South Africa, in addition to the role played by EEASA. These NGOs include, among others, the National Environmental Awareness Council (NEAC), the Umgeni Valley Project, and the Wildlife Society of Southern Africa (WESSA). Despite the fact that EE was not yet a component of the formal education system, all of these NGOs and other stakeholders significantly contributed to the growth of EE and to aiding in people's education about EE.

A significant improvement in EE's development occurred in February 1990, and NGOs and political parties took notice of it (Loubser et al., 2014). The creation of the Environmental Education Policy Initiative (EEPI) was one of several factors contributing to the advancement of EE at this time. The EEPI chose a "political

alignment and more democratic approach" to EE in order to involve practitioners in the formulation of the policy (Clacherty, 1993, p. 4).

The EEPI advocated for a curriculum to promote understanding values and skills for sustainable development and healthy living at various conferences held in South Africa. As a result, the 1993 National Education Coordination Committee (NECC) conference adopted the following resolution: "… The curriculum will develop the understanding values and skill for sustainable development and an environment that ensures healthy living" (Clacherty, 1993, p. 3).

However, this phrase was changed by the African National Congress's (ANC) policy framework in 1994 when the Tbilisi EE principles were incorporated into the 1995 Education White Paper, which declared that:

> EE involving an interdisciplinary, integrate and active approach to learning, must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future enjoy a decent quality of life through the sustainable use of resources" (Department of Education (DoE), 1995, p. 18).

Following the creation of these clauses, the EEPI shifted its emphasis to curriculum development and became the Environmental Education Curriculum Initiative (EECI). The Revised National Curriculum Statement from Curriculum 2005 was created as a result of environmental educators working under the EECI later establishing themselves as stakeholders in curriculum development (Loubser et al., 2014). According to Melville (2007), the National Environmental Education Project for General Education and Training (NEEP-GET) was founded by the Minister of Education on 5 June 2000 (World Environment Day) in order to properly integrate EE into school curricula. The fundamental goal of the NEEP-GET, according to Zwelibanzi (2016), was to make sure that EE was integrated into every subject in the GET band's (Grades R–9) curriculum.

According to Zwelibanzi (2016), little has been done to integrate EE into the Further Educational Training (FET) band despite the NEEP-GET's support of the integration of EE in GET bands. Additionally, it became clear from the volume of studies on EE

integration that the GET band rather than the FET band had received greater attention. For instance, studies by Lotz-Sisitka and Raven (2001), Le Grange (2003), Kimaryo (2011) and Maila (2003) all focused on the integration and application of EE in the GET band. This led to a general lack of awareness among teachers in the FET band regarding the incorporation of EE. By concentrating on the incorporation of EE by teachers in the FET band, this study seeks to close this knowledge gap. The relationship between EE and ESD is the next topic of discussion once the history of EE from both an international and South African perspective has been covered.

2.6 THE RELATIONSHIP BETWEEN ENVIRONMENTAL EDUCATION AND EDUCATION FOR SUSTAINABLE DEVELOPMENT

Regarding EE and ESD, different academics have different perspectives. This has sparked a discussion about the connections between EE and ESD. While some academics, like Loubser et al. (2014), think that ESD should be included in EE's objectives, others, like Fien (2001), Tilbury and Cooke (2005) and Yang et al. (2010), believe that EE has evolved to become a component of ESD. Nevertheless, some academics concur that EE already incorporates ESD (Loubser, 2014)

The four views of EE and ESD, as proposed by Hesselink et al. (2000) as well as Wals and Jickling (2000), are described here. According to the first viewpoint, EE is viewed as a component of ESD and is, therefore, considered to be a component of ESD's content. In contrast to the first approach, the second perspective considers ESD to be a component of EE. The third perspective sees EE replacing ESD while the last perspective sees ESD as a stage in the evolution of EE. One thing unites all of these viewpoints: they all demonstrate the relationship between EE and ESD.

According to Kimaryo (2011), ESD wants to build a "more sustainable society where individuals live in the environment, in a sustainable manner" while EE aims to create a "more democratic and environmentally just world" (p. 31). According to Loubser et al. (2014), EE and ESD are difficult to distinguish from one another because they have much more in common than they do differences. In addition to having different goals, they also share the same vision of "creating a better world where there is a balance between economy, ecology and society" (p. 31).

The purpose of EE and ESD, as seen in the literature discussed above, is to generate people who are environmentally literate and can take care of their environment. The next issue examines the integration of EE/ESD in school curricula, beginning with the international, followed by the African and South African conceptions. This goal is simple to achieve if EE is properly integrated into the entire curriculum. Throughout the investigation, EE and ESD will be used interchangeably.

2.7 INTERNATIONAL PERCEPTIONS ON INTEGRATION OF ENVIRONMENTAL EDUCATION IN SCHOOLS

Internationally, EE is incorporated into school curricula, but only in a select few courses, such Geography and the Life Sciences (Biology). The integration of EE in educational curricula is constrained for a number of reasons that have been discussed in the literature. The absence of teacher training in the EE integration process is the primary cause. For instance, according to a study carried out in Hong Kong by Ko and Lee (2003), instructors in primary schools were unable to instruct in EE because they lacked the necessary training, resources and class time. The development of environmentally literate students in Zambian high schools is further hampered, according to Monde (2011), by a lack of class time and inadequate training for EE teachers. This shows that EE was not taught as a part of the core curriculum in certain schools.

Lack of financing has been mentioned by various authors as another factor preventing the full integration of EE into the educational curriculum. In a study carried out in Michigan (USA) by Balaskovitz (2009), it was shown that the absence of financing for teachers' EE training contributed to the lack of EE integration in schools. Similar to this, De Caralho (2011) asserts that teachers in Brazil encounter difficulties integrating EE into their lessons. He lists a lack of financing as one of the major difficulties. This illustrates how EE will not be incorporated into school curricula if there is insufficient funding to support its implementation. I believe that if governments worldwide could launch a campaign to inform teachers and students about the significance of EE/ESD, the majority of countries would have safe, sanitary and healthy environments. This may also reduce the amount of waste dumped in landfills.

Aside from a lack of resources and expertise, there are other constraints that prevent the integration of EE into academic topics. The third factor limiting the incorporation of EE was recognised by Filhor and O'Loan (1996) in Scotland as teachers' lack of EE knowledge. Because they only identify EE with Social Sciences and Science-related disciplines, Cheng and Chen (2012) report that most teachers in China do not incorporate EE into their curricula.

In addition to the approaches listed above, it appears that learners are exposed to EE in other situations in other ways that might also be considered an integration of EE in curricula. Learners participating in community projects, such as those that support green schools, is one approach to integrating EE in the classroom. As a result, some schools throughout the world actively encourage their learners to get involved in community projects. Learners are encouraged to sign up for the Seeds Foundation, which aims to green Canadian schools (Cheng & Chen, 2012). In the UK, students are urged to participate in the Jupiter Project, which aims to maintain the school gardens (Makhoba, 2009:32).

These are a few of the methods that these nations employ to include EE into their educational systems, which equips students with the necessary information and expertise about EE. Participation of students in neighbourhood initiatives reflects the educational component of EE. This is so that students can learn about the environment, in the environment and for the environment when they participate in projects like greening the school. Additionally, these projects assist students in fostering a caring attitude toward the environment.

2.8 AFRICAN PERSPECTIVES ON INTEGRATION OF ENVIRONMENTAL EDUCATION/ EDUCATION FOR SUSTAINABLE DEVELOPMENT IN SCHOOLS

Although EE/ESD is officially included in the curriculum in the majority of African nations, there are still issues with teachers failing to include it into their curricula. In the Ubombo circuit, KwaZulu-Natal, South Africa, most teachers, according to Mathenjwa (2014), do not incorporate EE into their courses. They explained that they lacked pedagogical content knowledge (PCK) and a comprehension of EE/ESD when questioned as to why. People who used it said they did so informally in fields like Geography and the Life Sciences (Mathenjwa, 2014).

Le Roux and Bouazid (2009) did a study in South Africa and concluded that EE was not formally applied in schools, which is consistent with Mathenjwa's (2014) findings. Similar to this, Haindongo (2013) in a study conducted in Namibia highlighted one of the issues that prevents the integration of EE into their lectures in schools as lack of curricular comprehension by both teachers and subject advisors. On the other hand, Mwendwa (2017) says that in Tanzania, the majority of schools have incorporated EE/ESD, but only in a few chosen courses, such Geography and Life Sciences. Because these are the subjects with more issues that are relevant to the environment, EE was integrated into them in Tanzania. Students become confused as a result and begin to believe that EE is exclusively related to Geography and the Life Sciences and not with other topics.

According to the literature, most teachers struggle to incorporate EE into their curricula. According to Haindongo (2013)'s study, the majority of teachers lacked knowledge about how to incorporate EE into their curricula. Even if the majority of educationists supported the cross-curriculum approach, Dreyer and Loubser (2005) observed that there was no consensus on how to integrate EE in the formal education system. This shows that many teachers in Africa are still not incorporating EE into their lessons, but in nations like Zambia, where teachers are aware of how to do so, they do not view EE as a necessary piece of curriculum (Monde, 2011).

According to one of the study's participants, "*EE components integrated in the current topics, were not many in test papers*"; therefore even the teacher's effort while integrating those components was modest (Monde, 2011, p. 85). This demonstrates that neither the teachers nor the examiner viewed EE as a crucial component. Even though EE was integrated into their school curricula, if these stakeholders did not treat it seriously, they would not be able to accomplish its goal, which is to create students who are environmentally literate.

Teachers and subject advisors both need to be knowledgeable about EE for the integration of EE into educational topics to be successful. Its incorporation into the curriculum is limited by the teachers' and subject advisors' lack of understanding on the subject. According to Monde (2011), who agree with this assertion, one of the obstacles to incorporating EE into school subjects is a lack of teacher understanding because students will find it difficult to understand if teachers are unfamiliar with the

subject. As a result, teachers “have a limited grasp of EE and they do not comprehend how EE is implemented in their curriculum,” according to Haindongo (2013, p. 187). According to Mwendwa (2017), some teachers acknowledged that they lacked sufficient knowledge and comprehension of EE and its integration. It is assumed that there is not enough EE implementation in schools and in the classes when teachers choose not to integrate EE into their subjetc because they are unfamiliar with EE.

Lack of teaching resources was identified as one of the main issues preventing the implementation of EE in school topics in the Monde’s (2011) survey of Zambian high schools. The findings of Monde’s investigation demonstrated that some schools lacked EE teaching and learning tools, and even those that did claim to have such resources stated that their stock was insufficient. Despite the fact that UNESCO had emphasised that the integration of EE into formal education should take into account teaching resources (Gerasimov, 1980), it appears that schools that wanted to implement EE in their subjects lacked the necessary resources, which is a factor that hinders the integration of EE in schools.

Numerous academics, including Kimaryo (2011), Monde (2012), Zwelibanzi (2016), and Haindongo (2013), point to inadequate teacher preparation as another factor that hinders the incorporation of EE into their subjects. Additionally, Mwendwa (2017) asserts in her findings that “out of eight teachers contacted, only two reported to have had particular 27 training on subject matter” (p. 9) This demonstrates that many of the teachers still lack the necessary training to incorporate EE into their lessons. The incorporation of EE in the subject area was also discovered to be unknown to some teachers. This was based on a Tanzanian study by Kimaryo (2011), which was caused by the fact that the teachers there lacked the necessary training to incorporate EE into their curricula, even though it was Tanzanian law that all primary teachers must do so. This suggests, in my opinion, that most teachers do not include EE into the many school subjects.

Even though they are the ones advocating for such integration, the Department of Basic Education (DBE) appears to have little influence over how EE is incorporated into the academic curriculum. Many obstacles prevent the integration of EE into the academic courses, according to Mathenjwa (2014), although “some obstacles were caused by the Department of Education’s inadequate assistance” (p. 52), the “National

Policy of Education" in Zambia, offers little guidance to teachers who struggle to integrate EE in their lessons.

Even if the majority of the literature demonstrates that integrating EE presents difficulties, there appears to be a resounding consensus that doing so empowers individuals to protect their environment and lessen any potential threats to it. Haindongo (2013), for instance, claims that "EE is crucial to all countries which encounter environmental problems" (p. 44) because it aids in lowering certain environmental issues, such as environmental degradation. According to Kimaryo (2011), the inclusion of EE in the curriculum will provide students with the knowledge, skills and attitudes they need to take good care of their own environment.

The majority of the difficulties encountered in integrating EE into school curricula that are described in international literature, such as a lack of training for teachers on how to do so, are also present in the African environment. The integration of EE is now discussed as it is perceived in South Africa.

2.9. INTEGRATING EE/ESD IN SECONDARY SCHOOLS IN SOUTH AFRICA

South Africa shares the same issues with EE/ESD integration into the curriculum as other nations worldwide, including Namibia, Zambia and Tanzania in Africa. Le Roux and Maila (2004) assert that attempting to incorporate EE into the curriculum still presents significant difficulties. According to Schudel et al. (2008), only a small percentage (25%) of South African schools effectively integrate EE/ESD into their curriculum.

The non-governmental organisations WESSA and the Ezemvelo KZN in Kwazulu-Natal, South Africa, taught both teachers and students how to take care of their environment before the dawn of democracy in 1994, despite the fact that not all of the activities that those organisations run were part of the curriculum (Mathenjwa, 2014). Since the post-1994 Constitution of South Africa was adopted, every citizen has a right to a healthy environment (Republic of South Africa, 1996). As a result, the Constitution mandates that statement to be followed by all South African institutions, whether official or informal and as a result, EE is now part of the country's formal curriculum.

South African schools work to develop students who are environmentally literate, but this seems to be challenging because instructors, who are responsible for educating the students, do not seem to understand the term “environment,” much less the concept of EE (Makhoba, 2009). According to Mathenjwa (2014), the different definitions of EE make it difficult for instructors and students to understand what EE means; as a result, they frequently become perplexed and fail to incorporate EE into their school subjects although several academics have provided various definitions of EE. According to the White Paper from 1995, EE is a process that requires an active, integrated and interdisciplinary learning approach.

According to Janse van Rensburg and Lotz (2009), EE is a “continuous process of equipping people with the skills, attitude, knowledge, and commitment” (p. 635) that would enable people to both find solutions for current environmental issues and prevent the emergence of new issues. These definitions cover two distinct topics: the first calls for EE to be present in all areas of study, while the second focuses on finding solutions to environmental issues. Although the government has mandated that EE/ESD must be integrated into all learning environments, I am of the opinion that this could lead to misconceptions among teachers who are not trained in EE/ESD because they will expect one definition or different explanations that mean the same thing in different words.

Teachers are expected to read the necessary policy documents, such as the CAPS document, in order for the integration of EE/ESD in all disciplines to be successful. The curriculum developers “urge instructors to ready the policy texts when teaching”, according to scholars like Nhlongo (2015, p. 35) and Mbatha (2016). Results from a study conducted in Nkomazi East Circuit at the Ehlanzeni District, Mpumalanga Province by Nhlongo (2015) revealed that teachers in that study did not read the policy documents because they did not know the curriculum objectives, aims, and outcomes. Despite the fact that these are clearly indicated in the policy document (CAPS document) that they use; if teachers do not read these documents, then they are likely to fail to integrate EE in their lessons..

The integration of EE in academic courses is currently a major problem for the DBE in South Africa. According to Mathenjwa (2014), the government has created policies to integrate EE into all disciplines; however, one of the issues is that neither teachers nor

subject advisors have the necessary EE skills or expertise, making it challenging for them to incorporate EE into their classroom subjects. Kimaryo (2011) agreed with this assertion and stated that teachers' lack of EE understanding is their main obstacle. Regardless of the DBE's directive to integrate EE in all courses, if teachers lack expertise of EE, there will also be a lack of EE integration in the subjects.

According to academic literature, South Africa is one of the nations with few colleges that offer EE. According to Loubser et al. (2014), EE is offered in South Africa at the University of North-West, Rhodes University, the University of South Africa, and the University of Stellenbosch. This increases the number of EE graduates who go on to specialise in the field and aids in the integration of EE into other topics by teachers. However, according to Mathenjwa (2014), the few colleges in South Africa that offer EE programmes limit the potential for creating instructors who are experts in the field. As a result, many teachers lack EE-related qualifications. In a South African study on special needs schools, Zwelibanzi (2016) notes that "teachers in special needs schools often lack essential certification to be able to teach EE," (p. 148) which results in a lack of EE integration in academic subjects in such special schools. According to Zwelibanzi (2016), there are not enough EE specialists to fill subject advisor positions in special needs schools. The literature consistently holds the opinion that the integration of EE in Life Sciences in South African special schools is problematic due to a lack of teacher preparation and qualification. According to Makhoba (2009), integrating EE into all disciplines can help achieve the goal of creating citizens by preparing teachers to accept change.

The DBE must enrich and support educators in order for them to improve teaching and learning in classrooms. This can be done through conferences, school visits and workshops; however, some academics believe that the DBE seminars do not support teachers who are not teaching environmental subjects at schools. Mathenjwa (2014) asserts that the DBE's workshops on EE implementation appear to have little effect on preparing teachers with the knowledge and abilities to incorporate EE in their disciplines. Schudel et al. (2008) continue, "Because subject advisors do not visit schools to support their teachers, the DBE does not undertake follow-ups after their workshops to assure proper implementation of EE in all school subjects" (p. 543).

The study by Zwelibanzi (2016) also revealed that subject advisors are “responsible for conducting problematic workshops” (p. 154) since the workshops are led by individuals who lack subject expertise and are inadequately prepared to instruct teachers on EE. This further demonstrates the seriousness of the issue that our nation faces with the under-integration of EE into academic courses. As a result, DBE must create strategies and directives to aid in the growth of EE knowledge at both the school and district office levels.

One of the tools used in schools to support effective teaching and learning is the availability of resources. The majority of EE educators lack the resources necessary to support their instruction, which is another problem that restricts the integration of EE into academic courses. According to Zwelibanzi (2016), “teachers need to be well qualified to teach EE successfully, and as a result, they need to be provided with resources or instructed to produce their own” (p. 157) Lack of such tools and support will prevent EE from being integrated into curriculum.

The following topic explores potential methods of integrating EE in the curriculum after reviewing various scholars’ perspectives on the integration of EE in the international, African and South African viewpoints.

2.10 POSSIBLE WAYS OF INTEGRATING EE IN THE CURRICULUM

According to UNESCO (1978), there are various ways that EE might be incorporated into secondary education. Kimaryo (2011) makes a similar argument, stating that “there is no universal manner of putting EE in the curriculum or education plan” (p. 34). Numerous researchers, including Zwelibanzi (2016), Kimaryo (2011), Monde (2011), and Haindongo (2013), suggest that there are three different ways to incorporate EE into the curriculum: as an independent subject, a cross-curricular subject or as a theme centred around important issues and problems. All of these approaches, according to Zwelibanzi (2016), are suitable for integrating EE, but they each have advantages and disadvantages. The advantages and disadvantages of these strategies are examined in the next section.

2.10.1 EE as an Independent Subject

As suggested by the scholars above, one method to incorporate EE into the school curriculum is as an autonomous subject. Mohammed (2016) claims that in this method, “EE would be allotted its own time and material” (p. 65) and taught alongside other disciplines like English and Economics. Tanzania is only one of the nations that employ this strategy. Rusinko (2010) contends that because EE is an autonomous subject, it will not be tied to other disciplines and have a narrow emphasis. Kimaryo (2011) suggests that teachers appreciate this method because it is manageable and simple to apply. Not all students in a school will study EE if it is an independent subject, according to Kimaryo (2011), who thinks that if students have a choice of subjects, some may not choose EE, making some of the EE’s guiding principles unachievable, such as the one that states that everyone should be aware of their surroundings.

However, other researchers, including Gough (1997) and Powers (2004), contend that viewing EE as a standalone discipline undermines EE’s goal of re-establishing the connection between people and the environment. Similar to this, Kimaryo (2011) asserts that perceiving EE as a separate entity removes people from their surroundings. According to UNESCO in Kimaryo (2011), “EE should not be merely one more subject to add on to existing curricula but should be incorporated into programmes meant for all learners regardless of their age” (p. 35) Mohammed (2016) emphasises the need for cross-curriculum integration of EE into the educational curriculum, which is covered in the section that follows.

2.10.2 EE as a Cross-Curricula Subject

According to Kimaryo (2011), EE can be incorporated into all of the school subjects as a cross-curricular concern. According to Lacey and Lomas (2013), this strategy integrates EE across all topic areas taught in schools, from General Education and Training to Further Education and Training (GET-FET). Mohammed (2016) thinks that this strategy fosters collaboration across academic areas, which increases the significance of learning. According to Kimaryo (2011), integrating EE into other subjects aids students in acquiring the necessary knowledge, attitudes and skills to protect the environment. Bolstad (2004) argues that if EE is linked to an existing subject, rather than being introduced as a new one, its chances of being included in

the curriculum are increased. In other words, if EE is included into other subjects, there will be less of a disconnect between what is taught in the classroom and what is required for EE (Palmer et al., 1998).

Although it appears that some researchers disagree with this strategy, many academics believe it to be the best one for integrating EE. The implementation of this strategy necessitates time, money and specialised expertise, according to Kimaryo (2011) and Maila (2003:4), making the process challenging. In addition, Kimaryo (2011) adds that the lack of clear implementation instructions from the DBE makes it challenging for teachers to connect EE with their topics. Due to a lack of enough integrating knowledge, Drake (2004) adds that the majority of teachers do not feel comfortable using this kind of teaching.

Coherence, policies, transparency, practice, and ongoing professional development are characteristics that support the whole institution approach in education (Mogren et al., 2019). In actuality, a whole institution approach combines teaching and learning for sustainable development not just through curriculum components but also through sustainable operations like long-term planning, active and participatory learning, integrated governance and community involvement. A sustainable institution with ESD completely incorporated into the curriculum as the driving force requires the active participation of all stakeholders, including students, parents, teachers, and administrators (Hangreaves, 2008, KICD, 2016). The ESD ideal entails tackling both specific issues like climate change, poverty, biodiversity and waste management as well as the thoughtful application of approach methodologies and approaches. It also supports the process of school reform in terms of knowledge, attitudes, beliefs, and techniques (Mogren et al., 2019).

There are several aspects of the total school approach that should be enhanced in curriculum creation and implementation in order to make educational institutions zero waste centres and sustainable. Therefore, educators who design and administer curricula ought to place greater emphasis on:

- Curriculum to reflect our changing world such as citizenship education, embracing new concepts and competencies
- Domestic waste management plan

- Redesigning institutional operations and environmental management such as minimise waste generation, extract maximum value from waste and dispose waste appropriately
- Reorienting pedagogy and learning to make teaching, learning and participation in decision-making inclusive, adequate and appropriate
- Strengthening community relationships to ensure the school connects with and contribute to community initiatives in solid waste management and resources
- Implementing inquiry-based projects on waste management
- Participating in collaborative curriculum design, participative, action research/ learning-based activities
- Building community partnership for teaching and learning
- Developing school culture of waste management sustainability
- Integrating solid waste management actions in school values, beliefs and expectations
- Promoting accountability and reporting on waste interventions through setting a targets
- Promoting school practice towards becoming centres of excellence in solid waste management

This is the approach that is used in South Africa.

2.10.3 EE as Themes around Significant Issue and Problems

This method of integrating EE into the curriculum of schools is the most efficient, claim Flaws and Meredith (2007). This method involves students and instructors discovering and resolving environmental issues in their local areas, and it is not subject-specific. In this method, students actively participate in problem-solving and the teachers only offer instruction and tools that will aid the students in resolving their issues. According to Mohammed (2016), this method is the one where the curriculum is more closely tied

to actual environmental circumstances. Mohammed (2016) also makes note of the fact that this strategy is thought to “allow learners to gain adequate abilities, for recognising, classifying and assessing data linked to EE concerns” (p. 66)

2.11. INITIATIVES AND CHALLENGES OF TEACHING EE/ESD AROUND THE WORLD

These countries were chosen because they have research that highlighted issues regarding solid waste management.

2.11.1 England

EE was first acknowledged in England with the formation of the National Curriculum for 5–16 year olds in 1988. (Grace & Sharp, 2000). The National Centre for Education Statistics (NCC) provided supporting materials to encourage schools to study EE/ESD from sociological, economic, political, technical, artistic, ethical and spiritual perspectives. EE was acknowledged as a non-statutory, cross-curricular subject. The national curriculum should be used to educate environmental concerns, according to the most recent government directive on EE in English schools.

It re-emphasises the relevance of EE/ESD, rather than treating it as if it were just another topic with no unique meaning. “It is up to the schools to decide how to teach environmental issues via the National Curriculum and how far to go beyond the legislative duty,” it states, establishing its presence as a cross-curricular subject (Massey, 1996, p. 395). This was done to address the challenges that still afflict EE/ESD teaching and learning, including a lack of time, resources, sufficient teacher training, expertise and motivation (Grayford, 1991).

2.11.2 Kenya

The scale of the environmental problems facing the world today is beyond reasonable scientific debate. The idea of EE was created in recognition of the importance of an informed and educated population in making wise environmental decisions and adopting a behavioural approach to overcoming environmental concerns (Crompton & Kasser, 2009). The significance of EE is acknowledged and stressed as one of the most efficient ways, if not the only way, to address the challenging environmental issues. The EE/ESD call to action requires an educational system that promotes or

stimulates the growth of environmentally aware people who share concern for the environment in which they currently live and in which future generations will also have to live (Crompton & Kasser, 2009).

The United Nations Conference on the Human Environment in Stockholm in 1972 is where EE first gained official traction. The formation of an international EE programme was advised by this meeting (UNEP, 1972). The IEEP was introduced in 1975. It advocated the basic categories of EE curriculum aims and objectives, which include ecological behaviour and environmental attitudes, skills, and involvement (UNESCO, 1999).

Agenda 21 from the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro reaffirmed that schoolchildren must actively participate in preserving the environment through EE. Although EE has been taught in secondary schools in Kenya since 1985, concerns have been expressed about the attitudes and behaviour of the pupils. For instance, the Minister for Environment and Natural Resources expressed his concern about the students' daily activities not including any applicable conservation concepts (Kenya Times, 1993).

2.11.3 China

The purpose of EE, according to Clements et al. (2014), is to help people understand the environment through education, be aware of the connection between people's subjective needs and desires and the environment and change and reflect people's attitudes toward and value of the pursuit and use of the natural environment. According to Hall (2013), EE is the process of cognitive value and idea clarification to develop, comprehend and appreciate the necessary abilities and attitudes in the interdependent relationships among humans, culture and other living things and the physical environment.

The decision-making process for issues involving environmental quality and self-centred norms of behaviour should incorporate EE. Gainforth et al. (2016) went into detail about how EE was not just about understanding the environment objectively, but also about understanding people's values and relationships with the environment, as well as how to perceive and cultivate a life that is self-restrained and self-reflective and has a long-lasting relationship with the natural environment. According to Liu (2016),

EE is a process of education that aims to connect people with nature and the built environment, and to address issues on population, pollution, energy use and distribution, natural resource conservation, technological advancement, traffic infrastructure and urban and rural planning.

2.11.4 Colombia

To help students develop into more responsible citizens, there have been national efforts to introduce specific EE programmes (The World Bank, 2008). More specifically, since 1991, Article 67 of the Colombian National Constitution (Sauvé, Brunelle & Berryman, 2005) has emphasised education as a crucial tool to encourage environmental awareness and conservation. In Colombia, a number of programmes have been launched to promote EE. One tool is the policy documents from the Ministries of the Environment and Education (2002) that outline goals and potential sources of funding while also highlighting the independence of each region in terms of implementation.

Additionally, to aid in the integration of EE in various Colombian regions and municipalities, a particular committee (Interinstitutional Technical Committees of Environmental Education (CIDEA)) as well as particular programmes (School Environmental Projects (PRAE)), and Citizen Projects for Environmental Education (PROCEDA)), have been established (Mohammadi et al., 2016). The implementation of national educational directives is eventually handled by individual schools at the local level due to the emphasis on autonomy and decentralisation, which leads to significant variations across schools in terms of their emphasis on EE.

In some municipalities (like Santa Catalina de Alejandria) or cities (like Popayán), the PRAE programme has resulted in positive adjustments to the curricula that place a greater emphasis on environmental sustainability (Ministry of Environment and Sustainable Development, Colombia, 2016). This report does not attempt to review in detail how EE programmes have been implemented throughout Colombia. Instead, using the PISA scale (Envlearn), which is based on a five-item questionnaire about ongoing environmental learning activities, the degree of EE in all of Colombia is estimated.

2.11.5 Mexico

Basic education institutions in Mexico are either part of the state-level system or the federal system of education (the schools participating in this study belong to the former). Although these networks are connected and comparable, they have slightly varied operating schedules for schools. Basic education is provided in a variety of methods in Mexico, including school-based and distance learning. School schedules are determined by the educational system and school structures.

Currently, there are three different school schedule alternatives for primary education in Mexico: part-time school, full-time school, and extended-schedule schools (Government of Mexico, 2011). For primary school education in Mexico, part-time institutions are the norm. Part-time elementary schools in Mexico are gradually being converted to full-time institutions since they will soon become obsolete (Government of Mexico, 2011). A minimum of 900 hours, or 22.5 hours every 40 weeks, are allotted for part-time schools during a school year.

In the state of Nuevo Leon, where the fieldwork was conducted, the morning schedule for state-level schools begins at 7.30 and finishes at 12.30; there are modest modifications to this schedule in the summer and winter. The afternoon schedule runs from 13:00 to 18:00. A new curriculum proposal was implemented for the first time in the academic year 2017–2018 using the 2011 curriculum as a framework (Altschul, 2016). This emphasises how important it is to examine the prior curriculum in order to comprehend the unique programme that has been offered for elementary school education.

2.11.6 Argentina

According to Andelman (2005), only a small number of people in Argentina value ESD, including teachers who teach EE at various levels, EE activists who are involved with environmental issues and organisations, and researchers and academics in certain university circles. Furthermore, the Decade of Education for Sustainable Development is not mentioned in any agendas, suggestions for policymaking or proposals for decision-making, nor does it exist in any public or commercial sector or area. It also carries minimal weight in official and non-governmental circles. According to Andelman (2005), Argentina can benefit from the Decade’s possibilities by fostering

public understanding of ESD's strategic importance in achieving the successful implementation of sustainable social, environmental and economic policies and by defining what sustainable development means for Argentina. A comprehensive national policy is also required to ensure a society that is just and equal (Andelman, 2005). A just and equitable society would adopt a different concept of development, take into account the needs and aspirations of all individuals, comprehend pluralism and the delicate balance between people and the environment, develop new strategies for addressing the root causes of poverty, hunger, illiteracy, pollution, exploitation and dominance and approach critical issues holistically.

2.12 IMPORTANCE OF SOLID WASTE MANAGEMENT IN SCHOOLS

Environmental and human health protection, as well as resource conservation, are the goals of sustainable waste management (Kirama & Mayo, 2016). Other goals include avoiding trash-related problems in the future, such as using "clean" cycles and low-maintenance landfills (Brunner, 2013), as well as employing waste management methods that are acceptable to society (Wilson, 2007).

One of the most important prerequisites is the availability of low-cost trash management services. To achieve these objectives, decisions must be incorporated into plans that include a variety of interconnected activities including collection, transportation, treatment, recycling, and disposal (Al Sabbagh, 2012). As a result, decision-makers expect cost-effective waste management that considers environmental, economic, technological, regulatory and other societal considerations (Barton et al., 1996).

Because the number of available waste treatment and recycling options is always growing, and because economic boundaries are always shifting, decision-makers are constantly faced with the following questions: Is the current waste management system the most cost-effective method for meeting waste management goals? Is there a better approach (Rogge & De Jaeger, 2012) to integrate more sophisticated operations to provide the same service at a lower cost?

Even though waste management is a crucial area of government service, a number of published assessment methodologies for waste management systems are fairly complex and sophisticated (Coelho, 2012). An integrated strategy is needed to

achieve the challenging objective of ensuring sustainability as a balanced society, economy and environment.

As a result, all the processes involved must be examined when evaluating the multiple effects of waste management systems (Diaz & Warith, 2006). Within such a decision framework, an evaluation approach like the one presented in this study should be viewed as a cornerstone. The technique should be goal-oriented and objective, transparent and intelligible, and should offer an overview of the benefits and drawbacks of various alternatives.

Solid waste management has become one of South Africa's most critical issues. Budgetary constraints, system complexity and multidimensionality, as well as ineffective organisation, are the key difficulties that local municipal authorities encounter in solid waste management (Dlamini et al., 2019).

Local municipalities are the primary organisations in charge of processing solid garbage in an efficient and effective manner (South Africa, 2008). In order to achieve recycling targets, local governments often promote a decrease in domestic solid waste production and encourage citizens to take responsibility for their trash rather than relying on municipal waste services (Dlamini, 2017).

Despite South Africa's environmental laws and regulations, particularly in relation to MSW management, garbage reduction through recycling and community engagement has received little attention (Dlamini et al., 2019). In South Africa, efficient management of MSW, as well as garbage minimisation, has proven to be a difficult task. This is contingent on environmental laws and regulations being enforced, institutional capacity being appropriate, local governments cooperating and collaborating, and greater community involvement among its members, as well as public awareness (Department of Environmental Affairs, 2012).

Community and schools participation in solid waste management has become an important component of solid waste management through recycling in South African cities. Informal garbage pickers, for example, are increasingly important in recycling and solid waste management in Johannesburg (Serge Kubanza & Simatele, 2019). Such participation of schools and community benefits both the environment and the economy by fostering environmental sustainability and job creation (Gutberlet, 2010).

Politicians have not done much to include unofficial SWM systems in their plans and strategies, despite the fact that school and community participation in recycling promotes socioeconomic growth, environmental sustainability and SWM in South Africa (Dhokhikah et al., 2015). Due to this circumstance, local administrations in South African cities have disregarded the value of community and school involvement in SWM.

Solid waste recycling employs thousands of people in low-income metropolitan areas, despite efforts by South African authorities to incorporate informal garbage pickers into SWM systems (Dias et al., 2012). In 2016, the Department of Environmental Affairs projected that between 18 000 and 100 000 garbage pickers worked in South African cities (Simatele 2019).

This demonstrates that, in comparison to the amount of solid waste created, schools and community members are capable. Decision-makers in South Africa must recognise community participation as a way to improve SWM efficiency and achieve long-term waste reduction (Scheinberg, 2012).

2.13 SORTING AND DISPOSAL ANALYSIS THROUGH WASTE AUDIT IN SCHOOLS

In the modern world, solid waste is a significant environmental concern (Roberts et al., 2009). Every year, 164 million metric tonnes of MSW are dumped in landfills or disposed of using other non-reuse methods, such as incineration, in the United States (UNEP, 2018). Each year, recycling and composting divert an additional 87 million tonnes (UNEP, 2018). This suggests that each person generates about 2 kilogramme of solid trash every day.

Like other big institutions, schools generate a lot of solid trash that needs to be handled and disposed of. The cafeterias where students regularly eat lunch (and frequently breakfast as well) are one of the main sources of waste in schools. Wilkie et al. (2016) estimated the average cafeteria waste to be between 50g and 137 grammes per student per day (2016). Unused food as well as packaging and serving utensils are included in this trash. The majority of the remaining garbage is composed of papers, cardboard, plastic, metal, and other recyclable materials, and food waste is compostable (Wilkie et al., 2016). Implementing a system to collect those products

and decrease landfilled garbage benefits the environment by reducing waste, but it also aid in teaching students environmentally responsible practices and can lower the cost of trash hauling.

By way of example, Ravenelle (2018) describes a project at Longfellow Elementary School in the US where a small group of educators at worked on implementation-challenging strategies in a waste reduction programme. Almost all students at the time consumed lunch in the classroom, resulting in a significant distribution of garbage. Additionally, food was served on polystyrene trays, which were not accepted for recycling. After the creation of a waste reduction group, a group of parents, educators, students and other stakeholders from across the Portland Public Schools system, was able to put into action a waste reduction plan on a district level, things moved more swiftly. All schools received bins, compost pickups and volunteer assistance during the early stage. There was also a switch to compostable paper trays and eventually washable plastic ones.

2.14 STRATEGIES EMPLOYED IN SOLID WASTE MANAGEMENT

2.14.1 International

MSW management is a serious issue everywhere in the world because of the enormous amounts of trash that human living produces. The daily production of waste has been influenced by human development, economic growth, and population growth (Minghua et al., 2009). In 2022, solid waste generation amounted globally to about 2 billion tons a year (Matheson, 2022). The enormous amount of waste produced is a growing issue as a result of the ecological impact connected with improper waste management, which causes rubbish to deteriorate and harmful contaminants to develop (Karak, 2012).

Despite the difficulties both developed and developing nations face when it comes to managing MSW, first-world nations are setting the bar by implementing sustainable solid waste management policies and regulations (for example, waste-to-energy generation). In first-world countries, monitoring mechanisms have been set up to support MSW goals and encourage them (Nzeadibe, 2009). As a result, depending on the physical properties of the trash generated, enormous amounts of waste are managed in various ways.

The primary cause of this is the variety of physical traits present in the trash produced. For instance, the composition of garbage in developed nations is more likely to include recyclable elements (Chandrappa & Das, 2012). This is because people in wealthy nations favour purchasing goods that are already produced and packaged, whereas those in developing nations depend mostly on subsistence farming with little post-harvest food processing.

Developing nations are more likely to import new and used goods and more raw resources, which results in a higher percentage of organic waste (Metin et al., 2003). Various solid waste management methods are used in numerous countries across the world. The most effective methods for disposing of waste include recycling, composting, waste-to-energy technologies and sanitary landfilling, to name just a few (Guerrero, 2013).

On the other hand, cities without effective solid waste management practices have indiscriminate rubbish dumping; negative attitudes toward safe and secure disposal are escalating the issue (Johari, 2012). There are many reasons why there are so many people who have bad opinions of solid waste management. These include a lack of recycling and garbage disposal facilities, access to facilities for gathering, sorting and separating trash, as well as a lack of regulations, incentives and enforcement methods from the government. Residents of the majority of industrialised nations, including Canada, Ireland, the United States of America, Japan and Australia, often distrust local government officials (O'Connell, 2011). As a result, even countries with better waste management infrastructure and policies struggle with issues including the recycling of non-recyclable objects and a lack of solid waste sorting and recycling (Singh, 2014).

2.14.2 South Africa

Despite the City of Durban's success in managing MSW in Kwa-Zulu Natal, problems including how to manage an increase in the number of informal garbage pickers remain unaddressed. One of the causes of this issue is a lack of understanding of how to coordinate and incorporate formality and informality into urban development and planning plans. For instance, Chamuka and Ogola (2015) believe that the development of a sustainable MSW management strategy is frequently hampered by

a shortage of skilled labour and administrative indifference, corruption, and misuse of municipal resources. Due to population expansion and rural-urban migration, MSW management in Durban has become more challenging (Glasser et al., 2008; Simelane & Mji, 2015).

Some of the issues are evident when contrasting the current metropolitan MSW management system with that of other Sub-Saharan African countries. For SWM in South Africa, it is not enough to just have strong rules and devote effort to researching appropriate technologies and practices. Additionally, it is important to consider other factors, such as how to effectively include waste pickers into the MSW management system. Communities' participation must be taken into account for these strategies to be successfully implemented (Dias et al., 2012).

An introduction to the issue and background information on informal waste recycling in Sub-Saharan African cities will help put the informal waste recycling system in South Africa into perspective. In this context, it is important to highlight South Africa's extensive and active domestic waste management system, which is primarily supported by the illegal dumping industry (Samson, 2008; Simelane & Mji, 2015). Numerous South African cities have thousands of rubbish pickers that rely on recycling informal waste for a living. These individuals are categorised as poor and disadvantaged urban dwellers (Dias et al., 2012; Gutberlet, 2010; Medina, 2007). For instance, it is estimated that there are between 18 000 and 100 000 waste pickers in South Africa (DEA, 2016).

The most effective municipal garbage management systems are therefore built on informal networks, regardless of where they exist around the world or inside cities, according to statistics from top municipalities in Brazil, Colombia and Egypt. They need to be accepted as an effective waste reduction and management technique (Scheinberg et al., 2010).

Experts feel that informal garbage recycling might be successfully encouraged in African towns in light of the aforementioned (Adams, 2012). They go on to say that recycling in the informal sector has far-reaching consequences for African urban lives and environmental sustainability. Reduced waste sent for disposal, cleaner cities and

environmental protections are some of the benefits stated by academics because of informal waste recycling, which drives entrepreneurship, employment and revenue.

Climate change, the green economy and natural resource conservation are among issues that informal waste recycling helps to combat. Recently, a number of international organisations have made compelling arguments in favour of garbage pickers and their integration into MSW management systems. Based on the foregoing finding, SWM has become a major challenge in Sub-Saharan African cities ,Failure of institutions, civil wars (Simatele & Etambakonga, 2015), and socioeconomic inequalities are also contributing factors (Serge Kubanza & Simatele, 2015) of SWM. Given the foregoing, it appears that most research on MSW management in the urban context has rarely examined and evaluated the value of including waste pickers in MSW management.

It has been noted that the MSW system is undervalued in urban policy planning and development plans in Sub-Saharan African nations in general and South Africa in particular. As a foundation for enhancing green employment generation and environmental sustainability, waste pickers should be included in urban development and planning strategies. While research in South Africa has concentrated on the legal framework for waste management (Sentime, 2014), the solid waste collection system (Korfmacher, 1997), and MSW management (Ogola et al., 2011), no one seems to be aware of how to include the various informal structures so that we can have an efficient SWM system.

2.15 MUNICIPAL SOLID WASTE MANAGEMENT

2.15.1 Solid Waste Generation and Composition

The undesired non-liquid and non-gaseous byproducts of human activity are referred to as solid waste. Solid waste is referred to as waste for the purposes of this study. The proper processing of undesirable garbage in a way that would not directly impact human health or the environment is known as solid waste management (SWM). Accurate data on waste generation and composition are essential for planning and selecting the best waste management system, and their availability is a prerequisite for effective MSW management. The functional components of waste management are waste generation, composition, collection, transportation, treatment and disposal.

The production of solid trash is correlated with accelerated rates of urbanisation, economic development and societal behaviour. The environment and public health are threatened by the rise in waste generation in the absence of effective waste management (Levis, 2013).

In general, the amount of solid trash produced increases with economic growth and urbanisation rates (Levis, 2013). About 2 billion tonnes of MSW are produced annually on a global scale (Matheson, 2022). By 2025, it is anticipated that it will reach 2.2 billion tonnes annually (Hoornweg & Bhada-Tata 2012). According to Griffin et al. (1999), developed nations produce 85 million tonnes of garbage annually, the majority of which is made up of paper. Organic waste makes up the majority of the 158 million tonnes of waste that developing nations produce annually. Furthermore, it is predicted that by 2025, the rate of trash generation in emerging countries will climb to 480 million tonnes annually, whereas it will only slightly increase in wealthy countries to 86 million tonnes annually. Variations in trash creation and composition are caused by different waste generating causes (urbanisation, economic development, among others) in different regions and even within the same region's cities.

According to a 2009 study by Agyare et al. (2009), the city of London, Ontario, Canada produces more garbage per person (1.2 kg) than the city of Cape Town, South Africa (0.6 kg). However, due to Cape Town's huge population (almost 2 million), the aggregate amount of garbage produced is more than in London, Ontario (approximately 352 tonnes), with households being the city's top waste producers. While organic garbage makes up the majority of the waste in Cape Town, paper waste predominates in the waste composition in London, Ontario. The different living standards and lifestyles of the populations in the two cities are to blame for the differences in waste composition. In Muscat, Sultanate of Oman, Palanivel and Sulaiman (2014) found that the rate of trash creation was 0.70 kilogramme per day per person in 2004 but is now 0.97 kg per day per person with an average density of 312 kg/m^3.

The authors' indicated new rate falls within developing nations' generational rates. The generation of garbage has increased significantly with economic growth and rapid population growth (0.97 kg/day/person). The growth in end-product consumers and other human activities is to blame for the greater trash generation. In Oman, organic

waste – particularly mixed food waste – makes up the majority of MSW. Other waste components found in Oman include glass, paper, and plastic, in that order of predominance. These results are in line with past research and the Gulf Cooperation Council, which claimed that food waste constituted a significant amount of solid waste in developing nations (Palanivel & Sulaiman (2014).

A related Malaysian study examines patterns and the country's present trash management system (Agamuthu, 2007). According to this study, garbage creation increased daily from 13 000 tonnes in 1996 to 19 100 tonnes in 2006, with metropolitan people producing the most waste. Changes in consumption patterns and improved affordability of consumer items are blamed for the increase. In Malaysia, according to a study by Agamuthu (2007), organic garbage predominates in the waste composition, followed by paper and plastic waste. These results are in line with those from Bangalore, India (Ramachandra & Bachamanda 2007).

The main sources of the generation are households and commercial establishments, and the rising rate is attributed to consumption, cultural and educational trends. Developed nations have higher proportions of paper and plastic garbage than underdeveloped nations, where organic waste predominates.

The production of waste has been on the rise in RSA. According to the Department of Environmental Affairs (2018), the nation generated 121 million tons of waste in 2017. These projections are greater than those reported in 2011 (DEA, 2011), which predicted a total waste output of 108 million tons. According to Fakoya (2018), the development may be the result of increased waste generation brought on by increasing populations and better economic conditions, which has led to unaccounted-for waste that is classified neither as dangerous nor general. Despite the fact that the majority of landfill sites do not follow the set criteria, more than 60% of general garbage and almost 95% of hazardous waste go to landfills (DEA, 2018). Mannie and Bowers (2014) estimate that 87% of towns lack the infrastructure and capacity to efficiently manage waste and pursue reduction initiatives, and that 95% of waste generated is landfilled. Furthermore, SWM is underfunded and poorly planned, putting the nation 2 to 3 decades behind wealthy nations like Europe (Godfrey & Oelofse, 2017). Poor collection services, unauthorised SWM operations, unlawful dumping, inadequate waste data management, and a lack of enforcement of current waste legislation are

among the major problems (Abdel-Shafy & Mansour, 2018). Under the National Trash Management Strategy (NMWS), the national and municipal governments are promoting a trend toward waste minimization, reuse, and recycling in recognition of these difficulties (Dlamini et al., 2019). The emphasis will change from waste disposal in landfills to the perception of waste as a resource as these issues become more widely known.

Overall, the majority of research show that trash generation rates are rising, particularly in emerging nations. The majority of households generate organic garbage, which is the main type of waste (Miezah et al., 2015). Most of the organic waste produced by families is food waste, which is primarily caused by impulsive purchases and unplanned meals and purchases.

2.15.2 Collection and Transportation of Waste in Schools

Managing waste from the point of generation to the point of treatment or disposal is referred to as “collection and transportation of waste” (Cryprowski et al., 2019). Home to house, community bins, kerbside pickup and contractual service are a few examples of collection methods. Depending on where you are, many methods of service are available. According to local restrictions, the collected waste may be combined or segregated. Waste separation is essentially non-existent in poor nations, in contrast to wealthy nations. However, waste pickers remove recyclables in order to make a living. Their actions frequently spread gathered trash, making waste collection and disposal even more difficult (Oteng-Ababio et al. 2013).

However, waste pickers could be successfully included into a waste recycling system to support waste management if their activities are well organised. Developed nations have extremely effective collection services despite their relatively low budgets for SWM. On the other hand, developing nations spend the majority of their SWM budget on collection services, yet as a result of ineffective transportation and collection services, they have lower collection rates (Hoornweg & Bhada-Tata, 2012).

The most typical garbage collection practices in Bangalore City, East Africa, are community bin collection and door-to-door collection, according to Ramachandra and Bachamanda (2007). The authors added that as there is no transfer station, waste is collected using pushcarts and then transferred to tipper trucks at a meeting place for

disposal. In Bangalore City, East Africa, households place rubbish in communal bins, which are then picked up by an urban government or private operators and transported by trucks to disposal locations. Typically, private businesses collect waste at the source (door-to-door).

While commercial locations like malls hire private operators to pick up the rubbish, the latter negotiate the cost of waste collection with individuals. Urban councils are also used by communities to collect trash. Due to impassable roads, haphazard settlements and indifference on the part of urban administrations, the urban poor receive very little to no waste collection services. In metropolitan areas of East Africa, waste collection is depending on the locality's per capita income (Okot-Okumu, 2012).

Stats SA has been carrying out the essential tests leading up to the main census since 2018, which is typical of procedures before a population count, and has also just finished the Pilot Census. This was done to make sure the multi-modal approach to data collecting could be used effectively and that the essential strategies could be put in place.

Computer-Assisted Personal Interviews (CAPI) served as the primary method of data collection for the Census 2021 Mini-test; Computer-Assisted Web Interviews (CAWI) were only available to respondents who registered with fieldworkers to use them for completing the questionnaire. Data collection methods used for the Census 2021 Trial included CATI (Computer-Assisted Telephone Interviews) and CAWI (Computer-Assisted Web Interviews). In July 2021, the Pilot Census was carried out in a few key regions across the nation, and all available data gathering methods were used to get ready for the Census 2022.

The 2021 Housing and Population Census conducted by the South African Statistical Service (GTS) found that approximately 60% of households in South Africa currently employ house-to-house services or variations such kerbside pickup. On a national scale, 7.9% of households burn their household waste, compared to 4.8% who have their waste picked up straight from their residence. Furthermore, 57.6% store domestic waste in a variety of containers and transfer it to certain public dumps, such as sanitary sites or communal-container stations.

2.15.3 Disposal and Treatment of Waste in Schools

In developed nations, the two most typical methods of disposing of MSW are landfilling and thermal treatment of trash (Kremar et al., 2018). Only a few places in developing countries, like Bangalore, India, use composting as a method of waste treatment. Most developing countries use open dumping and have poorly maintained landfills. Most often found in environmentally delicate places, dumps pose a risk to waste pickers.

Waste disposal trucks are often open vehicles. They are left exposed, causing trash to stream onto streets while being transported and creating unsanitary circumstances (Babayemi & Dauda, 2009; Hoornweg & Bhada-Tata 2012, Okot-Okumu 2012, Ramachandra & Bachamanda 2007, Sharholy et al. 2008). Recycling rubbish is done informally in underdeveloped nations; hence, it is not viewed as a way to help with waste management in those countries (Agyare et al., 2009).

Almost 60% of families in South African communities rely on a communal or public landfill (Hine, 2019). Additionally, they use public restrooms as secondary storage. In many cases, the common containers or skips, utilised at the communal sanitary sites are not regularly emptied. According to the Government of south Africa (2010), 25.9% of households dispose of their trash in unidentified places such vacant lots, drains and the embankment of waterways like rivers, lakes and wetlands. Almost every community in South Africa engages in the practice of crude, open dumping. When regulated dumping does occur, both short-term and long-term environmental effects are disregarded. There are just three cities in South Africa with artificial landfills: Cape Town, Pretoria, and Bloemfontein (Han et al., 2014). The capital city of Bloemfontein lacks an established disposal site; therefore waste is dumped in abandoned quarries in neighbouring areas (Ministry of Local Government and Rural Development (MLGRD), 2010).

According to Hahladakis (2019), issues with garbage collection, transportation, disposal and treatment are among the difficulties associated with waste management in developing nations, as is the inability to control waste generation. Developed nations, on the other hand, have made progress in all areas of waste management, including budgeting for effective disposal. They are now more concerned with

recovering resources from waste than they were with the effects of waste management on human health and the environment.

2.15.4 16 Ways to Recycle and Cut Waste at Schools

Schools establish recycling programmes to promote recycling and waste reduction at their facilities. Teachers and students in schools use the following strategies (Goorah et al., 2020):

1. Send school notes electronically rather than printing them.
2. Wherever possible, reuse office and classroom supplies rather than purchasing new ones.
3. To see which classrooms or grades can collect the most recyclable materials in a week, hold recycling competitions.
4. For class assignments, use the front and back of copy paper, then recycle it.
5. Encourage students to use recycled materials, such as paper, beads, and water bottles, in their artwork.
6. Maintain a trash bin for used paper in every classroom.
7. Place a bin for recycling printer ink cartridges in each classroom. These can be gathered and exchanged for cash at various establishments, which can be used to pay for extracurricular activities.
8. Created a recycling club to promote recycling at the school.
9. Instead of printing assignments and documents, post them online.
10. Use discarded magazines to create art.
11. Reduce the amount of handouts you utilise in class, and discard those that are not needed.
12. Promote bulk food purchases at the cafeteria to cut down on paper and plastic waste.

13. Give any eatable items to local shelters.

14. Encourage students to bring reusable containers for their lunch from home.

15. Use air dryers instead of paper towels in the bathrooms.

16. Get students to bring their trash from home and put it in the recycling bins.

2.16 GAPS TO BE FILLED BY THIS STUDY

According to a survey of the literature, there have been no earlier studies on SWM in schools (Chazin & Skaar, 2012). Environmental consequences have not been researched as thoroughly, although there is a substantial body of study on other social school impacts, such as their implications for solid waste disposal.

This type of research will help the school better understand how to manage the solid waste that is created on school. The lack of past study on SWM at the school level reflects the need or potential for more research to be done.

Sethusha (2006) looked at how primary school learners conceptualise EE. Malaudzi (2019) conducted a study in Vhembe District Municipality, South Africa, on Municipality SWM. Neither of these studies looked at SWM in KZN schools although Msezane (2014) investigated the impact of EE innovation on learners in maintaining land resources in the Mkhondo village in the Gert Sibande District Municipality, of Mpumalanga.

None of these studies explored perception of teachers and learners towards SWM; hence my study intends to close this gap in research where this study investigated the perception of teachers and learners towards management of solid waste in township schools.

2.17 THEORETICAL FRAMEWORK

A theoretical framework is required to aid the study in producing accurate and desirable results by serving as a lens through which the investigation is viewed (Lens, 2014). As a result, the WMT was determined to be the best fit for this research (Keiski et al., 2004). The Theory of Waste Management provides information about the

subject, including conceptual waste assessments, waste activities and a holistic view of waste management goals.

The idea behind WMT is that it will prevent waste from hurting human health and the environment (Lagbas-Arams, 2015). It is founded on the concept that the way we characterise a goal dictates how we should behave to attain it, implying that the definition of sustainable waste management is crucial.

According to this idea, defining waste correctly is critical to developing a long-term waste management strategy. The majority of present law is focused on dealing with existing waste, rather than waste prevention. However, the definitions that emerge from this situation may clash with waste avoidance aims, because something that already exists cannot be stopped from developing. When something is labelled “waste,” it is treated as such; as a result, despite its stated goal of preventing waste, it essentially accumulates garbage.

Thus, new, dynamic waste management definitions must be developed, which can explain why waste is produced and provide innovative solutions to the problem. To describe important ideas in waste management, a radical new technique based on object-oriented modelling language is presented (Popov 2004). To design the most effective SWM system, the correct theoretical foundation must be established. The SWM Theory (Popov, 2004) includes the following ideas:

- The purpose of SWM is to keep garbage out of people’s homes and out of the environment.
- Resource conservation is the primary goal of SWM.
- In order to avoid manufacturing solid waste, useful goods should be manufactured.
- SWM’s goal is to turn waste into non-waste.

SWM’s practical values are thus: (Popov, 2004)

- Providing conceptual answers by discussing waste and concepts.
- Providing a basis for selecting and integrating waste management alternatives, as well as how and when to do so.

- Foreseeing the results of SWM measures.
- Assisting legislators in prescribing waste-related activities.

This theory will be used to provide an account of an in-depth examination of waste, waste activities, and a holistic perspective from teachers and learners of SWM's functions and aims in a school environment .

2.18 CONCLUSION

The evolution of EE into education for sustainable development is mapped out in this chapter. Additionally, it draws attention to the ongoing environmental issues wreaking havoc in local communities and the difficulties faced by SWM in educational institutions all over the world. This chapter also covers the conferences and workshops that were held to support educators and students as well as SWM. These declarations and workshops have influenced how EE is taught in schools today and how EE/ESD is integrated into the curricula. As every individual's life is significantly influenced by their environment, this chapter also emphasises the goals and strengths of EE/ESD in schools and community settings and how this can have a positive impact on the economy as a whole.

The chapter also described waste reduction and recycling strategies for schools. waste management and treatment in schools. Various SWM techniques are used for solid waste creation and composition. waste auditing in schools is used to analyse sorting and disposal. the significance of managing solid waste in schools.

It also points out where previous research on a similar topic has gaps and how this study will remedy those holes. The goal of the study is to offer strategies for the effective integration of EE/ESD in classrooms, and the theoretical framework of this study makes an effort to support that goal. It emphasises how EE is taught in classrooms and how teachers and students view their surroundings.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology is a framework for evaluating the methods used in a particular study (Igwenagu, 2016). Different approaches of gathering, organising, and analysing information are referred to as methodologies (Polit & Hungler, 2004). Techniques for learning something new are also referred to as methodology (Mouton, 1996). This chapter provides a research paradigm, a research approach, a research design, a description of the population and sampling method, a data collection method and procedure, a description of the data analysis method and interpretation strategy, the validity of the study, ethical considerations and a chapter summary.

The study primarily explores the perception of teachers and learners toward SWM in the schools. The overriding purpose of this research is to explore how teachers meet the EE curriculum needs of the learners in providing effective teaching and learning of SWM for learners.

3.2 RESEARCH PARADIGM

A research paradigm is a lens through which research is seen and done (Kivunja & Kuyini, 2017). According to Wikipedia, a research paradigm is “a collection of shared beliefs and agreements among scientists about how issues should be understood and addressed” Kuhn (1962) and Guba (1990) claim that research paradigms are defined by their ontology, epistemology and methodology. The ontological and epistemological positions have an impact on the technique and procedures used in a research effort. Interpretivism, positivism, critical theory, pragmatism, and subjectivism are examples of possible paradigms under which research can be performed (Creswell & Poth, 2018). A research paradigm is a set of beliefs about how to gather, analyse and apply evidence to the interpretation of a phenomenon. The research paradigms are positivism, pragmatism, realism and interpretivism. The positivist paradigm is connected with big samples and works in the tradition of natural scientists (Saunders et al., 2015). Test and experiments are used by positivists to verify or refute theories (Greener & Martelli, 2015). Mixed or multiple method designs are connected with the

pragmatism paradigm. The realism paradigm is concerned with approaches that are appropriate for the subject matter (Saunders et al., 2015).

In this study of the perceptions of teachers and learners toward SWM in three government secondary schools, I envisaged that as the researcher and the participants we would collaborate to interpret reality in a social context. In this research, I thus adopted an interpretivist paradigm as a lens for this study.

The interpretivist paradigm was created in response to a critique of positivism in the social sciences (Mohammed, 2016). The main purpose of interpretivist research is to record and comprehend various perspectives on a phenomenon that has been "experienced, felt, and endured" (Pesut et al., 2011, p. 24). As a result, the interpretivist research aims to collect and understand participants' "social constructions" of reality in order to gain a comprehensive understanding of reality (their perspectives on the world). Participants' voices, actions, attitudes, and behaviour express these social constructs (Creswell, 2014; Geertz, 1973; Klein & Myers, 1999).

Additionally, the interpretivist paradigm "enables researchers to analyse the environment through participants' viewpoints and experiences" (Thanh, 2019, p. 24). According to the interpretivism paradigm, the researcher interprets the participant-provided data using their experiences. Understanding and interpreting human behaviour is the interpretivist's objective (Bahari et al., 2018; Muhammed et al., 2020). Additionally, the interpretivist paradigm "enables researchers to analyse the environment through participants' viewpoints and experiences" (Thanh, 2019, p. 24). According to the interpretivism paradigm, the researcher interprets the participant-provided data using their experiences. Understanding and interpreting human behaviour is the interpretivist's objective (Bahari et al., 2018; Muhammed et al., 2020). The interpretivist paradigm is used in this study since the researcher wanted to discover the viewpoints of teachers and students on SWM as well as how the subject could be integrated into lessons. The responses of the participants, which were gathered through focus group interviews, face-to-face interviews, observation, and photovoice, are used to interpret the knowledge gained in this study.

3.3 RESEARCH APPROACH

This study will follow the qualitative approach to collect data through focus group, observation, photo voice and face-to-face interviews. In qualitative research, a study is based on interpretative concepts, which are frequently generated and logic is derived from ongoing practice (Scortland, 2015). The collection of data on a “naturally occurring phenomena” using a qualitative technique, according to McMillan and Schumacher (2010, p. :23), entails using words rather than numbers to represent the data. According to Magi (2010, cited in Mathenjwa, 2014, p. 35), a qualitative approach is a methodology that incorporates knowledge of the principles that underlie and guide human behaviour.

3.4 RESEARCH DESIGN

The structure that informs data collecting and analysis decisions is known as research design (Anderson, 2013). For this study, I will use a case study as research design. According to Creswell (2014, p. 14) “...case studies are methods of inquiry used in many areas, notably assessment, where the researcher conducts an in-depth investigation of the case; often, a programme, event, activity, procedure and one or more participants”. The cases for this research are three government secondary schools. By focusing on schools in a single district rather than being generic, the case study was an acceptable technique for establishing knowledge of the phenomenon under study, that is, SWM.

Therefore, I chose three secondary schools as cases in the study of Umlazi district. As the researcher interacts with numerous people, this technique aims to analyse the phenomenon of interest by gathering different perspectives (Maree, 2008). This method aids the researcher in gaining a better knowledge of the dynamics of SWM in government secondary schools.

Explanatory case studies concentrate on explaining a phenomenon or a question, while exploratory case studies “explore the assessment of an intervention that has unclear or multiple outcomes” (Mohammed, 2016, p. 76) and descriptive case studies “are used when a researcher wants to describe a phenomenon or intervention within the real-life context” (Mohammed, 2016, p. 76). This study uses a descriptive case

study to explain how teachers and students feel about including SWM in the curriculum.

3.5 POPULATION AND SAMPLING

The population for a study is defined as that group of people about whom conclusions are to be drawn (Babbie, 2015); in this instance, the secondary schools population from Umlazi District. Three secondary schools in Umlazi district were selected to participate in this study. The schools that were selected were Quintile 1 secondary schools in the Umlazi district and they exposed learners to a variety of science subjects including technical subjects. These learners were from various regions around Chesterville between the ages of 15 and 17. The first school had a population of 50 teaching staff members and a learner population of about 1 000. The second school which was in Quintile 4, and learners chosen were between the ages of 15 and 17. The school had a population of 38 teaching staff and a learner population of about 800. The last school has the population of 45 teaching staff and learners population of about 950 learners. In the three schools, my research was conducted based on learners who were in the science stream from Grade 10 only.

Different research methodologies use various sampling techniques. Mohammed (2016) claims that the research design influences the sampling strategy that is employed. The main difference between qualitative and quantitative sampling is that the former uses methods that are not based on probability, while the latter uses methods that are based on probability (Zwelibanzi & Ncwadi, 2019). The term “purposive sampling” is frequently used in qualitative research, according to Robinson (2019). In order to find and select cases with rich information related to the phenomenon of interest, purposeful sampling is frequently used (Palinkas et al., 2020). The term “probability sampling” pertains to a systematic approach of selecting a sample from a larger population for research purposes, ensuring that each individual within the population has a measurable probability of being included in the sample. On the other hand, non-probability sampling is done on purpose. Qualitative research sampling, for example, is defined by McMillan and Schumacher (2010) as “a selection of information-rich examples for an in-depth examination” (p. 325). As a result, a researcher does not choose information-rich volunteers at random, but they can be identified and selected using specified criteria.

The researcher used a purposive sampling technique in this study to choose the three secondary schools, one teacher from each, and 10 students from each school to represent the secondary schools in the province of KZN (learners and teachers). The purposive sampling technique stresses saturation to achieve full comprehension by carrying out research until no significant new findings are made (Etikan & Bala, 2018). Purposive sampling, according to my understanding, is a sort of sampling that allows the researcher to choose which people to use as participants.

3.6 DATA COLLECTION METHODS AND PROCEDURE

When conducting a qualitative research study, the following primary data gathering methods can be used: face-to-face interviews, observation, photovoice and focus group interviews. The data collecting strategies include a variety of methods for gathering information from the research sites. To acquire data from the sources, the study used questionnaires and interview guides for face-to-face and focus group interviews, an observation checklist for observation and photographs for photovoice.

3.6.1 Face-to-Face Interviews

Although there are many various kinds of interviews, the ones that are most frequently used are one-on-one discussions, in-person interviews, mailed or self-administered surveys, and verbal exchanges (Cronin et al., 2020). Given the exploratory nature of the research questions, I chose a qualitative interview approach since it is efficient for analysing teachers' and learners' perceptions, meaning definitions of conditions, and constructions of reality (Punch & Oancea, 2018).

Depending on the goal of the study, interviews may be semi-structured, unstructured, or both (Creswell, 2014). I used a semi-structured interviewing method for the analysis of this study. Semi-structured interviews provide a more flexible approach to the interview process and are a useful way to explore in-depth data that reveals participants' varied viewpoints and worldviews (Punch & Oancea, 2018).

Semi-structured face-to-face interviews were conducted with one Grade 10 teacher from each school on the assumption that these teachers had comprehensive knowledge and a grasp of the phenomenon being examined as well as experience with environmental-related issues. Face-to-face interviews allowed me to interpret

nonverbal cues by observing the interviewee's body language, facial expression, and eye contact (Ryan et al., 2020).

Face-to-face interviews have the following benefits:

- They allow for more thorough data collection and thorough understanding;
- They make it easier to recognise and understand body language and facial expressions;
- They allow the interviewer to elicit explanations for responses;
- They allow for the use of stimuli material and visual aids to support the interview;
- They allow for a much longer interview because the participant is more committed to taking part.

Face-to-face interviews have the following drawbacks:

- Interviews take more time to recruit for and conduct;
- Due to timing and travel costs, face-to-face interviews can be expensive;
- Interviews can produce biased results;
- It is best to carefully assess the respondent's abilities before spending time on the recruitment process and the interview process.

In the government secondary schools, the questionnaire/interview guide was used to collect data from three secondary school learners and teachers. Bryman's (2019) guidance on the use of the interview approach for data gathering served as my guide in doing this research. These consist of:

- creating interview guides based on the study's inquiries;
- the selection of potential interview themes or topics;
- steer clear of questions with many or double-barrelled answers;
- selecting potential respondents from a specific population;

- selecting a time limit for the interview (note-taking, audio recordings or both); and
- planning an acceptable time and location for the interviews and requesting the approval of the interview subjects (Bryman, 2019).

I also used different types of questions such as open-ended questions, behavioural questions and case questions in interviewing the teachers. The questionnaire/interview guide technique has been used in empirical studies in general education to explore implementation challenges as well as factors contributing to teachers' resistance to curriculum implementation (Wang et al., 2015).

Table 3.1: Profile of participants

Teachers Names [Pseudonyms]	**Name of School**	**Age in years**	**Experience**	**Subject taught**	**School quintile**
Sukuma Sakhe Teacher	Sukuma Sakhe Secondary School	35 years	5 Years' experience	Life Science, Natural Science and Mathematics	Quintile 3
Government Teacher	Government Secondary School	46 Years	15 Years' experience	Life Science, Mathematics, Natural Science and Life Orientation	Quintile 4
Bofela Teacher	Bofela Secondary School	53 Years	17 years' experience	Life Science, Geography, Natural Science and Mathematics	Quintile 5

3.6.2 Focus Group Interview

The overall goal of focus groups, rather than providing generalisable statistics, is to get close to the members' understanding of and viewpoints on specific subjects (Millward, 2017). Focus groups can be used as the primary means of data collection, as a pilot to elicit critical topics, or as a qualitative supplement to a quantitative approach of data collection (Barbour, 2018). The information gathered from a focus group includes an understanding of group processes, the dynamics by which people engage, express and evolve their ideas and the content of those opinions. Thus, nonverbal behaviour such as fidgeting or facial expressions, as well as paralinguistic elements such as interruptions, overlapping speech and voice tone, is recorded as

evidence (Finn et al., 2016). Furthermore, the verbatim text of the debate is included in the corpus of materials that will be content analysed.

Because some characteristics of focus groups are advantageous to learners, such as the fact that a focus interview is an informal discussion that fosters a regular conversation among chosen individuals about specific information pertinent to the situation at hand, I used a focus group interview approach with the Grade 10 learners. This created a relaxed environment in which the learners felt at ease with one another and able to fully participate in the interview. Focus group interviews was conducted with 18 learners, 6 learners from each school. Focus group interviews can also yield a lot of information in a short amount of time. This made it easier to gather more information while monitoring how long students could focus before losing interest in the activity (Vaughn et al., 2012).

Because of agreements that were made with the school's management team, the focus group interviews lasted nearly an hour and were conducted after school hours. Seeing learners reply quickly and freely to questions during the interviews was rewarding for me as the researcher. Some learners even went above and beyond what I asked for. In terms of the research goals, the focus group interviews with learners were beneficial in providing answers to the research questions.

The following are some of the advantages and disadvantages that I also experienced during data collection. According to Barbour (2018) these advantages and disadvantages are:

3.6.2.1 Advantages of focus group

- Beneficial for those who may be vulnerable or difficult to reach;
- Encourage people who are hesitant to talk one-on-one to participate;
- Provide continuous feedback on selected interventions;
- Enables process observation; and
- Location, timing and sample are all flexible options.

3.6.2.2 Disadvantage of focus group

- Can be disorganised and difficult to manage;
- Enables people to “hide” by being unengaged;
- Unsuitable for assessing attitudes;
- It is possible for a dominant participant to take control of the conversation; and
- Unsuitable for accessing individual tales because it is difficult to break free from the group’s flow

3.6.3 Photovoice

According to Wang and Burris (1997), who developed photovoice in 1997, it is a participatory method that enables individuals to recognise, express, and improve their local area through the use of a particular photographic technique. In order to identify practical solutions, it poses insightful questions to the community while using photos as a tool. Groups of students were brought together to explore how the perspective of SWM in schools and how the changing environment affected their mental health and psychosocial well-being using photovoice as a process. To evaluate subjective assessments of the impact on the built and natural environments, as well as their impact on mental health and well-being, I analysed pictures of three schools, one in Quartile 3, one in Quartile 4 and one in Quartile 5.

According to Lewison (2019) the following are advantages of photovoice as data collection method.

3.6.3.1 Advantages of photovoice

- It acknowledges the need for more creative methods;
- It makes creative use of the photographic talents of service users;
- Participating in a creative research project gives participants a sense of empowerment and enrichment;

- Participants are given the tools to take images in order to allay anxieties like “I can’t draw” and “I am not creative”;
- Participants gain new abilities that help them share their tales with others and the general public;
- By capturing the participants’ actual experiences, photographs help us comprehend the participants’ surroundings better;
- Visual imagery may be a tremendous tool for communication, dispelling myths and giving room for more in-depth and emotionally stirring thinking; and
- Visual representations are an effective tool for facilitating social interactions.

3.6.4 Observation

Observation, according to Brink (2016), is a technique for gathering descriptive data on behaviour, events and circumstances. “Understanding the natural environment as lived by participants, without altering or manipulating it” is the focus of observation (Gay, 2018, p. 384). According to McKernan (2014), the importance of this method is that it allows researchers to check for nonverbal expressions of feelings, observe how participants communicate with one another, and determine how much time is spent on particular tasks. Non-participant observation, as defined by Liu and Maitlis (2020), is the practice of observing participants without taking part in the activity. This approach involves immersing oneself in the relevant social structure or society in order to comprehend a phenomenon without becoming entangled in the observed behaviours.

This study aims to investigate how teachers and learners perceived SWM. My understanding of the functions and activities that schools perform in supporting SWM was aided by my observations. In order to monitor interactions, events and activities, the researcher entered the social system (Griffiths & Kuss, 2017:65). My role in this study was that of an observer researcher, with the objective of observing the procedure without interfering with the school’s operations.

This study involved observing both teachers and learners. Field and classroom observations were made. The identification of SWM initiatives, such as recycling programmes and other EE projects at the school, benefited from field observation.

Using the application also made it easier for me to observe how people behave around natural areas like the school garden, boreholes and tap water. From Monday through Friday, observations took place during physical science classes, at 11:00 a.m. during break, and at 14:45 p.m. after school.

Non-participant observation is frequently used in combination with other methods of data collection and can offer a more “nuanced and dynamic” view of events that are challenging to accurately record with other methods (Liu et al., 2020, p. 101510).

Limitations of non-participants observation according to Wang (2016) are:

- The observer effect: A researcher’s presence may have an impact on the participants’ behaviour. Over a longer time of observation, this might lessen, but it is still a potential problem.

- The observer’s objectivity: The researcher might take measures to guarantee methodical and exacting approaches to data collecting, field notes and sampling in order to promote transparency.

- Selectivity: No observation can ever fully encompass everything. By keeping an eye on as many various situations and for as long a time as feasible, this can be handled.

- Ethical issues: Should the researcher’s perspective be given more weight than the participants’? This can be solved by incorporating both participant and researcher accounts.

3.7 DATA ANALYSIS AND INTERPRETATION

Data analysis entails gathering, organising, condensing, decreasing, and presenting research data (Creswell & Poth, 2018). Given its adaptability and accessibility, thematic analysis was used as the method of analysis (Clarke & Braun, 2022). It can be used to support a wide range of theoretical and epistemological viewpoints, including interpretivism, the paradigm that guides the current study. The primary characteristics of a dataset can be summed up using thematic analysis, which also provides a detailed description of the data (Clarke & Braun, 2019). It makes it possible to compare the dataset’s similarities and differences (Braun & Clarke, 2019; Miles et

al., 2015). It may produce unexpected discoveries that the researcher may not immediately notice (Braun & Clarke, 2019; Miles et al., 2015). Inductive and deductive reasoning are both used in thematic analysis to analyse data. Inductive reasoning, also referred to as “bottom up” thinking, derives categories of meaning and relationships between categories from the facts. The research issue and more general theoretical presuppositions motivate analysis in deductive “top down” reasoning.

Typically, an inductive approach is used in qualitative research (McMillan & Schumacher, 2014). The methodology for data analysis used in my study was outlined by Nieuwenhuis (2016) and Creswell (2014), specifically:

- Tools and artefacts, community, rules, and labour division were the predetermined categories from Engeström’s Activity Theory (1996), which were used to prepare and organise the data;

- Data coding: carefully reading and rereading the data lines by lines to form an overall mental image (Creswell, 2014), followed by giving specific codes to the data’s most important or relevant elements or segments (McMillan & Schumacher, 2014);

- Creating categories and themes, reorganising the data to account for the creation of both new categories and subcategories within the predetermined categories from the coded data;

- Using content analysis as an inductive technique to analyse and evaluate the data while viewing it from a variety of angles to better understand and understand the data; and ultimately;

- Organising and presenting the data and findings in accordance with themes or subjects (Cohen, 2017) using content analysis as the data analysis approach, which allows for the use of both predetermined categories and the formation of new categories during the coding phase.

I carefully reviewed the data to make sense of it and write notes of any ideas that came to mind because of it. I coded the data based on the subjects that emerged from the

data, such as grounded theory development, contrasts and similarities in the teachers' practice and policy knowledge, and pre-identified themes.

3.8 TRUSTWORTHINESS OF THE STUDY

In qualitative research, four factors of trustworthiness must be addressed: credibility, transferability, dependability and confirmability. This section delves into what these concerns are and how they were addressed in this research.

3.8.1 Credibility

The reliability of the data or participant viewpoints, as well as the researcher's interpretation and portrayal of them, are all factors in credibility (Polit & Beck, 2012). Sharing study-related experiences with participants and having them confirm the research findings strengthens the researcher's credibility. A qualitative study is considered trustworthy when the descriptions of human experience are immediately recognised by those who have had similar experiences (Sandelowski, 1986).

To address credibility, this study will use the strategies indicated above. As a result, I used face-to-face interviews, focus groups, observation and questionnaires. First, I obtained permission from the participants to record the data on videotapes and images for immediate use in the study.

3.8.2 Transferability

Transferable knowledge is defined as knowledge that may be used by diverse groups of individuals or circumstances (Houghton et al., 2013; Polit & Beck, 2012). A qualitative study satisfies this condition if the findings are applicable to those who are not participating in the study and readers can connect the findings to their own experiences. I gave the reader enough details about the informants and the research context so they could decide whether the conclusions "fit" or were applicable to other situations. In this study, a thorough explanation of data collection is provided to ensure transferability. To further show that the study was not intended to generalise the findings, the sampling techniques and methodology are extensively discussed. All responses given by interviewees were recorded, protecting any information they may have shared.

3.8.3 Reliability

Reliability is the consistency of data under similar conditions (Polit & Beck, 2012; Tobin & Begley, 2004). This can be done if the decision made at each stage of the study procedure is accepted by another researcher. If the results of a study are replicated using identical subjects under identical circumstances and the researcher's methods and descriptions, the study would be recognised as reputable (Koch, 2006). The processes, which covered the research concept and methodology, sampling, data collection and analysis approaches, were in-depth to ensure the study's dependability.

3.8.4 Confirmability

Confirmability is the ability of the researcher to show that the statistics reflect the responses of the participants rather than the researcher's biases or opinions (Polit & Beck, 2012; Tobin & Begley, 2004). The research findings in this study could be confirmed because they are based on participant responses rather than my opinions. Additionally, each phase of the data analysis process is described in depth. To complement the presentation of the findings, direct quotes from the participants are used.

3.11 ETHICAL CONSIDERATIONS

Ethics must be considered when human subjects are involved in research. Ethical considerations must be examined since they safeguard both the researcher and the research participants from potential harm (Cohen-Vogel, 2015; Lester, 2015). According to Kvale (2014), conducting research must take into account three ethical factors. Participants' informed agreement to engage in the study, confidentiality, and the study's outcomes are among them. Also, everyone who contributed to and supported the research should be thanked (Cohen-Vogel, 2015; Kvale, 2014; Lester 2015). Ethical issues must be considered because they protect both the researcher and the participants in the research from harm (Cohen & Reilly, 2000; Lester, 1996). When doing research, three ethical considerations, according to Kvale (1996), must be taken into account. These include the participants' informed agreement to engage in the study, confidentiality, and the study's outcomes. All participants in the study must be acknowledged for their time and effort (Cohen & Reilly, 2000; Kvale, 1996; Lester, 1996).The researcher kept ethical factors in mind when conducting the study.

All of the ethical considerations were adhered to. Before the collection of data, letters was sent to the relevant department and school in which data was collected from. A briefing was conducted and informed consent forms were sign by participants and parents of learners who were under the age of 18 years. Anonymity and confidentiality was maintained throughout the study. My supervisor sends for me Ethical application form to complete then I completed the form then I send it to my supervisor after I was done with completing it. Then my supervisor sends the application to the university.

Because I am a secondary school teacher I was able to do the following:

- Individual principal consent was obtained, first through email and then by a follow-up phone call. To comply with the ethics regulations, I was able to get authorisation from the DBE to do research in the province where the school is located, KwaZulu-Natal Province, before beginning my fieldwork. Permission was also sought and granted by the school's principals of the three schools.

- Consent was sought in writing from all participants. Each participant received a letter detailing the research as well as a copy of the consent form to keep for their records, as well as a copy of the form that would be maintained for verification if necessary. I asked permission from the teachers to participate in this study after receiving permission from the administrator. I informed the teachers that their participation in the study was entirely optional, and that they were free to leave at any time (Creswell, 2013; Wilson et al., 2013).

- Confidentiality: All participant's privacy was ensured. The identity of the school, as well as the names of the participants, was hidden behind pseudonyms.

3.12 FINDINGS OF THE PILOT STUDY

A short feasibility study known as a "pilot research" seeks to assess a few of the methods that are planned for a larger, more in-depth, or confirmatory investigation (Arain et al., 2010). In essence, a pilot study is conducted to guard against the development of a fatal error in a costly study in terms of both time and money. A pilot study's main objective is not to answer specific research questions but rather to deter

researchers from starting a large-scale investigation before they are sufficiently familiar with the suggested methodologies (Polit & Beck, 2017).

The researcher used observations to observe a Life Science session that had EE content while performing this pilot study. It was noted that both teachers and students had a clear understanding of the EE subject. Learners cooperated fully during the lesson and teacher knew very well what he was teaching. The lesson involved natural resources and integrated EE. The lesson went beyond the classroom because learners gave real-life situation examples of EE where they talked about the importance of water in our daily life. The research topics, research methodology, design and tools of this study were all in line with the pilot study. The researcher used the same screening procedures and ethical standards for both the pilot study and the primary research study. The research approach for this investigation was qualitative. The researcher carefully considered the participants in this study to achieve a balanced representation of the socioeconomic backgrounds of the schools in the Umlazi District of KwaZulu-Natal (KZN). This study's goal was to investigate how the Umlazi District's secondary schools handled solid waste.

Because the interview questions used an interview guide, the researcher was able to rearrange those questions in a meaningful way. The researcher was able to reorder the interview questions and arrange them with the help of a pilot study. The teacher encountered some language difficulties during the interviews and eventually responded to some of the questions in Zulu. The teacher objected when I asked her if she wanted me to translate the interview questions into Zulu before doing the interview.

Learners participated in focus groups. Since there were six (6) learners in each group, it was observed that the learners did not feel under pressure to respond quickly to the questions because some of the questions were more general in nature and served to better prepare the researcher for the actual data collection for the research study. The researcher was helped in gathering research data by doing the pilot study because she developed her expertise in interviewing. It also taught her to explore participants' replies because they occasionally remained silent and did not respond to the questions asked or only a few participants responded.

The pilot study was beneficial to me as a beginning researcher since it allowed me to gain study conducting experience. My inadequacies in managing time during the interviews, communicating with the participants, asking follow-up questions and exploring and interpreting the participants' nonverbal signs were all identified and corrected. By juggling multiple tasks at once listening, taking notes, observing and recording, I was able to better familiarise myself with the data collection techniques and technologies. More significantly, the pilot study helped me to identify ethical concerns that might interfere with the major study and gave me guidance on how to resolve them.

3.12 CHAPTER SUMMARY

In this chapter, the study's methodology was covered. The study's design and its research questions served as the basis for this explanation of the qualitative research methodology. It included research design as well. Prior to doing this study, demographic and sampling, as well as research techniques like observation, focus groups, photovoice, and face-to-face interviews, were also discussed. The study's authorisation, data collection and analysis related to ethical concerns were discussed. The following Chapter 4 provides a presentation, analysis and interpretation of the data gathered.

CHAPTER 4

DATA PRESENTATION, INTERPRETATION AND ANALYSIS

4.1 INTRODUCTION

The aim of the study was to evaluate perception of teachers and learner on SWM practices in township secondary schools. Data collection was done through observation, face-to-face interviews, photovoice and focus group interview. The research findings aimed to address the research objective mentioned in Chapter 1. The main questions and sub-questions guiding my research are indicated below as seen in Chapter 1.

4.1.1 Main Question and Sub-questions

What are the perceptions of teachers and learners towards the management of solid waste in township secondary schools in Umlazi District?

4.1.2 Sub-Questions

- What role do learners and teachers play in SWM at schools?
- What are the existing strategies towards management of solid waste in schools?
- What are the challenges that are faced by school regarding solid waste disposals?
- How can township schools improve solid waste disposal?

4.2 DATA PRESENTATION AND DISCUSSION

Data was presented through predetermined themes using sub-questions and categories as indicated in Table 4.1.

Table 4.1: Predetermined themes and categories of the study

THEMES	CATEGORIES
1. Perceptions on SWM	1.1 Teachers and learner's role on SWM. 1.2 Teachers and learner's perceptions on SWM in schools
2. Waste management challenges	2.1 Lack of resources 2.2 Lack of support from stakeholders

THEMES	CATEGORIES
	2.3 Lack of knowledge on waste management
3. Strategies of SWM used in schools	3.1 Waste generation, 3.2 Waste minimisation

Source: Author

4.3 CASE 1: SUKUMA SAKHE TEACHER, LEARNERS FOCUS GROUP A, PHOTOVOICE AND OBSERVATION

4.3.1 Theme 1: Perceptions on SWM

Awareness, which is defined as the perception or awareness of an occurrence, is acknowledged as the first stage and serves as a necessary component for successful education and likely behavioural change, especially when it comes to environmental challenges (Ari & Yilmaz; 2017). Any nation's waste management policy should include education and awareness. This is also demonstrated by the 2010 Integrated Waste Management Strategy (IWMS) of the National Environmental Management Waste Act of South Africa (National Environmental Management: Waste Act 59, 2008). In light of this, Teacher A was asked "... Glass, metals, plastics and paper waste can all be sold for money. Do you want to use this process to make money?"

"No, I do not think that selling waste will generate income for my school."

From the above assertion, it showed that Sukuma Sakhe Teacher was aware of the SWM concept but he did not agree with the fact that the school could generate money through reusing, recycling and reducing of waste. Desa et al. (2011, p. 643) claim that "environment awareness can be broken down into two categories: perception and behaviour, or the perception of environmental issues and the propensity to act in ways that promote environmental protection". People's subjective knowledge, perceptions and environmental reality all play a role in how environmental problems are perceived. According to a number of studies, EE/ESD is crucial to increasing learners' environmental consciousness. Learners should also be educated in a way that will increase their knowledge and increase their awareness of the environment so that they may make wise decisions as adults (Zelezny & Schulz; 2015). Learners in school A were asked "Do you learn about caring for nature and the environment in your school?"

“No, because we are not taught about taking care of the environment although in Life Science some topics do involve the environment. But we are not taught deeply about the importance of environment and we also feel that learners that are not doing Life Science – they are not even aware of the importance of the environment.”

They are not aware of the importance of environment and they feel that there is a need for their school to enlighten them on the importance of waste management. Strong evidence from global waste management reveals that the human race’s attempts to address the current waste management issues depend on its understanding of garbage generation and management, as well as its attitudes toward it. Studies from South Africa show that learners’ environmental awareness is not very high (Zelezny & Schulz, 2015). Learners do not appear to have sufficient fundamental understanding about the environment, according to the limited educational research done by researchers such as Schulze et al. (2015). According to the study by Schulze et al. (2015), which is similar to this study, the school curriculum should pay more attention to environmental developments like ecology, population growth, pollution and the depletion of natural resources. Peden (2008) draws attention to a variety of problems with South Africa’s current EE system. He suggests that a review of the environmental curriculum in schools is necessary to guarantee that learners receive a top-notch environmentally sustainable development that will expand their knowledge and awareness in terms of solid waste disposal initiatives. All participants in Sukuma Sakhe Secondary School showed low levels of awareness and knowledge of SWM importance and its impact on the environment.

4.3.1.1 Summary

Understanding the fundamentals of learners’ awareness, knowledge and practice in waste management will help to improve waste management, enhance education and undoubtedly lead to a future that is more sustainable. Findings from Theme 1 are shown in Table 4.2, where the features indicate a lack of understanding of waste separation and a reluctance to take part in waste reduction programmes. The findings show that neither learners nor teachers are aware of the significance of waste management techniques that can be used in schools.

Table 4.2: Summary of findings on perception on SWM

Categories	Characteristics
Teachers and learners role on solid waste management	• Sukuma Sakhe Learners lack of knowledge about separating of waste. • Sukuma Sakhe Teacher is not aware that the school can generate income from waste.
Teachers and learners perception on solid waste management	• Sukuma Sakhe Learners are not aware of the importance of waste management. • Sukuma Sakhe Teacher he is aware of waste management but he is not interested about gaining more information about the Rs.

Source: Author

4.3.1.2 Findings

This section presents findings on the roles played by teachers and learners on SWM and perception of the participants on SWM.

- Teachers and learners' roles in SWM

The study findings revealed that teachers and learners in Sukuma Sakhe Secondary School are not taking responsibility for SWM in school. Sukuma Sakhe Secondary School revealed that for their school to manage their solid waste, learners need to respond to the negative impact of environment posed by littering. When asked about the importance of environment, one learner in the focus group interviews responded by saying, "*the environment is important because most of the resources that we use come from the environment*." Another learner stated that "*environment depends on human beings and humans also depend on the environment*." In contrast, learners also stated that they are not aware of the importance of recycling and that they should separate solid waste into separate packages like glass, papers, plastics and garden waste. Another question in the focus group interview was how they learned about caring for nature and environment in their school. The response was "*No, we are not taught about importance of nature and how to keep the environment free from solid waste but in Life Sciences some topics do involve environment but those topic does not teach us deeply about the environment sustainability and we also feel that learners who do not do Life Science as a subject they do not know anything about the*

environmental issues." Learners mentioned that their role as learners in SWM was to ensure that they put waste in bins and to encourage other learners about the importance of keeping the environment free from solid waste.

Sukuma Sakhe Teacher also stated that the school needed to run some campaign of waste management where they could teach learners about the importance of taking care of the environment and to create a group of learners that would run a waste-free campaign in the school. He further stated that there was no campaign at the moment in the school and he also thought that learners were not aware of importance of managing waste since nothing was done by the school. Only the caretakers were responsible for waste removal at the school. He added that schools needed to consider planning community clean-up days where learners walk out into the neighbourhood and help pick up litter. Such events might be centred on waste management.

- Teachers and learner's perceptions on SWM

The finding of this study has shown that Sukuma Sakhe Teacher had positive perceptions of SWM. The teacher stated that there was a lot of pollution in South Africa especially in township areas and stated that people needed to be educated about the importance of keeping the environment free from improper waste disposal. He further stated that people were not well-informed about littering and the effect of disposing waste in the wrong way which he regarded as deplorable. He also stated that the school needed to have garden so that their biodegradable waste could be recycled into compost.

Learners in this case shared different perceptions about SWM. Learners had different views on littering where some said that they recycled waste generated in the school, but others stated that they did not learn about SWM in school. They had learned about it at primary school and they were encouraged to keep the environment clean. Other learners also stated that they did not even know what the 3Rs stands for, namely reduce, reuse and recycle. They further stated that the school needed to put bins around the school and put different tags on them so that they would know how to separate waste.

I, therefore, think that the DBE should make some interventions in the curriculum because this case revealed that Sukuma Sakhe Secondary School was not aware of the importance of environmental sustainability measures in schools. Neither teachers nor learners knew about the importance of recycling because there was no campaign that is in place at the school. Additionally, I think that teachers and learners can work to make their school a 'waste warrior' by establishing a waste management committee, conducting a waste audit, reducing the amount of waste they generate, reusing materials to keep them from becoming waste conscious, and establishing a recycling programme.

4.3.2 Theme 2: Waste Management Challenges

The management of waste in secondary schools is getting more and more attention globally as a result of people being more aware of various environmental challenges, such as global warming, air, water, and land pollution (UNEP, 2016). It is hard to totally rule out negative effects on the environment or on human health, yet waste produced by daily human activity harms natural resources (Post, 2012). There are now more environmental problems a result of the municipality's inappropriate disposal of solid and liquid hazardous waste inside the township (Simón et al., 2017). According to Sukuma Sakhe Teacher:

> "*Only municipality that collect waste in our school once a week and I wish that municipality can collect waste twice a week".*

This study shows that the Umlazi district, including learners, teachers and school administration, have a very negative attitude toward environmental cleanliness in general and proper waste disposal, as seen in the section above. Waste is thrown away carelessly by someone without concern. For instance, posters depicted the inadequate waste management practices at schools on 22 August 2007 and 19 May 2008 respectively (Post, 2012). SWM in emerging countries is made more difficult by shifting economic trends, urbanisation and a sharp rise in the population of students. Perhaps more telling was the response of Sukuma Sakhe Teacher who was interviewed:

> "*I think there is a lot of pollution in Umlazi and South Africa most especially in townships school areas they are quite polluted."*

From the teacher's assertion above, I am of the view that poor waste management in schools can increase the spread of disease or otherwise endanger the health of learners, teachers, school administrators and staff members. It can also contaminate the surrounding area by allowing toxic materials and pathogenic organisms to leak into an open waste dump, endangering the water supply of the area around the school, and generate unpleasant odours. Learners further stated that:

> *"Sometimes the municipality transport does not come to collects school waste and the waste is left outside the school gate for days."*

I agree with what the learners in Sukuma Sakhe Secondary School said because one of the days during my data collection in the school as seen in Figure 4.1. I did come across of this situation where outside the school gate there was lot of black bin bag packed outside the school gate and I also asked one of the school care taker what was happening with those black bags packed outside the school gate he explained to me that the municipality did not come for waste collection on that dates. This relates to Rasmeni and Madyira's (2023) definition of SWM which is the process of gathering, transporting, processing, monitoring and properly disposing of solid waste material.

Figure 4.1: Showing waste dumped by community outside the school premises

Source: Author

Figure 4.1 shows how the community members including teachers and learners were observed dumping their waste outside the school premises. As we see, lot of waste is

plastic from different shops. As seen in Figure 4.1, this is a challenge that is faced by schools around Umlazi district regarding improper solid waste disposal..

4.3.2.1 Summary of discussion

This study demonstrated in Sukuma Sakhe Secondary School during focus group interviews and a face-to-face interviews with participants that uncollected waste in the school leads to poor sanitation; that social consequences of poor sanitation due to poor waste disposal management affect students; and that poor waste disposal is bad for students' health. Other difficulties faced by learners at school include poor opportunities for recreation and social learning, poor waste management that results in diarrhoea, skin conditions, typhoid fever and malaria and last but not least, poor waste management that has a negative impact on students' academic performance. The conclusions based on problems with a lack of resources and assistance from stakeholders are shown in Table 4.3.

Table 4.3: Sukuma Sakhe secondary school summary of findings.

Categories	**Characteristics**
Lack of resources	• Buy school resources such as bins
Lack of supports from stakeholders	• Principals, SGB and staff members have to create waste campaigns
Lack of knowledge on waste management	• Make sure that teachers are educated about ESD. • Encourage teachers and learners to make use of the resources that they can reuse.

Source: Author

4.3.4.2 Findings

The findings of Theme 2 on the challenges faced by teachers and learners are discussed below.

- Lack of resources

In Sukuma Sakhe Secondary School, the participants revealed that there was a shortage of resources when it came to solid waste separations. Learners also stated that they did not have enough bins in schools; even in their classroom they were using cardboard boxes for waste. Sukuma Sakhe Teacher also stated that the school never

had any campaigns where they talked about the importance of waste management but he think that there is a need to enlighten learners about the environment and how to keep the environment free from waste. Learners also stated that the school needed to buy enough bins so that they could start separating waste into separate packages.

- Lack of support from stakeholders

Sukuma Sakhe Secondary School also stated that a lack of support from the principal and staff was the cause of learners not being aware of the importance of SWM. I therefore think that principals, teachers and SGB members should develop policies on EE projects in school. Stakeholders also need to create campaigns in the school that encourage learners to keep the environment free from solid waste and discourage unhealthy disposal of waste at schools. Findings of this study showed that waste management challenges are exacerbated by lack of support from stakeholders.

- Lack of knowledge on waste management

Sukuma Sakhe Teacher as seen in the section above also stated that they did not have enough knowledge of how to manage waste in school. He wished that they can implement it in the curriculum or introduce a subject that specifically address waste so that learners can gain more knowledge and the school can start running campaigns about SWM. The findings of this study on the challenges faced by participants show that learners need to learn about the 3Rs in order for them to understand the importance of recycling, reusing and reducing waste.

4.3.3 Theme 3: Strategies of SWM Used in School

The National Waste Management Strategy (NWMS) (Department of Forestry, Fisheries and the Environment, 2020) updates and revises the 2011 strategy while filling in the gaps and building on the successes and lessons learnt from its implementation. The nation’s Medium-Term Strategic Framework (MTSF) priorities for the five years that make up the term of administration were also taken into account in this plan’s modification, which was prepared at the beginning of the sixth term of democratic government in the country.

The NWMS 2020 makes a significant strategic shift from the 2011 strategy, including:

- addressing how the informal sector, garbage collectors, and vulnerable populations fit into the circular economy; and helping disabled people, young people, and women;

- encouraging methods of product and package design that reduce waste or support preparation for reuse, repair, and recycling, and promoting markets for source-separated recyclables;

- examining potential financial or regulatory initiatives to increase participation in programmes for residential separation at source;

- investing the money saved from moving recyclables in companies that handle trash;

- bridging the skills gap in the sector, with a focus on women, young people, and those with disabilities in particular; and

- discussions with the National Treasury over the operational costs for municipalities under the NWMS and Waste Acts

Sukuma Sakhe Teacher stated that the school did some recycling of paper only but it was done by few individuals. From the teacher's, response I am of the view that it is important to have different strategies of waste reduction and waste separation for example having different bins of waste as seen in Figure 4.2 so that they do not mix all waste in the same bin. As seen in Figure 4.2, the school has some metal bins for disposing of all different kinds of waste but sorting of the waste in the school is not done. The findings suggest that it is important to educate learners about the importance of keeping the environment free from waste and that waste should be separated into different kind of waste.

Learners also suggested that each class must have monitors that will be appointed in class to check how learners dispose their waste. These monitors also need to be trained about waste management. There should be big posters with prohibition signs of illegal dumping and actions that will be taken if learners break the rules. I, therefore, agree with the learners' views that it is important to educate learners about the environment.

Figure 4.2: Metal dustbin used in school for all different kinds of waste.

Source: Author

Figure 4.2 shows that the school uses mental bins for the disposal of their waste. This relates to Theme 3 strategies of SWM used in school.

Figure 4.3: Municipality irregularly collecting waste outside the school gate.

Source: Author

Figure 4.3 shows members from municipality collecting solid waste in school. This relates to Theme 3 on the strategies of SWM used in the school.

4.3.3.1 Summary

The study found that the school needs to implement more strategies of waste management in school. More bins need to be placed in classrooms and around the school yard. The interviews with participants showed that the school also need to have garden so that their biodegradable waste can be used to make compost for the school garden. Table 4.4 presents a summary of findings on strategies of SWM used in school.

Table 4.4: Summary of strategies for dealing with solid waste at schools

Categories	**Characteristics**
Waste generation	• Put waste prohibition sign around the school walls
Waste minimisation	• Put bins around school with labels. Example papers, plastics, glass, metal, etc • Avoid throwing of waste unnecessary • Use packages that can be reused again

Source: Author

4.3.3.2 Findings

- Waste generation

Teachers in Sukuma Sakhe Secondary School believed that in Sukuma Sakhe secondary school, students were the main producers of solid waste. Additionally, learners stated that since they make up the majority, they were the ones who produced substantial waste. Reda et al. (2019), however, challenged this assertion by pointing out that waste generation in schools is not solely dependent on building size or learner enrolments. Waste creation also encompasses the types of daily activities that teachers, learners and other stakeholders engage in. Plastic and paper waste were the most common types of waste that learners at the school produce.

- Waste minimisation

Better practices for managing waste in the healthcare industry should attempt to avoid or recover as much waste as possible rather than burying or burning it, according to a waste management hierarchy based on the 3Rs concepts (David et al., 2019). To avoid inefficient practices, the most desired management strategy is to prevent the

creation of waste in the first place. A good plan that uses purchasing and stock control tactics can help reduce the quantity of waste created, even if waste minimisation is frequently conducted at the moment of its formation. This includes separating hazardous waste from other wastes.

According to Sukuma Sakhe Teacher, the school only does recycling of paper to minimise waste generated. All the other waste such as plastic is thrown away and collected by the municipality. I therefore suggest that they should implement recycling of other things. Materials such as plastic, glass and aluminium could be recycled for the school to raised funds from this waste. I believe that implementing other strategies of recycling will help the school in many ways such as waste minimisation.

According to Kuffour (2020), preparing food in large quantities could reduce the amount of trash produced in classrooms and discourage students from purchasing meals from outside during breaks. I further suggest that Sukuma Sakhe Secondary School should also not allow outside vendors to sell food to their learners but they must only use school cafeteria only so that it would be easier for the school to minimise the waste generated at school.

4.4 CASE 2: GOVERNMENT TEACHER, LEARNERS' FOCUS GROUP B, PHOTOVOICE AND OBSERVATION

4.4.1 Theme 1: Perceptions on SWM

The collection, disposal or treatment of waste items is known as SWM. It has to do with man-made materials and the process typically used to reduce its effects on health, the environment and aesthetics (Helwege, 2018). It reduces or eliminates negative effects on the environment and human health, instead promoting economic growth and a higher standard of living. Learning the proper techniques for treating the waste produced in today's dirty world has become crucial (Helwege, 2018). The question put to Government Teacher was: Do you believe that our children are the future, and we must protect nature for them as well? She responded by saying:

> "*Yes, our children are the future they have to protect the nature because the very same nature will be used by their children. If they destroy it now, it means their children's will not have the natural resources that we are having".*

Participation by schools is necessary in waste prevention and SWM strategies. Olive (2016 cited by Villanueva, 2017, p. 684), indicated that education is a crucial part of SWM and should be implemented in the curriculum for the learners. Learning about SWM will alter how learners view waste. Learners have an ingrained belief that waste should not be touched or approached since it is waste and believe that all waste should be disposed of in a single container (Sarino, 2012). According to Baula et al. (2018, cited by Punongbayan, 2019, p. 45), involvement and awareness are the keys to getting learners interested in waste management programmes at schools so that good SWM may be implemented in a way that is both efficient and long-lasting. A question was posed to learners in Government Secondary school was: what is the importance of environment? One learner stated that:

"We have to keep the environment clean, so that people can breathe fresh air."

Another learner stated that:

"Keep it clean so that the plants can be beneficial to us and provide us oxygen".

The Solid Waste Management Act (SWM Act) mandates that the national government collaborate with the Department of Basic Education (DBE), the Technical Education and Skills Development Authority (TESDA), the Commission on Higher Education (CHED) strengthen the integration of environmental concerns in educational programmes at all levels, with a focus on SWM (2019). Learners in Government Secondary School stated that they had little knowledge on waste management because their teachers did not educating them about the importance of keeping environment clean.

4.4.1.1 Summary

I believe that, if schools can implement the use of 3Rs in teaching learners about the importance of keeping the school free from waste, learners will have more information and they can pass it to their friends at home or in the community. I also believe that the DBE can still play a huge role in implementing awareness of waste management in their school curriculum or even create a specific subject where all learners will get an opportunity to be enlightened about the environment as a whole.

Table 4.5: Perceptions on SWM at Government Secondary School.

Categories	Characteristics
Teachers and learners' role on solid waste management	• Recycling: Government Teacher they do recycling at school. • Reuse: Government Teacher willing to make use of plastic waste to make chair for learners.
Teachers and learners' perceptions on SWM in school	• Learners in Government Secondary School: they are aware of SWM but they are willing to learn more about it. • Government Teacher is willing to have Eco-club but due to shortage of free period she cannot manage to run it.

Source: Author

4.4.1.2 Findings

- Teachers and learners' role in SWM

According to Government Teacher, her role as teacher on SWM in school is to teach learners about how to keep environment clean inside the classroom and around the school premises. She also stated that she implemented a waste reduction strategy for those learners who came late to school:

> *"when learners came late at school I ask them to pick up the papers or plastics around the school premises but it not enough because I do not have many periods where I can be free".*

She also stated that she was not satisfied about current solid waste removal at school because bins could be full in one day and it would be filthy for the next four days because waste was collected by municipality only on Mondays.

Learners in Government Secondary School stated that their role in SWM in the school was to encourage learners not to throw papers on the ground and to teach other learners not to litter everywhere.

- Teachers and learners' perceptions on SWM in schools

Learner in Government Secondary School said they have little information about awareness of SWM, because they only learned about waste in Life Sciences, Physical Science and Geography. Even though some topics included nature, they did include the management of solid waste. For example, in Life Sciences, the students learned about species and conducted an outdoor activity to count the number of species present on the school grounds. However, the exploration ended there without further discussion or elaboration on how to protect these species or why they hold significance in the natural environment. The lack of information and guidance on the importance of the environment and waste management left the students wishing for their school to provide more education on these subjects.

Government Teacher mentioned that she was aware of the significance of SWM and that she even watched the news on her phone. She also spoke with me about the Kyoto Protocol, which was signed on December 11, 2011, in Durban, South Africa, where countries recognised the urgent need to increase their collective level of ambition to reduce greenhouse gas emissions. She mentioned that she incorporated environmental themes into her lessons, such as during the classification of species. An activity was organised where the students went outside to assess the number of species present on the school grounds. However, during this observation, some learners mistakenly plucked leaves from the plants without permission, causing damage to the vegetation. She promptly addressed this issue, informing the students that such actions were unacceptable as they were harming nature. She emphasised the importance of treating the environment with respect and instructed them not to repeat such behaviour.

4.4.2 Theme 2: Waste Management Challenges

Even though South Africa has made great strides in developing a legal framework to support SWM, as can be seen in the section above, much more needs to be done to enforce these laws, improve waste services, and increase resource recovery given that landfilling is still the most popular waste solution (Godfrey, 2019). A few of the challenges the country faces with SWM include planning, financial management, understanding the country's current SWM rules and providing trash services (DEA, 2016). Financial, institutional, labour, and equipment management are the four primary areas under which these problems fall according to (Oelofse, 2018). A complicated

issue, SWM takes into account societal, institutional, legal, economic and technological factors. It is tough and challenging to connect these aspects within a system that functions properly while simultaneously involving all relevant players in South Africa because no perfect methods have been provided to assess the current and future demands of the sector at all governing levels. According to Gutberlet (2018), the baseline data and decision-making tools that would enable municipalities responsible with providing waste services to make well-informed decisions about SWM are lacking. A participant was asked how they felt about the air, water and ground pollution in South Africa. She stated:

> *"I think there is a lot of pollution in South Africa; most especial in our townships. They are quite polluted".*

Despite its insufficient management of local governments, which face financial constraints due to expanding populations and rising waste quantities, the national government asserts that providing waste services is a right (Tsheleza, 2019). Rural areas frequently lack adequate waste disposal facilities, so locals resort to illegal dumping and burning, both of which have detrimental environmental effects. Furthermore, these shortcomings have led to unappealing and unhealthy settings. The complex waste flow caused by a surge in middle class residents and informal settlements, which put strain on local authorities with increased generation, makes waste services difficult to provide even in urban places like Johannesburg (Dlamini et al., 2019). This problem highlights the government's inability to effectively plan and use affordable methods to close the SWM deficit (Simelani-Mnisi & Mji, 2016). Improved governance and planning including all stakeholders, including informal waste pickers, is crucial to addressing these waste services and cost recovery concerns (Godfrey, 2019). Government Teacher was asked what she thought about illegal dumping and pollution in the school and its surroundings. She responded;

> *"It a shame we are not doing well in township there is a lot of littering in suburbs littering is minimal but I have notice that people in suburbs they take their waste and litter it around in township because the is no fine in townships and they fear the fines in their area. In rural areas there is no management of waste at all it depend on each household to burn the waste".*

Some of the strategies that the school could use to minimise challenges that school was facing in terms of lack of support from stakeholders were suggested by Government Teacher as:

> "*Create waste free campaigns in the school and also invite the municipality team to come in the school and encourage learners about the importance of keeping the environment clean."*

She further stated that there was a need to:

> "*make sure all staff is educated about staff environmental and they are aware of the importance of integrating the nature during their lessons with the learners"*

Government Teacher also stated that during her free period in the morning sometimes she make learners that come late in school to pick up the papers around the school premises. She further state that this strategy also help the school to reduce late comers.

I fully agree with what Government Teacher. Educating teachers and learners is the key to fighting with SWM in the school. Providing education to all school staff members would enhance the school's support for waste minimisation within its premises.

Figure 4.4: Showing waste dispose outside the school premises.

Source: Author

This picture show waste is disposed of outside the school premises. This waste might be disposed of by street vendors or by members of the community. This picture relates to Theme 2: Waste challenges in school.

4.4.2.1 Summary

SWM is required of local governments in South Africa, where issues with infrastructure, institutions, human capability, labour and financial management are factors that contribute to waste generation. According to participants, a workable approach to sustainable SWM could involve combining the efforts of waste pickers, the private sector and international partners.

Table 4.6: Presents the summary of findings of waste management challenges at Government Secondary School.

Categories	**Characteristics**
Lack of resources	• Buy more bins for the school • Hire more staff to clean the school
Lack of support from stakeholders	• Create waste free campaign in your school and also invite the municipality team to come in the school and encourage learners about the importance of keeping environment clean. • Learners who came late in the morning have to pick up the papers around the school this will also reduce late comers in the school
Lack of knowledge on waste management	• Make sure all the staff is educated about staff environment and they are aware of the importance of integrating the nature during their lesson with the learners

Source: Author

4.4.2.2 Findings

- Lack of resources

Government Learner stated that in their school there was a shortage of bins and even in their classrooms they used cardboard boxes to discard waste that was generated inside the classroom. The school needed to hire more staff and caretakers. It could also seek donations from different companies that can help the school. I therefore suggest that the school can also try to find help from their previous learners who stay around the school, in terms of running clean-up campaign.

- Lack of support from stakeholders

Government Teacher also mentioned that despite her efforts to encourage waste management by engaging late-arriving students in cleaning the school premises during her free time in the morning, there was a lack of support from the school management team. However, due to her limited availability and teaching responsibilities, she expressed that her attempts alone were insufficient to address the issue effectively.

- Lack of knowledge on waste management

Learners at Government Secondary School stated that they have less knowledge on waste management because their teachers are not educating them about the importance of keeping environment clean. Government Teacher also state that the school need to educate teachers and learners about important of environment.

4.4.3 Theme 3: Strategies of SWM Used in Schools

NPSWM (No. 904), the DEA's National Pollution Prevention Strategy for Waste Management (DEA, 2016a). regulates the cost of garbage in South Africa. NPSWM supports the development of waste into secondary economic resources, the mainstreaming of the polluter-pay idea, and waste reduction by reuse, recovery, and recycling rather than landfilling (DEA, 2016b).

These are some of the 3Rs initiatives that can be implemented in educational institutions. Teacher B stated that in terms of waste reduction the school must buy smart boards or chalkboard to give written instructions. Teachers must start assigning work that does not require writing. Government Learner also suggested that school tuck-shop must try to sell products that use materials that can be reused or recycled. DEA (2016b) suggested that in terms of paper minimisation learners should submit their assignments digitally rather than on paper. Teachers and learners only print what is necessary. I, therefore, think that also duplex printing should be used by teachers, staff and learners to reduce paper consumption.

Government Teacher also stated that the school should encourage learners and teachers to buy products that can be reused more than once. Such as learners art groups could repurpose paper from written assignments into papier-maché materials,

recycled beads and other items. Learners and teachers could establish a paper supply exchange for notebooks and other paper products that people no longer use. Learners at Government Secondary School also said that they needed to be given artwork that would make them use waste material such as plastic and papers. I, therefore, agree that if teachers and learners could implement such ideas, their school would become an environmentally friendly school.

Learners at Government Secondary School suggested that the school need to hosts a recycled paper drive for the community and invite neighbouring schools to this event and weigh the final amount collected. Learners could host a paper recycling competition to see which grade level could collect the most paper. Teacher B also stated that learners and staff could collect and recycle old homework. The school needed to start buying paper made from recycled paper. I, therefore, think that all these strategies can promote and develop a good mind-set for the learners and the school as whole regarding SWM.

Figure 4.5: Learners looking at the school post that represent waste reduction in Government Secondary School

Source: Author

Figure 4.5 show learners looking at a poster on the school wall. Figure 4.5 shows the different kinds of waste in a plantation since agriculture subjects are offet at the school. There was also prohibition sign showing how to dispose waste.

Table 4.7: Summary of findings on strategies of SWM in school.

Categories	**Characteristics**
Waste generation	• Encourage learners to put waste in bins • Reduce waste generation by burning it
Waste minimisation	• Host recycling competition • Encourage use of reused materials • Create Eco group

Source: Author

4.4.3.1 Findings

- Waste generation

At Government Secondary School, both teachers and learners said plastic and paper were the most common type of waste that the school generates. Government Teacher also stated that most of the waste come from the school tuck-shop and from paper work that they have to learners.

- Waste minimisation

Government Teacher said that "*Recycling is one of the strategies they used for waste minimisation*". While Government learners "*said the school need to host recycling events to encourage learners about how to put waste in separate packages*". I therefore think educating both teachers and learners might be the best solution to resolving all the challenges that the school faced. Putting strategically placed bins around the school premises might also be helpful.

Government Teacher stated that for waste minimisation at school they do recycling of papers while learners at Government Secondary School said they sometimes recycle waste but they usually threw it away. Learners at Government Secondary School also stated that the school need to host recycling events as seen in Figure 4.5, where they encouraged learners to put waste in separate bins. I, therefore, think that educating

both teachers and learners will be the best solution in solving all these challenges. Putting bins around the school premises can also be an advantage.

4.5 CASE 3: BOFELA TEACHER, LEARNERS' FOCUS GROUP AT SCHOOL C

4.5.1 Theme 1: Perception on SWM

According to Holland (2020), one's assessment of their own abilities places a cap on what they can do and, ultimately, what they can accomplish. The way a person perceives himself and the world around him affects how he perceives both, and thus tends to guide his behaviour. School perceptions and SWM techniques had a beneficial relationship, according to Del Mundo et al. (2010). This shows that educational institutions with a positive attitude toward the environment are more likely to practise sound SWM, which includes waste collection and appropriate disposal. Learners at Bofela Secondary School stated that:

> *"Yes, we are aware of SWM in school and the school did even bring students from DUT to come and enlighten us about the importance of the environment and the negative effect of dumping waste in a wrong way".*

The question asked was: what is the importance of taking care of environment? One learner at School C replied.

> *"the importance of an environment is to look after it because it help us in other ways that we can like it save around it if the environment is clean and we look after it".*

Another learner stated that:

> *"the importance of environment lies in the fact that it affects our whole surrounding so it provide us with almost all the natural resources that we need as human beings like oxygen water and all of that it is important because we need it for survival".*

Learners at Bofela Secondary School also stated that they made posters and paste them on the school walls, where they advertised how to keep the school free from waste. In their posters, they also use bright colours to attract learners to read. They

also put photos on those posters so learners would understand what they are talking about when they said “reuse, recycle and reduce”.

Bofela Teacher was asked, what is your level of satisfaction with the current solid waste removal in the school? She responded:

> *“Not good, because we not doing recycling. As much as interact club is trying to do some recycling we still don’t have proper infrastructure and that what I have to work on next year”.*

Another question was asked to the Bofela Teacher. How can school improve solid waste disposal?

> *I totally believe that better recycling management is where it all begins. It's like, when we talk about recycling, there's also this whole thing with organic waste. We can totally make use of that in a school garden or something. Before COVID, we had this cool Eco warrior club, and they were all about planting and using everything wisely. We told the home economics learners not to toss their stuff in the bin; they gave it to us, and we used it for composting. We even encouraged them to bring stuff from home to make their own compost. It was awesome because they learned how to do it, and they could even do it at home. At one point, our school was so eco-friendly that we even got these green flags for being an Eco-school. ”.*

In terms of reducing and reusing as well as fair practices for recycling and proper disposal, the learners had good SWM practices. While the learners’ practices in terms of segregation, reduce, reuse and recycling had a strong relationship with their awareness of SWM, their practices in terms of disposal did not change because of their awareness of SWM. I believe that the DBE should provide opportunities for learners and teachers to engage in actions and behaviours that impact positively on achieving a more sustainable school environment.

4.5.1.1 Summary

In conclusion, the staff and students at Bofela Secondary School recognised the significance of the environment, leading them to establish an Eco-Club aimed at

educating learners about the principles of the 3Rs (reduce, reuse, recycle). Additionally, the school initiated recycling campaigns and even received an Eco flag as recognition, indicating support from various stakeholders.

Table 4.8: Summary of funding of perceptions of SWM

Categories	**Characteristics**
Teachers and learners' role in solid waste management	• Create Eco group • Encourage waste minimisation
Teachers and learners' perceptions on solid waste management	• Educate other learners about recycling • Encourage the use of bins for separating the waste

Source: Author

4.5.1.2 Findings

- Teachers and learners' role in SWM

According to the learners at Bofela Secondary School, they actively participated in solid waste management (SWM) activities within their school. They created and displayed posters on the school walls, promoting ways to maintain cleanliness and minimise waste. The learners used vibrant colours to attract attention and incorporated images of different bins to aid in understanding the poster's message. During assemblies, they encouraged each other to refrain from littering and delivered speeches focused on SWM within the school. Furthermore, they organised fundraising initiatives for planting, collecting plastic bottles and cutting them in half to serve as containers for growing plants. These plants were later transferred to the school garden once they had matured.

Bofela Teachers also mention that she was a Life Science teacher but she also ran an Interact club and Eco-Club. She further stated that she integrated environmental topics into her lessons:

> *"sometimes the learners get irritated because I can deviate to that easily I suppose because I have been studying you know reading it really of the passion for me so I do that."*

She further stated that

"I will actually help a student not in the school but another school to do a project where they took paper recycled it like mashed it up and made it into reusable paper for cards and artistic staff".

- Teachers and learners' perceptions on SWM in schools

Bofela Teacher is aware of SWM because she is in the field of EE she stated that"

> "*environmental education it been there through my study, and now I am trying to teach it in the school and also cooperate it during Life Science lessons*".

4.5.2 Theme 2: Waste Management Challenges

Solid waste is an inevitable bi-product of human activity. Any material that is rejected as a result of residential or industrial activities and for which there is no market demand must be disposed of is considered solid waste (Sridhar, 2019). Every school produces waste as a result of everyday tasks like classwork, sweeping, providing food and bush-cutting. Paper, grass, nylon (used to make pure water bags and biscuit, lollypop, ice cream, and sweet or candy wrappers), sugar cane, maize or corn cobs, and groundnut shells are some of the frequent kinds of solid waste seen in different schools in less-developed countries (LDC) communities (Wahab & Ola, 2017). On school grounds, additional types of waste may be present that were not necessarily produced by learners and teachers. Learners at School C stated that plastic comprised most of the waste generated in their school. One teacher said:

> *"Plastic is generated the most in school because tuck-shop sell packets of chips which most of learners throw it on the bin or around the school premises. They also sell bottled drinks made of plastics".*

The amount and complexity of solid waste generated in schools is increased by economic development, urbanisation, a higher standard of life in cities, and an increase learner's enrolment brought about by government initiatives in LDCs. This solid waste, if accumulated, may result in a number of health problems (Central Pollution Control Board (CPCB), 2015)). Most public schools across the world are exposed to pollution due in part to a lack of proper solid waste disposal infrastructure. The problem is worse in LDCs like South Africa (Fajehinsan, 2018). There are several issues with waste disposal in public places, especially schools, including the scattering

of food scraps and other abandoned items. As a result, rats may start invading and become carriers of disease (Sridhar, 2019). Rats may also start destroying important school supplies like paper and priceless documents.

To overcome all of these challenges, learners at Bofela Secondary School suggested that the school needed to buy more dustbins for the school and put labels on each bin to separate the waste. Encourage all teachers to integrate environment topics or use nature examples during their lessons. Stakeholders such as SGB, principal and other staff members could support learners by educating them about the importance of managing waste.

Figure 4.6: Bofela Secondary School: Litter free classroom in the morning

Source: Author

Figure 4.6 shows how in the morning before the learners arrived, the class was litter-free and clean with no paper on the floor. This picture relates to Theme 2 SWM challenges.

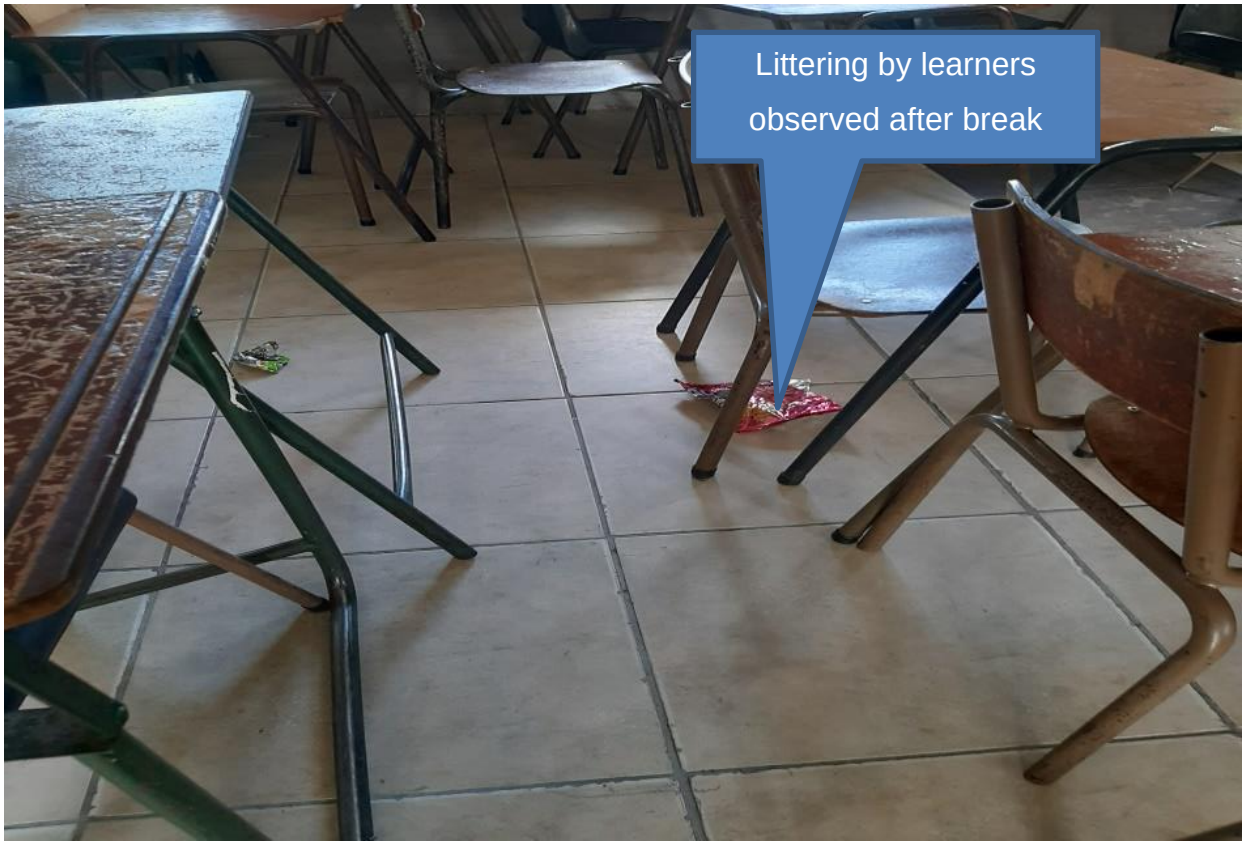

Figure 4.7: Showing littering from learners after break.

Source: Author

Figure 4.7 shows the classroom after break. The class is dirty; there are plastic wrappers for lollipops littered on the floor and the desks and chairs are disorganised compared to the morning, where the desks were well organised. This shows challenges that these schools are facing in terms of lack of proper solid waste disposal from participants in Bofela Secondary School.

Figure 4.8: Bofela Secondary School metal dustbins for disposal of litter

Source: Author

Figure 4.8 show waste in a metal bin. This also show different kind of waste put together in one bin. In this bin there are water bottles, papers and other kinds of waste. This shows that there is still a need to educate learners about waste separation. Some learners do not follow the rules which may be due a lack of understanding of waste separation.

Figure 4.9. Bofela Secondary School Eco-club in school.

Source: Author

Figure 4.9 shows learners holding a banner displaying the 3Rs, Reduce, Recycle and Reuse. This picture emphasises that the school is an Eco-School.

Figure 4.10: Students from DUT encouraging learners in Bofela Secondary School about nature conservation

Source: Author

Figure 4.10 show learners from DUT impacting environmental knowledge by educating learners from Bofela Secondary School about nature conservation and telling them about the vision of 2030 and some of the important strategies for sustainable development.

4.5.2.1 Summary

Schools are the second most important venues for learning after the home, and this is also where learners spend much of their time, particularly indoors for study and outdoors for play. As a result, the goal of my study was to investigate participants' level of knowledge and awareness of the issues surrounding SWM in schools. Findings of Bofela Secondary School revealed that teacher and learners were aware of the importance of SWM in school. The findings also shows that the teacher understood the issues relating to the environment since she was able to create an Eco-Club in the school. In future it would be advisable for all schools to have teachers or people who can promote the importance of keeping the environment free form solid waste disposal.

Table 4.9: Summary of findings of waste management challenges

Categories	**Characteristics**
Lack of resources	• Buy more bins in the school
Lack of support from stake holders	• Stakeholders support learners by educating them about important of managing waste.
Lack of knowledge of waste management	• Encourage teachers to integrate environment during teaching and learning of the lessons.

Source: Author

4.5.2.2 Findings

- Lack of resources

Bofela Secondary School stated that lack of resources in their school had led to their not separating waste into separate bags since there was a shortage of bins in school. They indicated that they were willing to continue with their recycling campaign and to educate everyone in the school about keeping their school clean. They hoped to reintroduce their flag of Eco-School.

- Lack of support from stakeholders

Lack of support from stakeholders contributed to poor SWM in school, although there was a teacher who was responsible for running a campaign of waste management. However, it was still hard for her since there was no support from the SGB, principal or other school staff. A lack of support from the municipality since they only came on certain days for waste collection also affected the school in many ways. For example, they had to keep the waste for some days that led to a bad smell.

- Lack of knowledge on waste management

At Bofela Secondary School, a teacher expressed having extensive knowledge in waste management due to studying environmental education (EE). However, the challenge she faced was being the sole provider of environmental knowledge to the learners in the school. This responsibility demanded a significant amount of her time, as she also taught other subjects. Nonetheless, her passion for educating learners about the significance of maintaining a waste-free environment and teaching them about the principles of recycling, reuse, and reduction remained unwavering.

4.5.3 Theme 3: Strategies of SWM Used in Schools

A club for SWM had been started at the school by Bofela Teacher. She claimed that they were able to start a group named “fighter” that was in charge of maintaining the cleanliness of the school. She continued that the existing club was completely operational. Mawela (2018) suggested that SGB members, teachers and school administrators created a policy for EE in the classroom. Bofela Teacher stated that they also made sure to remind students to use the accessible dustbins every morning during assembly to prevent littering. As a result of the teachers’ awareness of the damaging effects that solid waste has on the environment, there had been a positive shift in attitude and behaviour toward littering (Ahmed et al., 2020).

The school needs to purchase more bins and place bins in each class, according to learners at Bofela Secondary School. Bins are essential, as Gayanthika (2019) noted, citing them as the best alternative for waste management. Dustbins, according to Viljoen et al. (2021), not only assisted in reducing solid waste and benefiting the

environment, but they also enhanced aesthetics by giving people a convenient place to dispose of their solid trash. This was similar to what Bofela Teacher said when she said that their technique of recycling plastic had resulted in improvements to school cleanliness.

Bofela Teacher added that open burning of solid garbage was a smart idea because it was one of their solutions for when the municipality did not show up to collect waste. This was comparable to Nathanson's (2020) claim that open burning of solid trash, despite causing greenhouse gas emissions, is one of the most effective ways to reduce the amount of solid waste. Leaners at Bofela Secondary School also stated that a different method of managing solid waste involved digging a hole and dumping solid garbage inside of it.

I, therefore, believe that if the school can implement these goals in their strategic plan of reducing waste in the school by doing recycling, excess waste can be minimised. The school should continue to encourage learners to join the Eco-group.

4.5.3.1 Summary

Strategies that were used by teachers and learners in Bofela Secondary School promote better control of solid waste in the schools. These strategies also improved learners' awareness of SWM in school and even around the community that they were living in. Strategies included making boreholes using two litre bottles of cold drinks and putting small plants inside them before they planted them in the garden. Recycling of papers was also mentioned.

Table 4.10: Summary of findings on strategies of SWM used in schools.

Categories	**Characteristics**
Waste generation	Reduce the amount of waste that is generated in the school by implementing some strategies
Waste minimisation	Do more recycling with the learners and encourage learners to use more of the things that can be reused more than once

Source: Author

4.5.3.2 Findings

- Waste generation

Bofela Secondary School participants said that the most waste that was generated in the school plastic because the tuckshop sold packets of chips which most learners threw onto the top of the bins or around them. Tuckshops also sold drinks in plastic bottle. The question posed was: how many bin bags of solid waste do you have a week? Bofela Teacher stated that:

> *"about 8 to 10 of the large green bin, including different solid waste. Because at moment we not doing any recycling the reason for that we had recycling bin from Mondi and during weekends and holidays it was vandalised and it was lit on fire so Mondi took the bin back. But now, we getting more of the community help and we got our school fenced that something I am looking at getting back on recycling next year."*

- Waste minimisation

In order for them to minimise waste, the school had started a campaign to reuse bottles. This is what was stated by Bofela teacher:

> *"water fountains are commonplace in schools, so we recommended starting a scheme to encourage learners to bring their own reusable bottle from home. It could be a good opportunity to provide bottles that learners can use and will drastically reduce the amount of single use plastic waste that the school produce. The school is also an eco-school they have waste management team which is responsible for waste management across the school. This team devise plans to reduce waste, promote recycling and work with learners and families to produce less waste."*

4.6 SYNTHESIS OF THE CHAPTER

In the beginning, I posed research questions to which I will give concluding answers in the fallowing paragraphs.

The first research question posed in this research was: *What roles do learners and teachers play in SWM at school?* The majority of interviewed teachers and learners

were well aware of environmental challenges and listed common behaviours and actions that harmed or protected the environment. Deforestation, industrial pollution, water pollution through cultivating adjacent to rivers, harmful agriculture and solid waste disposal were environmental challenges reported by the interviewees. The importance of taking care of the environment was pointed out by most of the teachers and learners' reasons for it were mainly anthropocentric. For instance, the problem of waste lying around and pollution of water were seen as a danger to health. The various definitions and interpretations of sustainability, given by the teachers, emphasised their personal thoughts, such as the struggle of either sustaining the environment or the economy. Others gave concrete examples of separating waste into different packages, rather than mixing waste into one packages, or recycling it. Various channels through which this knowledge was received, such as schools, university and news, were mentioned by the interviewees. The teachers argued that EE does not receive enough time or attention in schools and suggested different ways of improvement, which indicated that they were not in favour of the current situation on the said topic.

The second research question was: *What are the existing strategies towards management of solid waste in school?* According to the teachers' SWM it predefined by the syllabus to be integrated in all subjects. However, only a few of the interviewed teachers gave concrete examples of how they manage their school solid waste. One stated that they recycled papers only; another one said they burned their waste since took take too much time to collect waste in school. Others said that they had an Eco-Club for the school where they educated learners about all 3Rs, reduce, reused and recycling.

The third research question was: *What are the challenges that are faced by school regarding solid waste disposal?* Teachers argued that more time and attention should be given to environmentally sustainable development. The argument was that without information, there was no opportunity to create an intention to act or behave differently. Other suggested enhancements were having an expert to teach the learners about environmentally sustainable development or even to create a separate subject. One of the challenges schools faced was the waste that is found outside their school premises but closed to the school fence. Other challenges were that waste was not

collected by municipalities for days. This caused problems for the school since they leave the waste outside the school gates. Problems were exacerbated by dogs opening the waste and spreading it outside the school gate.

The fourth research question was: *How can township school improve solid waste disposal?* Life Science teachers argued that if they could get support from all the stakeholders, there was a possibility of improving waste disposal. Other teachers also stated that the DBE needed to create programmes in school to educate both teachers and learners about waste disposal. The school principals and stakeholders have to also display school rules in bold of how waste has to be disposed in schools. Other teachers suggested that it was important for each class to have its own bins in which to put waste instead of having cardboard box to dispose waste. Other teachers also stated that township schools could create a campaign or competition where they could encourage other learners about proper waste disposal.

The conclusions suggest that teachers lack the content expertise necessary to implement SWM strategies in schools. The DBE must, therefore, offer comprehensive training. This study showed that when teachers have the right skills, they can effectively impart their knowledge to learners and can provide an example of environmentally beneficial behaviour that learners can follow. The results also show that SWM is not regarded as a critical component of learning and teaching by learners, teachers or school administration. According to this study, a lack of teaching and learning resources makes it difficult to teach and learn, so it is critical that schools have an adequate supply of these materials available. This study emphasises the value of outdoor education in the teaching and learning of EE since it offers another way to involve learners in the learning process while they engage with nature.

4.7 CONCLUSION

In conclusion, this chapter discussed how research questions were answered in terms of predetermined themes that were used to gather data from different schools and sources. The last chapter will discuss the summary, implication, recommendations and conclusion of this study.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary of the findings about the perceptions of teachers and learners on SWM in secondary schools in Umlazi district. The conclusions of this study are based on research questions, implications, limitations and recommendations.

5.2 SUMMARY OF THE STUDY

This section presents the summary of the perceptions of teachers and learners on SWM. This section also summarises each chapter from Chapter 1 to Chapter 5.

Chapter 1

This chapter discusses the background of the study including the problem statement, the rationale for the study, aim, objectives, research questions, study area, the study's methodology, ethical considerations and limitations.

Chapter 2

In this chapter, the literature was reviewed. A theoretical framework was then formulated for this study. The gaps in other studies which this study aimed to fill were identified, namely, that most studies concentrated on school environment education not on perceptions of teachers and learners' perceptions on SWM.

Chapter 3

The chapter discussed the research methodology of the study, which was a qualitative approach, a research design, data collection techniques, which were focus groups with six learners, face-to-face interviews with one teacher in each school and observations in three different secondary schools and it discussed how trustworthiness of the study was maintained.

Chapter 4

This chapter presented data and discussions of findings of this study. Data collected was analysed in terms of three predetermined themes that emanated from the sub-questions of this study. This chapter also indicated the synthesis of the findings in relation to SWM. This chapter further indicated the level of awareness, knowledge and practices of participants in terms of solid waste disposal at schools.

Chapter 5

This chapter discusses the overview of the summary of the findings, implications of the study, further study, recommendations, limitations of the study and draws the study to a close.

5.3 PRESENTATION OF FINDINGS BASED ON THE RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

The findings of this study were discussed according to the objective and research questions of the study.

5.3.1 Objective 1: To Determine Role of Teachers and Learners Waste Management in School.

This objective responds to the research question:

- What role do learners and teachers play in SWM at school?

The study revealed that the teacher's role in waste management in school is to educate the learners about the importance of waste management and teach learners about the 3Rs, namely, recycling, reuse and reduction, for learners to get an understanding of waste management. The findings of this study showed that the learners' role is to apply what they have been taught by the teacher in school and they can even apply it at home. For example, during the interview, Bofela Teacher stated that most of the time when they were learning topics based on waste disposal, she even told the learners to do at home like recycling of paper.

In contrast to Bofela Teacher, Sukuma Sakhe Teacher and Government Teacher, played a minimal role in ensuring that learners were exposed to proper SWM ways.

Sukuma Sakhe Secondary School revealed that for their school to manage their solid waste, learners needed to respond to the negative impact posed by littering on the environment. Learners were not aware of the importance of recycling and to separate solid waste into separate packages like glass, papers, plastics and garden waste. Learners needed to be taught about importance of nature. The schools needed to have campaigns about waste management where they would teach learners about the importance of taking care of the environment. There was no campaign at the moment and Sukuma Sakhe Teacher also thought that learners were not aware of importance of managing waste since nothing was done by the school. Only the caretakers were responsible for waste removal at the school and keeping the environment clean inside the classroom and around the school premises.

Government Teacher mentioned that she had implemented a strategy for late-coming learners at the school. However, there was a lack of emphasis on teaching them about the importance of nature and how to ensure their safety. She expressed a desire for the school to provide more education on the significance of the environment and waste management. In her lessons, she incorporated environmental topics, such as species classification. One activity involved going outside to count the number of species on the school grounds. During this observation, some learners mistakenly plucked leaves from the plants without permission, causing damage. She promptly corrected them, highlighting the importance of not harming nature. The learners at Bofela Secondary School exhibited good practices in waste management, including reducing, reusing, and engaging in fair recycling and proper disposal. The school also established an Eco-Club to educate learners about the 3Rs and organised recycling campaigns. In the past, the school received an Eco flag, indicating support from various stakeholders. Bofela Teacher, who taught Life Science, also actively led the Interact Club and Eco-Club.

5.3.2 Objective 2: To Explore Existing Strategies Towards SWM in Township Secondary School.

This objective responds to the research question:

- What are the existing strategies towards management of solid waste in school?

The study found that the teachers used question and answer methods during the lesson that were based on the environment. For example, Sukuma Sakhe Teacher was teaching learners about ecology and defined ecology as “interaction between plants, animals and their environments”. However, there was only one strategy that the school used for waste management in school. That strategy was the recycling of papers only. The reason for having one strategy was the lack of knowledge/awareness about SWM in school. However, Government Teacher revealed that in their classrooms they used cardboard boxes for learners to discard their solid waste. The waste that was generated in classrooms was mixed up in one box. The Life Science teacher also states that she was trying to educate learners about recycling of papers. Thus, in this school they had only one strategy for waste management which is the recycling of paper. Bofela Teacher further stated that in their school they had created an Eco-Club. The Eco-Club picked up waste around the school premises. However, there were two strategies that were used in Bofela Secondary School. The first strategy was recycling of papers and plastics and second strategy was using compost made from waste in the garden.

The schools used . similar strategies to minimise waste generated in schools. Strategies such as recycling of papers and plastics were used in schools. These were similar to the strategies that were found by O’Connell (2011) who stated that there was insufficient recycling and waste disposal facilities, a lack of access to facilities for collecting, sorting and separating trash, and a lack of government rules, incentives and enforcement mechanisms. Citizens in most industrialised countries such as Canada, Ireland, the United States of America, Japan and Australia, had a general distrust of local government officials. As a result, even nations with improved waste management policies and infrastructure had problems, such as the recycling of non-recyclable items and insufficient solid waste sorting and recycling (Singh et al., 2014). The findings in the current study align with Singh et al. (2014) that in most cases, waste collection was an issue most schools faced and that recycling was still an issue in schools due to lack of awareness of how to do recycling in schools. Different SWM techniques exist in many nations across the world. Composting, recycling, waste-to-energy technologies and sanitary landfilling are only a few of the best practices for waste disposal (Guerrero, 2013). I am of the view that these schools should adopt these model technologies of SWM.

Learners also suggested that each class must have monitors to check learners how they disposed of their waste. These monitors also need to be trained about waste management. Large posters should be displayed with warning signs about illegal dumping and actions that would be taken if the rules were broken. I therefore agreed with the learners' views that it is important to educate learners about the environment. According to the perception of learners at Sukuma Sakhe Secondary School, Sukuma Sakhe Secondary School, they were regarded as the primary contributors to solid waste generation. They explained that this was mainly due to their larger presence in the school population. As a potential solution, learners proposed that teachers should assign tasks that do not heavily rely on writing, thus reducing paper waste. Learners at Government Secondary School further suggested that the school tuck-shop should prioritise selling products made from reusable or recyclable materials. Government Teacher also acknowledged that a significant portion of the waste originated from the school tuck-shop and the distribution of copies to learners. Government Teacher "said that recycling is one of the strategies they used for waste minimisation".

5.3.3 Objective 3: To Explore Challenges that are Faced by Schools Regarding Solid Waste Disposal

This objective responds to the research question:

- What are the challenges that are faced by school regarding solid waste disposal?

The study's participants appeared concerned about a lack of resources since they saw this as a hindrance to teaching and learning. The participants also brought up the limitations of the classroom, and the lack of textbooks as the only teaching resources in the classroom appears to be an obstacle to learning. Yet, learners felt that they would appreciate outdoor education since it might give them a chance to engage with the natural world.

Municipality's improper disposal of solid and liquid hazardous waste within the township has led to the emergence of new environmental concerns (Simón et al., 2017). Sukuma Sakhe Teacher stated that: "*Municipality only collect waste in the school once a weak and he also stated that he wishes that municipality can collect waste twice a weak".* He further stated that *"Sometimes the municipality transport does not come to collects school waste and the waste is left outside the school gate for days."* This

relates to Rasmeni and Madyira (2023) as they described SWM as a process of collecting, transporting, processing, monitoring and disposing solid waste material in an appropriate manner.

Other challenges that schools are facing it a lack of supports from stakeholders' principals, SGB and other school staff are not doing anything to encourage solid waste minimisation in schools. *"Plastic is generated the most in school because tuck-shop sell packets of chips which most of learners throw it on the bin or around the school premises also selling of bottle drinks made of plastics".* There are several issues with waste disposal in public places, especially schools, including the scattering of food scraps and other abandoned items. As a result, rats may start invading and become carriers of diseases (Sridhar, 2019).

Increase the spread of disease or otherwise endanger the health of learners, teachers, school administrators and staff members. It can also contaminate the surrounding area by allowing toxic materials and pathogenic organisms to leak into an open waste dump, endangering the water supply of the area around the school, and generate unpleasant odours. I also asked one of the school caretakers what was happening with the black bags packed outside the school gate. He explained that the municipality did not come for waste collection on that date. This relates to Rasmeni and Madyira (2023) as they described SWM as a process of collecting, transporting, processing, monitoring and disposing solid waste material in an appropriate manner. Learners also stated that they do not have enough bins in schools; even in their classrooms they used cardboard boxes for waste. Sukuma Sakhe Teacher also stated that the school had never had any campaigns where they talked about the importance of waste management but he thought that there was a need to enlighten learners about the environment and how to keep the environment free from waste. Rural areas frequently lack adequate waste disposal facilities, so locals resorted to illegal dumping and burning, both of which have detrimental environmental effects. A learner from Bofela Secondary School stated that plastic was most of the waste that was generated in their school.

However, SWM is very challenging in schools since most of teachers are not well-educated about waste management. I believe that in future the DBE needs to integrate topics based on SWM into the curriculum or even in the policy documents. One of the

challenges was waste collection from schools due to delays from the municipal waste collector. I think the DBE needs to implement some interventions to help the schools solve this problem. Another challenge was that of teachers lacking knowledge of how to integrate SWM in their lessons. I believe that the schools and all stakeholders have to devise strategies of educating teachers about the environment.

5.3.4 Objective 4: To Determine How can Township Schools Improve Solid Waste Disposal

This objective responds to the research question:

- How can township schools improve solid waste disposal?

The study showed that most of the teachers thought that a school need to educate all teachers about the importance of the environment. All the stakeholders of the school need to be involved in the school programme for waste management. They further stated that for the schools to improve solid waste disposal, teachers need to learn how to integrate environmental education/education for sustainable development into their lessons. The schools also needed to encourage all staff members to educate their learners about SWM and the importance of waste disposal. Participants further suggested that in order for schools to improve waste disposal, the schools needed to buy more bins for each class and some bins needed to be put around the school premises. All bins needed to be labelled so that learners could learn that waste should be separated into glass, paper, plastic and biodegradable waste. Dustbins, in Viljoen et al.'s (2021) opinion, not only contribute to a reduction in solid waste and benefit the environment, but they also enhance the aesthetics by giving people a convenient place to dispose of their solid trash.

Schools can develop programmes that encourage students to bring their own reusable water bottles from home.

5.4 IMPLICATIONS OF THE STUDY

Poor waste management range from non-existing collection systems to ineffective disposal cause land pollution. Proper solid waste collection is important for protection of learners and teachers' health in school. In schools, they are faced with challenges of improper waste disposal since the municipality does not come frequently for waste

collection from the schools. The schools decided to burn the waste or bury it. Some of challenges school experienced are lack of awareness and waste management rules, no strict rules that penalise non-separation of waste and availability of collectors who did not refuse mixed waste. The schools can solve these issues by minimising the use of disposable items and promoting the use of recyclable items. They can also educate learners to separate biodegradable and non-biodegradable waste before dumping it and to recycle the non-biodegradable waste. Schools were also trying to minimise solid waste that was generated in school by teaching learners about recycling and creating Eco-Clubs to educate learners about the importance of recycling. Some schools created posters with warnings about improper waste disposal. in conclusion, it is important for all stakeholders of the school to take some responsibility for SWM at schools.

5.5 LIMITATIONS OF THE STUDY

This section presents the limitations of the study:

- The study involved three teachers who taught Life Sciences to Grade 10 learners. The study did not consider other subjects and grades in the schooling system.
- The study was limited to three schools. It was interesting to undertake a study of this kind. In the future, I would use a larger sample of districts.
- The study was a case study; thus, its conclusions cannot be applied to all teachers, but they can provide researchers with an idea of how to approach future research on how to incorporate solid waste in their lessons.

5.6 RECOMMENDATIONS OF THE STUDY

Arising from the findings of this study, the following recommendations are proposed:

5.6.1 Waste Generation

It is best to avoid using plastic bags, particularly those used by stores and supermarkets. One illustration is the practice of putting a loaf of bread in two plastic bags at once. It is time to start using recyclable paper bags in place of standard plastic

bags. Less waste production may result from the use of natural products like sorghum plastic.

5.6.2 Recycling and Reuse

In order to promote recycling and product reuse, waste products should be sold for a large amount. In terms of reducing and reusing as well as fair practices for recycling and proper disposal, the learners had good SWM practices. Learners from Bofela Secondary School also indicated that a strategy that was used to manage solid waste was digging holes in order to dispose of biodegradable solid waste and make compost.

5.6.3 Waste Separation

Schools ought to make the separation of garbage at the source clear. Waste separation at the school level could be accomplished with the use of coloured bags or bins. The danger to waste collectors of broken bottles in plastic bags should be made clear to learners, and they should be urged to segregate other waste.

5.6.4 Illegal Dumping of Waste

In order to make it harder for learners to dispose of waste outdoors, trees should be planted in open areas on the school grounds that can be turned into parks. Those who report the unauthorised disposal of waste in schools need to receive compensation. To ensure that this behaviour does not persist indefinitely, it is important to comprehend and address the causes behind learners' illicit waste disposal.

5.7 FURTHER STUDY

- This research was carried out at three schools in Umlazi District in the FET phase. It is advised that further research be done in the foundational and senior phases as well.

- Further studies can be conducted on the economic benefits of implementing the 3 Rs in the schools.

- Further studies can be conducted on the content that policy makers and study materials can incorporate to reduce improper solid waste disposal in schools.

5.8 REFLECTIONS

5.8.1 Case 1

In Case 1, the school had no recycling campaign. Learners were not taught about 3Rs in the classroom (reduce, reuse and recycling). My findings showed that teachers had no knowledge about solid waste practices and they were not aware that it was important to educate learners about SWM and create some activities that can encourage learners to keep the environment free from unnecessary waste disposal. Awareness of SWM was lacking in Sukuma Sakhe Secondary School.

5.8.2 Case 2

In Case 2, there was only recycling of papers not plastic and glass. Both teachers and learners lacked awareness of SWM. It was encouraging to here that learners were encouraging each other regarding issues of SWM. As in Case 1, the learners in Case 2 were not taught about SWM practices. Thus they lacked the awareness and the knowledge of proper solid waste disposal.

5.8.3 Case 3

Case 3 was different from Case 1 and 2. Poster on 3Rs were seen around the school (reduce, reuse and recycling). Even when I walked around the school, I observed that the school was well aware of the importance of keeping the environment clean. Even the school garden was clean. However, even though they had posters encouraging awareness about solid waste disposal, they did not have enough resources such as dustbins.

The findings of my study showed that Bofela Teacher had knowledge on SWM that helped in cascading environmental knowledge to learners. For example, during the classroom observation, Bofela Teacher was able to integrate a solid waste topic into the lesson. It was encouraging to see that Bofela Secondary School was involved in reducing littering in the school through the information of Eco-Club activities.

5.9 CONCLUSION

This study into the perceptions of teachers and learners regarding solid waste disposal in the Umlazi Districts was a success because the researcher was able to meet its objectives and aim. The conclusions showed that the teaching and learning in most schools did not successfully incorporate SWM. Although there was potential for incorporating proper solid waste disposal, it was clear that both teachers who did so and those who did not faced difficulties. The findings demonstrated that, when taking into account the instructional methodologies that teachers used, their inadequate knowledge of EE had a significant impact on how they incorporate SWM in their lessons. This study showed that in order for participants to incorporate proper SWM strategies, they need to play a leading role in the schools. The leading roles can be fully supported by the participants being aware, knowledgeable and actually practise proper SWM strategies that would ensure that the school environment and the surroundings are kept environmentally friendly.

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APPENDICES

APPENDIX A: ETHICAL CERTIFICATE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2022/09/07

Ref: **2022/09/07/48821942/16/AM**
Name: Ms PF Mzobe
Student No.:48821942

Dear Ms PF Mzobe

Decision: Ethics Approval from 2022/09/07 to 2025/09/07

Researcher(s): Name: Ms PF Mzobe
E-mail address: 48821942@mylife.unisa.ac.za
Telephone: 0844239407

Supervisor(s): Name: Prof SB Msezane
E-mail address: msezasb@unisa.ac.za
Telephone: 012 481 2888

Title of research:

Perceptions of Teachers and Learners on Solid Waste Management in uMlazi District Schools in KwaZulu-Natal

Qualification: MEd Curriculum studies

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 2022/09/07 to 2025/09/07.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2022/09/07 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 **2025/09/07**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2022/09/07/48821942/16/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

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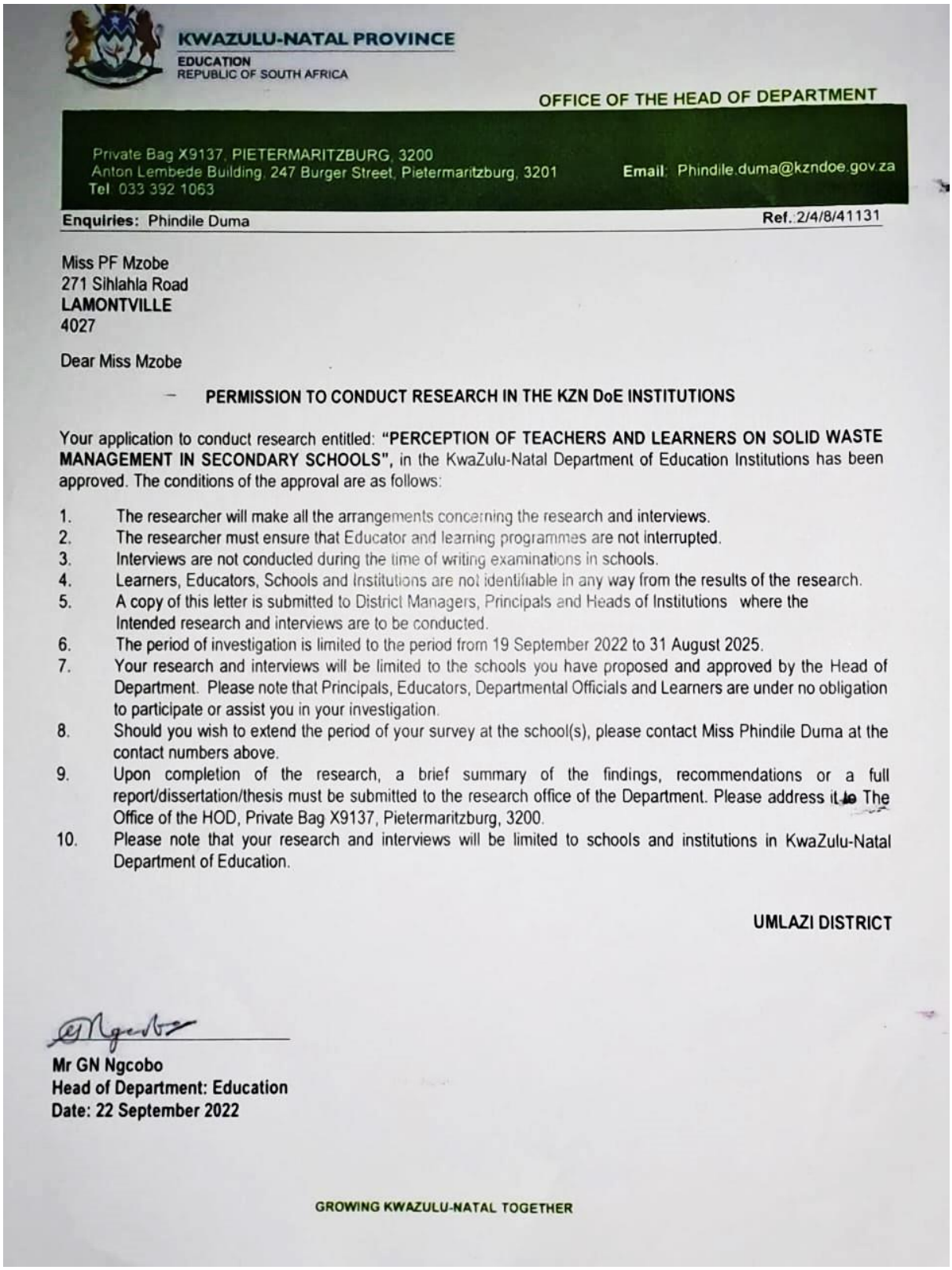
APPENDIX B: APPROVAL LETTER FROM DISTRICT



KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 392 1063
Email: Phindile.duma@kzndoe.gov.za

Enquiries: Phindile Duma
Ref.: 2/4/8/41131

Miss PF Mzobe
271 Sihlahla Road
LAMONTVILLE
4027

Dear Miss Mzobe

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"PERCEPTION OF TEACHERS AND LEARNERS ON SOLID WASTE MANAGEMENT IN SECONDARY SCHOOLS"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 19 September 2022 to 31 August 2025.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UMLAZI DISTRICT

Mr GN Ngcobo
Head of Department: Education
Date: 22 September 2022

GROWING KWAZULU-NATAL TOGETHER

APPENDIX C: REQUEST TO CONDUCT A STUDY IN SCHOOLS (CIRCUIT)

UNISA

APPENDIX C: Circuit

Enquiries: Miss.P.F.Mzobe

University of South Africa

Student No: 48821942

Cell No: 0844239407

271 Sihlahla Road

Lamontville

Durban

4027

Dear Sir/Madam

REQUEST TO CONDUCT INTERVIEWS IN YOUR CIRCUIT

My name is Princess Farida Mzobe. I am currently doing a Masters of Education (Med) in Environmental Education student at the University of South Africa who will be participating in fieldwork for my research project entitled, "Perception of teachers and learners on solid waste management in uMlazi district township Secondary Schools". My supervisor for this research is Prof SB Msezane, and associate Professor at the University of South Africa.

I humbly request permission to conduct research at Chesterville Secondary School, uMkhumbane Secondary School and Bonela secondary school. The research will be carried out for a period of one week in the school. One grade 10 teacher who teaches Life Sciences will be expected to participate in an hour interview which will be audio-taped. Interview will be conducted after school as I do not want to interfere with teachers contact time with learners. Classroom observation will also be done two times with the teacher. The teacher will be expected to teach and learners will be expected to learn while I will be observing data about how teacher teach Environmental Education or how teacher integrate Environmental topics such as Solid Waste Management in his/her lessons. The information collected from the interviews and classroom observations will be confidential and will be used for the purpose of my study.

Your school participation in this study is voluntary and confidential. All interviews will be audio-taped. Participants will have access to all transcripts from the interviews and the rights to review, change, or withdraw information or data that has been given. I will make every effort to ensure that the school and participants identities are not divulged. To ensure the protection of the school and

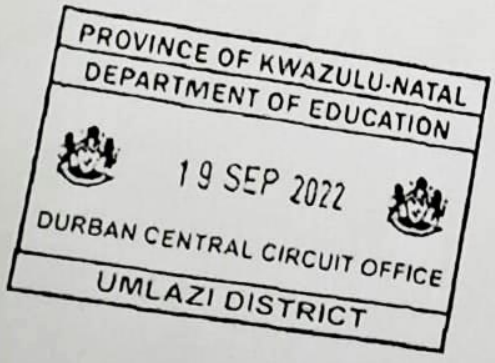
participants, I will ask all participants to use aliases or for the interviews. Participants are at liberty to withdraw from the research at any point without any penalties or negative consequences. All audio recordings and transcripts from interviews will be stored and locked away for safe keeping by the researcher.

I appreciate your sincere consideration to my request.

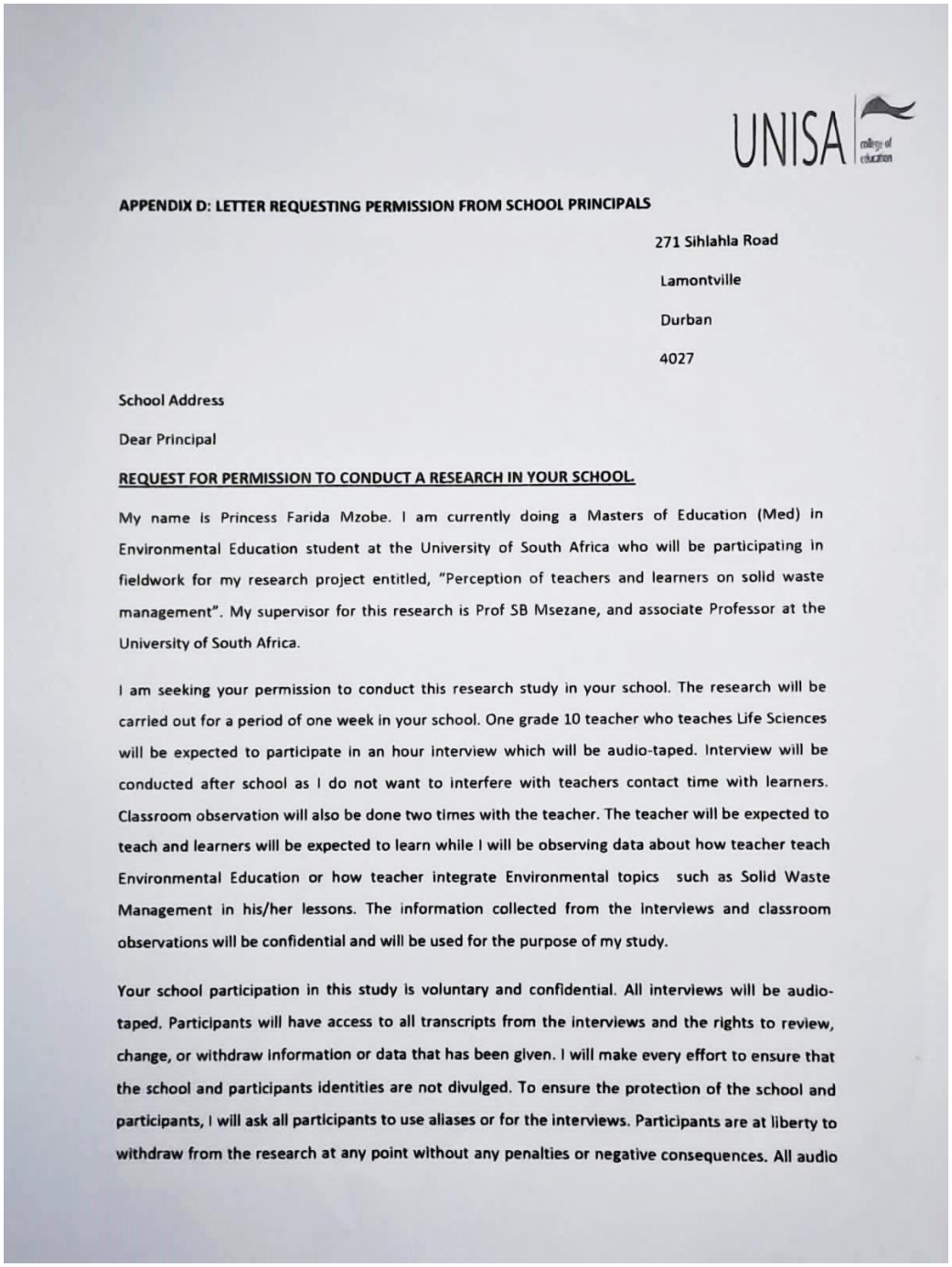
Yours faithfully

Miss.P.F.Mzobe

Circuit Manager
Signature



APPENDIX D: LETTER REQUEST PERMISSION FROM SCHOOL PRINCIPALS



UNISA college of education

APPENDIX D: LETTER REQUESTING PERMISSION FROM SCHOOL PRINCIPALS

271 Sihlahla Road

Lamontville

Durban

4027

School Address

Dear Principal

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH IN YOUR SCHOOL.

My name is Princess Farida Mzobe. I am currently doing a Masters of Education (Med) in Environmental Education student at the University of South Africa who will be participating in fieldwork for my research project entitled, "Perception of teachers and learners on solid waste management". My supervisor for this research is Prof SB Msezane, and associate Professor at the University of South Africa.

I am seeking your permission to conduct this research study in your school. The research will be carried out for a period of one week in your school. One grade 10 teacher who teaches Life Sciences will be expected to participate in an hour interview which will be audio-taped. Interview will be conducted after school as I do not want to interfere with teachers contact time with learners. Classroom observation will also be done two times with the teacher. The teacher will be expected to teach and learners will be expected to learn while I will be observing data about how teacher teach Environmental Education or how teacher integrate Environmental topics such as Solid Waste Management in his/her lessons. The information collected from the interviews and classroom observations will be confidential and will be used for the purpose of my study.

Your school participation in this study is voluntary and confidential. All interviews will be audio-taped. Participants will have access to all transcripts from the interviews and the rights to review, change, or withdraw information or data that has been given. I will make every effort to ensure that the school and participants identities are not divulged. To ensure the protection of the school and participants, I will ask all participants to use aliases or for the interviews. Participants are at liberty to withdraw from the research at any point without any penalties or negative consequences. All audio

recordings and transcripts from interviews will be stored and locked away for safe keeping by the researcher.

Should you require further clarification, please contact my research supervisor, Prof SB Msezane: email: msezasb@unisa.ac.za , Cell phone No: 012 481 2888

Yours Faithfully,

PRINCESS FARIDA MZOBE FMzobe 19/10/22

Fieldworker's full name Fieldworker's Signature Date

Fieldworker's details:

Name of Student: Miss Princess Farida Mzobe

Institution: University of South Africa

Course: Masters of Education (Med)

Cell: 0844239407

Email: 48821942@mylife.unisa.ac.za / sindimzobe1@gmail.com

DECLARATION

I..... (Full names of principal), hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to ..... (Full name of school) participating in the research project.

I understand that the school can withdraw from the project at any time.

....

SIGNATURE OF GATEKEEPER (PRINCIPAL) DATE

Contact details

Initials and Surname of Principal: .....

Telephone: .....

Email: .....

APPENDIX E: LETTER REQUESTING PERMISSION FROM TEACHER

UNISA college of education

APPENDIX E: LETTER REQUESTING PERMISSION FROM TEACHER

271 Sihlahla Road

Lamontville

Durban

4027

Dear Sir/Madam

REQUEST YOUR PARTICIPATION IN THE RESEARCH (TEACHER)

My name is Princess Farida Mzobe. I am currently doing a Masters of Education (Med) Environmental Education student at the University of South Africa who will be participating in fieldwork for my research project entitled, "Perception of teachers and learners on solid waste management". My supervisor for this research is Prof SB Msezane, and associate Professor at the University of South Africa.

I humbly request your participation in the research to be conducted in your school. The research will be carried out for a period of one week in your school. One grade 10 teacher who teaches Life Sciences will be expected to participate in an hour interview which will be audio-taped. Interview will be conducted after school as I do not want to interfere with teachers contact time with learners. Classroom observation will also be done two times with the teacher. The teacher will be expected to teach and learners will be expected to learn while I will be observing data about how teacher teach Environmental Education or how teacher integrate Environmental topics such as Solid Waste Management in his/her lessons. The information collected from the interviews and classroom observations will be confidential and will be used for the purpose of my study.

Your school participation in this study is voluntary and confidential. All interviews will be audio-taped. Participants will have access to all transcripts from the interviews and the rights to review, change, or withdraw information or data that has been given. I will make every effort to ensure that the school and participants identities are not divulged. To ensure the protection of the school and participants, I will ask all participants to use aliases or for the interviews. Participants are at liberty to withdraw from the research at any point without any penalties or negative consequences. All audio recordings and transcripts from interviews will be stored and locked away for safe keeping by the researcher.

Should you require further clarification, please contact my research supervisor, Prof SB Msezane: email: msezasb@unisa.ac.za , Cell phone No: 012 481 2888

Yours Faithfully,

PRINCESS FARIDA MZOBE Mzobe 18/10/22

Fieldworker's full name Fieldworker's Signature Date

Fieldworker's details:

Name of Student: Miss Princess Farida Mzobe

Institution: University of South Africa

Course: Master of Education (Med)

Cell: 0844239407

Email: 48821942@mylife.unisa.ac.za / sindimzobe1@gmail.com

DECLARATION

I..... (Full names of teacher), hereby confirm that I understand the contents of this document and the nature of the research. I agree to take part in the interviews. I understand that I can withdraw from the research at any time.

SIGNATURE OF TEACHER DATE

Contact details

Initials and Surname of teacher:

Telephone:

Email:

APPENDIX F: LETTER REQUESTING PERMISSION FROM LEARNERS

UNISA college of education

APPENDIX F: LETTER REQUESTING PERMISSION FROM LEARNERS

271 Sihlahla Road

Lamontville

Durban

4027

Dear learners

REQUEST YOUR PARTICIPATION IN THE RESEARCH (LEARNERS)

My name is Princess Farida Mzobe. I am currently doing a Masters of Education (Med) in Environmental Education, student at the University of South Africa who will be participating in fieldwork for my research project entitled, "Perception of teachers and learners on solid waste management". My supervisor for this research is Prof SB Msezane, and associate Professor at the University of South Africa.

I humbly request your participation in the research to be conducted in your school. The research will be carried out for a period of one week in your school. One grade 10 teacher who teaches Life Sciences will be expected to participate in an hour interview which will be audio-taped. Interview will be conducted after school as I do not want to interfere with teachers contact time with learners. Classroom observation will also be done two times with the teacher. The teacher will be expected to teach and learners will be expected to learn while I will be observing data about how teacher teach Environmental Education or how teacher integrate Environmental topics such as Solid Waste Management in his/her lessons. The information collected from the interviews and classroom observations will be confidential and will be used for the purpose of my study.

Your school participation in this study is voluntary and confidential. All interviews will be audio-taped. Participants will have access to all transcripts from the interviews and the rights to review, change, or withdraw information or data that has been given. I will make every effort to ensure that the school and participants identities are not divulged. To ensure the protection of the school and participants, I will ask all participants to use aliases or for the interviews. Participants are at liberty to withdraw from the research at any point without any penalties or negative consequences. All audio recordings and transcripts from interviews will be stored and locked away for safe keeping by the researcher.

Should you require further clarification, please contact my research supervisor, Prof SB Msezane: email: msezasb@unisa.ac.za , Cell phone No: 012 481 2888

Yours Faithfully,

PRINCESS FARIDA MZOBE

Fieldworker's full name

Fieldworker's details:

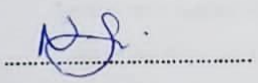
Name of Student: Miss Princess Farida Mzobe

Institution: University of South Africa

Course: Master of Education (Med) in Environment Education

Cell: 0844239407

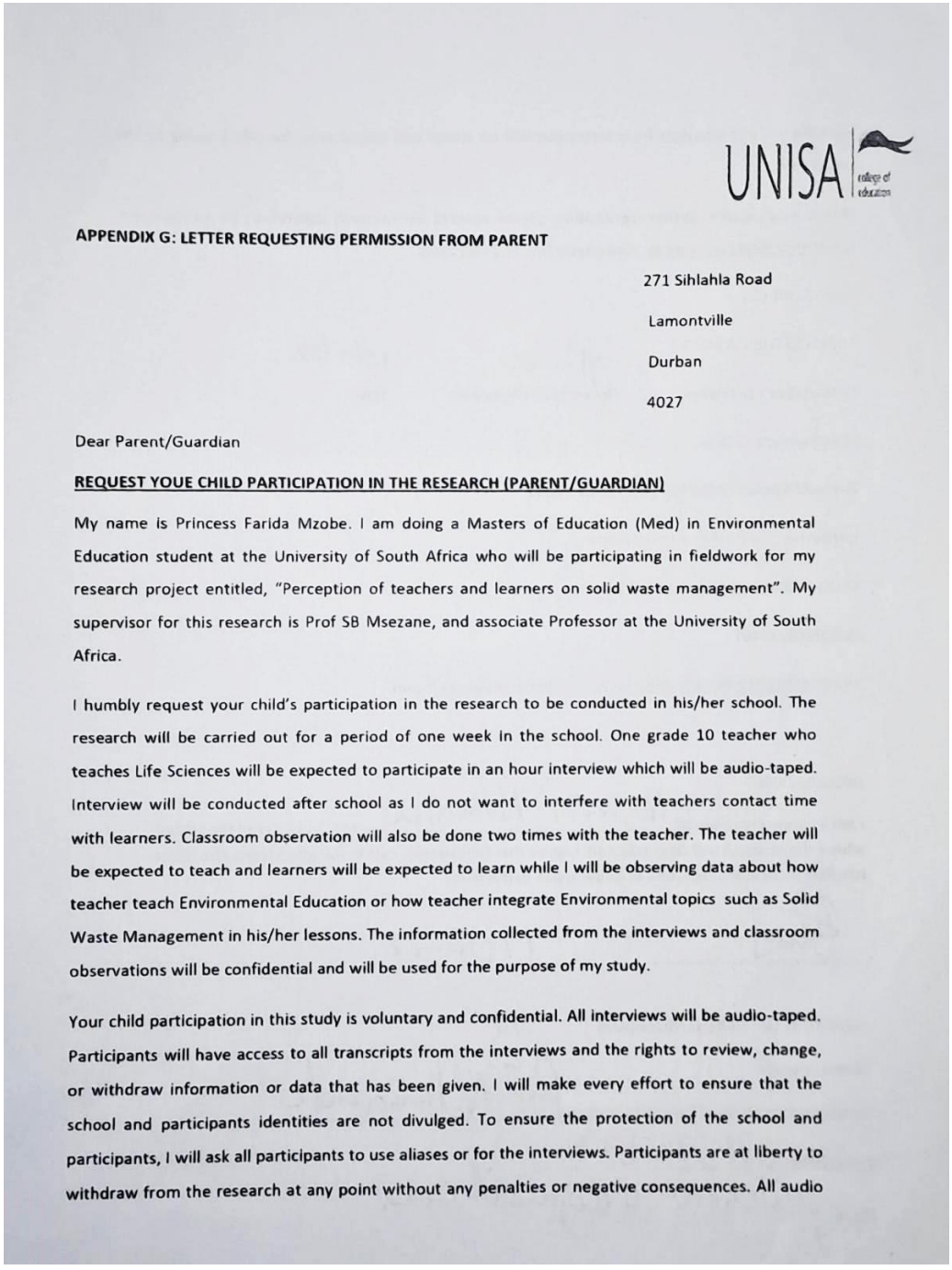
Email: 48821942@mylife.unisa.ac.za / sindimzobe1@gmail.com



19/10/22

Learner Signature Date

APPENDIX G: LETTER REQUESTING PERMISSION FROM PARENT



UNISA college of education

APPENDIX G: LETTER REQUESTING PERMISSION FROM PARENT

271 Sihlahla Road

Lamontville

Durban

4027

Dear Parent/Guardian

REQUEST YOUE CHILD PARTICIPATION IN THE RESEARCH (PARENT/GUARDIAN)

My name is Princess Farida Mzobe. I am doing a Masters of Education (Med) in Environmental Education student at the University of South Africa who will be participating in fieldwork for my research project entitled, "Perception of teachers and learners on solid waste management". My supervisor for this research is Prof SB Msezane, and associate Professor at the University of South Africa.

I humbly request your child's participation in the research to be conducted in his/her school. The research will be carried out for a period of one week in the school. One grade 10 teacher who teaches Life Sciences will be expected to participate in an hour interview which will be audio-taped. Interview will be conducted after school as I do not want to interfere with teachers contact time with learners. Classroom observation will also be done two times with the teacher. The teacher will be expected to teach and learners will be expected to learn while I will be observing data about how teacher teach Environmental Education or how teacher integrate Environmental topics such as Solid Waste Management in his/her lessons. The information collected from the interviews and classroom observations will be confidential and will be used for the purpose of my study.

Your child participation in this study is voluntary and confidential. All interviews will be audio-taped. Participants will have access to all transcripts from the interviews and the rights to review, change, or withdraw information or data that has been given. I will make every effort to ensure that the school and participants identities are not divulged. To ensure the protection of the school and participants, I will ask all participants to use aliases or for the interviews. Participants are at liberty to withdraw from the research at any point without any penalties or negative consequences. All audio

recordings and transcripts from interviews will be stored and locked away for safe keeping by the researcher.

Should you require further clarification, please contact my research supervisor, Dr SB Msezane: email: msezasb@unisa.ac.za , Cell phone No: 012 481 2888

Yours Faithfully,

PRINCESS FARIDA MZOBE Mzobe 18/10/22

Fieldworker's full name Fieldworker's Signature Date

Fieldworker's details:

Name of Student: Miss Princess Farida Mzobe

Institution: University of South Africa

Course: Masters of Education (Med)

Cell: 0844239407

Email: 48821942@mylife.unisa.ac.za / sindimzobe1@gmail.com

DECLARATION

I am a parent/guardian of Nolwazi Ndimande who is a learner of the school where the research will be conducted. I agree that he/she take part in the interviews. Also allow him/her to be video recorded or audio taped in the study.

..... 19.10.22

SIGNATURE OF PARENT/GUARDIAN DATE

Contact details

Initials and Surname of Parent/Guardian: P.P. Ndimande

Telephone: 0783720859

Email: phdcania74@gmail.com

APPENDIX H: OBSERVATION SCHEDULE AT SCHOOLS

LESSON OBSERVATION GUIDE

A. Teacher's personal information

Subject……. Class……No. of Leaners……..

Gender……Age…….Teacher's experience……..Educ. Level……

Previous training in the Teaching of EE:

……
……

B. Details of the lesson

Topic:

Was the topic related to environmental education? Yes/No……

If not, how were environmental aspects addressed in the topic?

Environmental education content:

What was environmental education content brought up in the lesson?

Knowledge of subject matter:

How knowledgeable was the teacher about the environmental education content which he/she taught?

Involvement of learners:

How did the teacher involve the learners in the lesson?

Teaching/learning materials:

What kind of teaching/learning materials did the teacher use?

Assignments:

What kind of assignments did the teacher give to the learners?

Were they related to environmental aspects?

Post-observation question

a. To what extent do you think you have been successful in integrating EE components in your lesson?

b. Do you use outdoor experiences to teach your lesson? Yes/No

   Give reasons for your answer.

c. Do you use the school environment in teaching the content of your subject? Give some examples.

d. What challenges do you face in your day to day classroom practice in teaching environmental education?

APPENDIX I: FACE-TO-FACE INTERVIEW GUIDE

QUESTIONNAIRE GUIDE for TEACHERS

Date: _____

A. **BACKGROUND INFORMATION**

1. Organisation _____
2. Gender. Male ☐ Female ☐
3. Qualifications: 1st Degree 2☐ Degree Indicate, if a☐ _____
4. Current occupation _____
5. Years of Services: As a trainer _____years. On current position_____ years. Other assignment _____/___years. Total _____ years.

B. SEMI-STRUCTURED INTERVIEWS GUIDE

1. How do you get rid of solid waste in school?

2. Which general solid waste do you have more in the school?

3. About how many bin bags of solid waste do you have a week?

4. What do you do with your garden waste?

5. What is your level of satisfaction with the current solid waste removal in the school?

6. Is there a need for more frequent of solid waste removal in school?

7. What do you think about the current solid waste management practices in school?

8. What do you think about littering and illegal dumping in the country?

9. How do you feel about separating your glass and metal, paper and plastic and perishable into separate bags?

10. Waste such as glass, metals, plastics and papers can be sold for cash. Would you like to make money in this way?

11. How do you feel about air, water and ground pollution in South Africa?

12. Do you read the newspaper and learn about protecting the natural

13. Do you believe that our children are the future, and we must protect nature for them as well?

14. Would you use book and paper made from recycled material?

15. Do you integrate environmental topics on your lessons?

16. How can schools improve solid waste disposal?

17. What role do you play in solid waste management in your school?

18. Are there any existing strategies toward management of solid waste in school?

APPENDIX J: FOCUS GROUP GUIDE

FOCUS GROUP INTERVIEW GUIDE for LEARNERS

Date _____

A. Background information

1. Organisation _____
2. Gender. Male ☐ Female ☐
3. Age group. Under 18 ☐ Above 18 ☐
4. Grade _____

B. FOCUS GROUP INTERVIEW GUIDE.

1. What is the importance of Environment?

2. How do you get rid of waste in your school?

3. About how many bin bags of solid waste generated a week in your school?

4. Are you learners responsible for disposing sold waste?

5. What do you do with your solid waste generated in school?

6. Which of the solid waste that forms the bulk of waste in the school?

7. Which general solid waste do you have more in your school?

8. What is your level of satisfaction with the current solid waste removal in your school?

9. Is there a need for more frequent of solid waste removal in your school?

10. Do you learn about caring for nature and the environment in your school?

11. How often do you dispose litter incorrectly?

12. How do you feel about separating glass and mental, paper and plastic and perishables into separate bag?

13. Who should be responsible for the school environment?

14. How air, water and ground pollution in your school?

15. Why is keeping the environment free from waste so important?

16. How can the school reduce littering of solid waste in the classrooms?

17. Do you think refuse can cause any harm in your health?

18. If yes. How?

19. What role do you play in your school and community to keep environment safety/sustainable for future generation?

20. Have any people informed you of the need to put waste away properly?

22. How can your school improve solid waste disposal?

23. What role as learner do you play in solid waste management in school?

24. What are the challenges faced by the school regarding solid waste disposal?

APPENDIX K: TRANSCRIPTIONS FOR FACE-TO-FACE AND FOCUS GROUP (Case A)

QUESTIONNAIRE GUIDE FOR TEACHERS

SCHOOL A

QUESTIONS	ANSWERS
1. How do you get rid of solid waste in school?	• It usually taken by municipality.
2. Which general solid waste do you have more in the school?	• Old furniture broken desk.
3. About how many bins bags of solid waste do you have a week?	• 10+
4. What do you do with your garden waste?	• Nothing since we don't have garden to make compost.
5. What is your level of satisfaction with the current solid waste removal in the school?	• Good because we have ground man who pick up waste in school premises.
6. .Is there a need for more frequent of solid waste removal in school?	• Yes, if it can happen twice a week not once a week.
7. What do you think about the current solid waste management practices in school?	• It not efficient since we don't have garden, because the biodegradable waste can be recyclable in order to make compost.
8. What do you think about littering and illegal dumping in the country?	• Very bad, and there is a need to educate people about the importance of keeping the environment safety, and most of the people are not well-informed about littering.
9. How do you feel about separating your glass and metal, paper and plastic and perishables into separate bags?	• I think it good, because you can do recycling.
10. Waste such as glass, metals, plastics and paper can be sold for cash. Would you like to make money in this way?	• No, I don't want maybe papers because glass I never explore it.

11. How do you feel about air, water and ground pollution in South Africa?	• I think there is a lot of pollution in South Africa most especial in our townships they are quite polluted.
12. Did you read the newspaper and learn about protecting the natural environment?	• No.
13. Do you believe that our children are the future, and we must protect nature for them as well?	• Yes
14. Would you use books and paper made from recycled material?	• Yes
15. Do you integrate environmental topics in your lessons?	• Yes, I do try especially when we are talking about global warming.
16. How can school improve solid waste disposal?	• Put bins around the school.
17. What role do you play in solid waste management in your school?	• Emphasising to learners about the importance of keeping environment free from waste.
18. Are there any existing strategies toward management of solid waste in school?	• Yes, only recycling papers.

FOCUS GROUP INTERVIEWS

LEARNERS IN SCHOOL A

QUESTIONS	**ANSWERS**
1. What is the importance of environment?	• The environment is important because most of the resources we use are from the nature/environment such as minerals. • Because us as human being we depend on the environment and also the environment depend on human.
2. How do you get rid of waste in your school?	• We do recycling.
3. About how many bin bags of solid waste generated a week in your school?	• 10 per week.
4. Are you learners responsible for disposing solid waste?	• Yes.
5. What do you do with solid waste generated in school?	• Municipality collect it.

6. Which of the solid waste that form bulk of waste in the school?	• Plastic.
7. Which general solid waste do you have more in your school?	• Papers and plastics
8. What is your level of satisfaction with the current solid waste removal in your school?	• Not satisfied.
9. Is there a need for more frequent of solid waste removal in your school?	• Yes.
10. Do you learn about caring for nature and the environment in your school?	• No, because we are not taught about taking care of the environment although in Life Science some topic does involve the environment. But we are not taught deeply about the importance of environment and we also feel that learners that are not doing Life Science they are not even aware of the importance of the environment.
11. How often do you dispose litter incorrectly?	• Sometimes.
12. How do you feel about separating glass and mental, paper and plastic and perishables into separate bag?	• We think it a good idea.
13. Who should be responsible for the school environment?	• Both teachers and learners.
14. How air, water and ground pollution in your school?	• Very bad, especial land pollution.
15. Why is keeping the environment free from waste so important?	• So that animals that live on the environment are safe.
16. How can the school reduce littering of solid waste in the classrooms?	• Having more bins in classrooms. • Learners should be encouraged to not litter in school yard/premise.
17. Do you think refuse can cause harm in your health?	• Yes.
18. If yes. How?	• Especial to those people who have diseases such as TB air pollution affect them a lots.
19. What role do you play in your school and community to keep environment safety/sustainable for future generation?	• I try not to litter incorrectly most of the time. • I encourage other learners to stop littering.

20. Have any people informed you of the need to put waste away properly?	• No, only in primary school.
21. Do you think teachers make a different in the way you treat litter?	• Yes, like the one teacher who used to tell learners every morning to pick up the papers in the assembly?
22. How can your school improve solid waste disposal?	• By teaching learners the importance of waste management. Educate learners more about 4 Rs.
23. What role as learners do you play in solid waste management in school?	• Encourage my classmate to clean the classroom.
24. What are the challenges faced by the school regarding solid waste disposal?	• Sometimes the municipality transport doesn't come and the waste remains outside the school gate for days.

APPENDIX L: TRANSCRIPTIONS FOR FACE-TO-FACE AND FOCUS GROUP (Case 2)

QUESTIONNAIRE GUIDE FOR TEACHERS

SCHOOL B

QUESTIONS	ANSWERS
1. How do you get rid of solid waste in school?	• Each class have box to put waste.
2. Which general solid waste do you have more in the school?	• Papers.
3. About how many bins bags of solid waste do you have a week?	• About 20.
4. What do you do with your garden waste?	• We make compost.
5. What is your level of satisfaction with the current solid waste removal in the school?	• I'm not satisfied because bins may be full in one day than it will be filthy around the, for the next four days because waste only taken out for transportation on Monday.
6. Is there a need for more frequent of solid waste removal in school?	• Yes, the is a need because we are waking with papers and tuck-shop they are selling, so even we may reduce the paper striping in class but still if the go to tuck-shop defiantly the will be some plastic and papers.
7. What do you think about the current solid waste management practices in school?	• It not efficient.
8. What do you think about littering and illegal dumping in the country?	• It a shame we are not doing well in township there is a lot of littering in suburbs littering is minimal but I have notice that people in suburbs they take their waste and litter it around in township because the is no fine in townships and they fear the fines in their area. In rural areas there is no

	management of waste at all it depend on each household to burn the waste.
9. How do you feel about separating your glass and metal, paper and plastic and perishables into separate bags?	• That is the very good idea so that the people from municipality cannot get harmed while collecting waste. It needs to be done for safety reasons as well and for recycling.
10. Waste such as glass, metals, plastics and paper can be sold for cash. Would you like to make money in this way?	• Plastic and papers they can be sold for cash and they can also be used to make chair for learners during break time, I like the school to make money through waste.
11. How do you feel about air, water and ground pollution in South Africa?	• I think there is a lot of pollution in South Africa most especial in our townships they are quite polluted.
12. Did you read the newspaper and learn about protecting the natural environment?	• I don't buy newspapers now but before the smart phones I use to buy it, but now I'm using the smartphones to read the news.
13. Do you believe that our children are the future, and we must protect nature for them as well?	• Yes, our children are the future they have to protect the nature because the very same nature will be used by their children if they destroy it now it means their children's will not have the natural resources that we are having.
14. Would you use books and paper made from recycled material?	• Yes.
15. Do you integrate environmental topics in your lessons?	• Yes, like we were doing in classifications of species, we went outside to calculate the number of species that we have, during outside observation of species some learners remove leaves from the species without the permission by doing that they were damaging the plant.
16. How can school improve solid waste disposal?	• They can have dumping site which have big whole where they can dispose the bags so that on Monday they can take out for the municipality to collect it.

17. What role do you play in solid waste management in your school?	• When learners came late at school I ask them to pick up the paper or plastics around the school premises but it not enough because I don't have many periods where I can be free.
18. Are there any existing strategies toward management of solid waste in school?	• Yes, recycling of papers.

FOCUS GROUP INTERVIEWS

LEARNERS IN SCHOOL B

QUESTIONS	ANSWERS
1. What is the importance of environment?	• We have to keep the environment clean, so that people can breathe fresh air. • Keep it clean so that the plants can be beneficial to us provide oxygen.
2. How do you get rid of waste in your school?	• By cleaning the school, we also have people who clean the school. We also put the waste into the black bags and DSW truck come and takes it.
3. About how many bin bags of solid waste generated a week in your school?	• About 20 a week.
4. Are you learners responsible for disposing solid waste?	• Yes we are.
5. What do you do with solid waste generated in school?	• Sometimes we use it for recycling, sometimes we usually through it away.
6. Which of the solid waste that form bulk of waste in the school?	• Plastic.
7. Which general solid waste do you have more in your school?	• Papers and plastics
8. What is your level of satisfaction with the current solid waste removal in your school?	• Not satisfied, because we don't have the bins in class to put waste we are using card box that sometimes can't hold the amount of waste that is being generated in class.
9. Is there a need for more frequent of solid waste removal in your school?	• Yes, actually they are workers in the school but they are lazy.

10. Do you learn about caring for nature and the environment in your school?	• A little bit only in Life Science classes, physical science, geography and agriculture.
11. How often do you dispose litter incorrectly?	• Since Grade 8.
12. How do you feel about separating glass and mental, paper and plastic and perishables into separate bag?	• They don't do recycling in school they never done the separating of waste in different packages.
13. Who should be responsible for the school environment?	• Us as learners and also teachers because most of them are old.
14. How air, water and ground pollution in your school?	• Poor, because there is a lots of pollution on the ground.
15. Why is keeping the environment free from waste so important?	• Because waste could harm some organism.
16. How can the school reduce littering of solid waste in the classrooms?	• By putting bins around the school and in classes, hire new staff members to clean the school also teach learners about the importance of environment. Also create a roster of learners to pick up the papers around the school.
17. Do you think refuse can cause harm in your health?	• Yes.
18. If yes. How?	• When causing air pollution it affects those who have breathing problem or sinuses.
19. What role do you play in your school and community to keep environment safety/sustainable for future generation?	• Not throwing the papers on the ground. • Teaching other learners about not to litter everywhere.
20. Have any people informed you of the need to put waste away properly?	• Yes, teachers but only in primary school.
21. Do you think teachers make a different in the way you treat litter?	• No, because if they are contributing they should have teach us from Grade 8 about the safety of environment but instead they don't emphasise that.
22. How can your school improve solid waste disposal?	• By educating learners about the importance of keeping environment clean.
23. What role as learners do you play in solid waste management in school?	• Encourage my classmate to clean the classroom.

24. What are the challenges faced by the school regarding solid waste disposal?	• The challenges is that the school cause air pollution when they are burning waste.

APPENDIX M: TRANSCRIPTIONS FOR FACE-TO-FACE AND FOCUS GROUP (Case 3)

QUESTIONNAIRE GUIDE FOR TEACHERS

SCHOOL C

QUESTIONS	ANSWERS
1. How do you get rid of solid waste in school?	• It taken away by waste disposal.
2. Which general solid waste do you have more in the school?	• Plastic because tuck-shop sell packet of chips which most of learners throw it on the bin or around also they are selling bottle drinks made of plastics.
3. About how many bins bags of solid waste do you have a week?	• About 8 to 10 of the large green bin, including different solid waste. Because at the moment we not doing any recycling the reason for that we had recycling bin from Mondi and during the weekends and holidays it was vandalised and it was lit on fire so Mondi took the bin back. But now we are getting more of the community help and we got our school fenced that something I'm looking at getting back next year
4. What do you do with your garden waste?	• We make compost for our garden.
5. What is your level of satisfaction with the current solid waste removal in the school?	• Not good, because we not doing recycling. As much as interact club is trying to do some recycling we still don't have proper infrastructure and that what I have to work on next year.
6..Is there a need for more frequent of solid waste removal in school?	• I think we need more recycling infrastructure than removal we will actual have less to remove if we do our recycling correctly.
7. What do you think about the current solid waste management practices in school?	• It not helping the environment because all our solid waste is going straight to the landfill sites.

8. What do you think about littering and illegal dumping in the country?	• I'm so sad that why I have taken it as responsibility to do something at school level so that my learners can take it to the community. And spread there because landfill site one that we have near us that I pass all the time is in clerestate and landfill site is now come on to the road because people are just abusing the whole system. We seem to not have solid waste disposal system anymore
9. How do you feel about separating your glass and metal, paper and plastic and perishables into separate bags?	• I differently enforce that, I try to do that at home and I'm trying to do that at school now.
10. Waste such as glass, metals, plastics and paper can be sold for cash. Would you like to make money in this way?	• That what we trying to do I have an interact club so they need to do fundraising and that something that we are looking at in the new year to start getting this things in place where they can collect and sell so that they can get the money to use for the activities.
11. How do you feel about air, water and ground pollution in South Africa?	• It very bad at the moment because we can't even go to our beaches so that affecting tourism it is affecting us as wanting to enjoy holiday so the water defiantly it not good and it sad the soil is also being affected with the whole lot of pollution I really think we need to catcher wake up in our country when it comes to pollution, recycling and maintaining our environment.
12. Did you read the newspaper and learn about protecting the natural environment?	• Because I'm in the field of science it been there through my studies and being an educator I'm now trying to teach it and educate in the school so I'm generally try to keep updated with current affairs with things that are happening in overseas other countries and you notice what I mansion in class, I mansion that I do that across the board from Grade 9 I teach NS I'm cooperating I bring it in and the

	Life Sciences Grade 10 and 11 even my Grade 12 class so I just hope somewhere along the line the learners also it filters through and goes to their homes and communities
13. Do you believe that our children are the future, and we must protect nature for them as well?	• It and you had me saying they are the once that need to make the difference because they have been told what the problem they been told what the solution they just have to implement now. So I think schools play a big role because as I mansion to one of my learners to that in primary school they seem to be a lot more awareness made with the kids and children are eager to do this recycling collect the this do that and as soon as they come to high school we just push academics only and performance and we forget about the holistic growth of the child. So I really think high school needs to maybe even to in cooperate it into the syllabus
14. Would you use books and paper made from recycled material?	• I will actually help a student not in the school but another school to do a project where they took paper recycled it like mashed it up and made it into reusable paper for like cards and artistic staff.
15. Do you integrate environmental topics in your lessons?	• I do sometimes my children get that irritated because I can deviate to that so easily I suppose because I have been studying you know reading it really of the passion for me so I do that.
16. How can school improve solid waste disposal?	• I defiantly think better management of recycling I think where it will start because it will cut down you know when we talk about recycling than we also have organic waste which we can incorporate it into a school garden or something like that and we use to do that pre-covid I had Eco warrior club they

	were planting and they were using all the staff like holmic economics learners were told don't through your staff in the bin give it to us we will put it for our compost bring staff from home and make your compost even once they learn they can do it at home so we were doing that at one stage at school we even had green flags for the Eco-schools
17. What role do you play in solid waste management in your school?	• I am the science teacher but I run interact club and an Eco-club.
18. Are there any existing strategies toward management of solid waste in school?	• Yes because of our Eco-Club now we going to be putting that more into implementation next year. So we have started in a small way like the kids had litter campaign and they use to go in the morning with their bin bucket and pick up litter and then they slowly in the next term they will start to move it to each grade and told them to clean your area

FOCUS GROUP INTERVIEWS

LEARNERS IN SCHOOL C

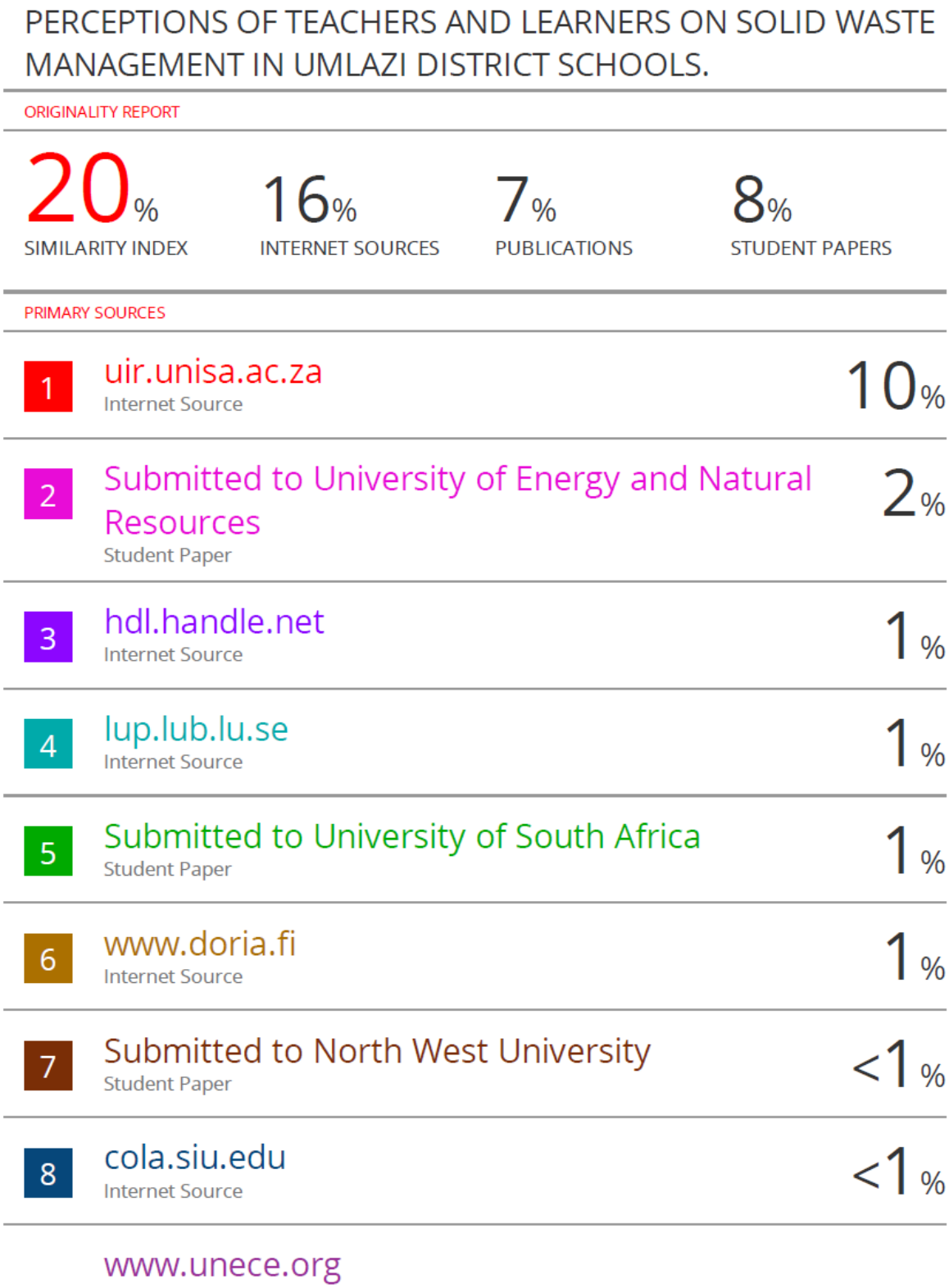
QUESTIONS	ANSWERS
1. What is the importance of environment?	• The importance of an environment is to look after it because it help us in other ways that we can like is safe around it if the environment is clean and we look after it. • The importance of environment it lies to the fact that it beastly our whole surrounding so it provide us with almost all the natural resources that we need as human beings like the oxygen water and all of that it beastly important because we need it for survival.

2. How do you get rid of waste in your school?	• Littering campaign it stated in term one.during this campaign we walk around the school picking all the dirty.
3. About how many bin bags of solid waste generated a week in your school?	• About 20 a week.
4. Are you learners responsible for disposing solid waste?	• Yes we are.
5. What do you do with solid waste generated in school?	• We recycle it and reuse it to make plants pots.
6. Which of the solid waste that form bulk of waste in the school?	• Plastic.
7. Which general solid waste do you have more in your school?	• Papers and plastics
8. What is your level of satisfaction with the current solid waste removal in your school?	• Satisfied in the way of progress it clean.
9. Is there a need for more frequent of solid waste removal in your school?	• Yes, so that the school can be supper clean. • Yes I think it will be really helpful because seeing the consistent of litter being picked up will give kids the mind-set that littering has bad effect on the environment.
10. Do you learn about caring for nature and the environment in your school?	• Yes in different subject like physical science, Life Science.
11. How often do you dispose litter incorrectly?	• Sometimes.
12. How do you feel about separating glass and mental, paper and plastic and perishables into separate bag?	• It effective.
13. Who should be responsible for the school environment?	• Everyone.
14. How air, water and ground pollution in your school?	• Poor, because there is a lots of pollution on the ground.
15. Why is keeping the environment free from waste so important?	• So we don't get infected of different diseases. It important because the more waste that is in the environment it create harmful fumes and things are given on to the atmosphere and to the ocean and that is bad because our ecosystem if our plants and staff and our oceans are not

	taken care of properly it would somehow affect us because we need clean water and we need fresh air.
16. How can the school reduce littering of solid waste in the classrooms?	• By putting bins around the school and in classes, hire new staff members to clean the school also teach learners about the importance of environment. Also create a roster of learners to pick up the papers around the school.
17. Do you think refuse can cause harm in your health?	• Yes.
18. If yes. How?	• Because I remember the was a story about a lot of waste that been bought into the ocean so when people go into ocean they swim and sometimes swallow the water inside the ocean so that harmful to us we had that lot of people are getting sick because of the corrupted water.
19. What role do you play in your school and community to keep environment safety/sustainable for future generation?	• We do posters • We encourage each other to stop littering • We do fundraising for planting.
20. Have any people informed you of the need to put waste away properly?	• Yes, learners from DUT and UKZN they were teaching us about the environment and the negative effects of the environment.
21. Do you think teachers make a different in the way you treat litter?	• Yes, some of them.
22. How can your school improve solid waste disposal?	• We can have rosters for each class where learners are divided into group of picking up litter. • By putting different types of bins for different waste • To find the ways to reuse the plastics instead of just throwing it away.
23. What role as learners do you play in solid waste management in school?	• Recycling.

24. What are the challenges faced by the school regarding solid waste disposal?	• Some learners don't want to participate in the company that we are running the is a lack of interest in them • I think some learners don't know how to reuse the papers and other waste.

APPENDIX N: TURNITIN REPORT



PERCEPTIONS OF TEACHERS AND LEARNERS ON SOLID WASTE MANAGEMENT IN UMLAZI DISTRICT SCHOOLS.

ORIGINALITY REPORT

20%	16%	7%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	uir.unisa.ac.za Internet Source	10%
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