

**Exploring the level of knowledge of sustainable solid waste management
amongst school personnel in selected Chatsworth primary schools,
KwaZulu-Natal**

by

**KALIN NOLAN NAIDOO
25036068**

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SUPERVISOR: DR U. VAN DEN BERG

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Declaration

Name: Kalin Nolan Naidoo

Student Number: 25036068

Degree: Master of Science in Environmental Management

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Dedication

I dedicate my study to Swami Sathya Sai Baba. Thank you, Swami, for giving me the strength and courage to complete my studies.

To my parents and my brother, thank you for standing by me and inspiring me to succeed.

To my grandparents, thank you for always believing in me. Thank you for your words of wisdom and encouragement.

Abstract

Schools generate a significant amount of waste and the success of encouraging SSWM practices at schools relies on the knowledge and awareness of key education stakeholders, such as school personnel. Moreover, schools play an important role in promoting ideas and strategies that encourage environmental responsibility. However, many primary schools have limitations linked to resources and infrastructure, and there are inconsistencies in school personnel's knowledge and enactment of sustainable solid waste management strategies. These limitations emphasise the importance of further exploration of school personnel's knowledge of sustainable solid waste management practices. School personnel who have limited knowledge of sustainable solid waste management practices are restricted in their attempts to nurture school environments that promote environmental responsibility. While research in the field highlights the importance of solid waste management in diverse educational environments, there is limited research that concentrates specifically on the knowledge levels of school personnel in primary schools. The aim of this study is to explore this gap in research in selected primary schools in Chatsworth, KwaZulu-Natal. A purposive sampling method was used to select twelve primary schools located in Chatsworth, KwaZulu-Natal, South Africa. The study was a mixed-method case study located within an interpretivist paradigm. Findings indicate that while school personnel acknowledged the importance of solid waste management, there are gaps in their implementation of particular strategies. Implementation of sustainable solid waste management practices differed across the participating schools. These findings provide valuable perspectives for the development of targeted workshops, education programmes, and policies to promote effective solid waste management practices within the school environment. It is recommended that targeted workshops and training programmes be conducted for school personnel to improve knowledge and encourage practical implementation of sustainable solid waste management practices in primary schools. If school personnel's knowledge is improved this will promote the use of sustainable solid waste management practices at schools. Thereby reducing the amount of solid waste generated while fostering environmental responsibility.

Key Terms: Solid waste; Primary schools; School personnel; Knowledge; Sustainable; Waste management practices; Policy; Environment; Mixed-method; Case study

List of Acronyms and Abbreviations

Curriculum and Assessment Policy Statement: CAPS

Department of Basic Education: DBE

Department of Education: DoE

Department of Environmental Affairs: DEA

Education for Sustainable Development: ESD

Environmental Education Policy Initiative: EEPI

Environmental Education: EE

Environmental Literacy: EL

Knowledge-Attitude-Behaviour: KAB

KwaZulu-Natal: KZN

National Environmental Management Act: NEMA

School Personnel: SP

Solid Waste: SW

Solid Waste Management: SWM

South Africa: SA

Sustainable Development Goals: SDGs

Sustainable Solid Waste Management: SSWM

United Nations Environment Programme: UNEP

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CHAPTER ONE: INTRODUCTION

1.1. Introduction

Schools are important institutions that shape and construct the knowledge, behaviours and attitudes of future generations. Schools play a crucial role in nurturing sustainable practices and schools in SA are guided by a national compulsory Curriculum and Assessment Policy Statement (CAPS) that all schools need to adhere to (Damoah & Omodan, 2022; Wagner, 2024).

Research (Anokye et al., 2024; Keramitsoglou et al., 2023) indicates that without effective education to prepare and guide our future generation, there are no guarantees of a sustainable future. This has motivated the study under focus. Sustainable solid waste management (SSWM) is a global priority (Sharma & Jain, 2020) in responding to environmental challenges and encouraging sustainable development. Among the key stakeholders in this effort are school personnel. These school personnel include school management and school governing body members (Lim, 2024; Monus, 2022), whose awareness and understanding of SSWM can considerably impact sustainable practices within schools and the broader community.

Part of the study is located in an area facing increasing challenges related to waste generation, urbanisation, and environmental degradation (Matthew, 2023). Despite policy interventions aimed at promoting environmental sustainability, the effective implementation of SSWM practices often pivots on the knowledge and engagement of these key school stakeholders. Their level of awareness and ability to integrate SSWM into daily school operations and educational activities are crucial for building environmentally responsible behaviours among learners while fostering a culture of sustainability (Finnegan, 2023; Mpuangnan et al., 2023).

This chapter provides an overview of the study, which aims to explore the level of knowledge of SSWM among school personnel in selected Chatsworth primary schools. Chapter one introduces this study by discussing the background of the study and focusing on the problem statement and research rationale for the study. Next, the research aim, research objectives, and delineation of the study are included in this chapter. Finally, the chapter concludes with an explanation of the structure of the dissertation, thus providing an overview of the dissertation.

1.2. Background to the Study

Sustainability revolves around addressing the needs of the current generation without having a negative impact on future economic, environmental and social needs (Rosen, 2020). Sustainable development is a strategy to ensure that current economic and social growth responds to the needs of society without having an adverse effect on the economic and social growth of society in the future (Ferguson et al., 2022; Nousheen et al., 2020). Sustainability and sustainable development are important concepts to consider when researching about solid waste management (SWM).

Sustainable solid waste management (SSWM) has become an important global concern, more so in educational contexts where a large amount of waste is generated daily. SSWM practices are important for reducing the negative environmental impact and encouraging the repurposing of resources to promote sustainable development. Schools as institutions of teaching and learning play a vital role in encouraging environmental responsibility among teachers, learners and the broader community.

While sustainable practices are promoted nationally and globally, there is a gap in research that focuses on the knowledge of SSWM practices in national and global education settings (Aforo, 2020; Anokye et al., 2024; Jerath, 2021; Mzobe & Msezane, 2024). This is a problem since globally SWM is a critical environmental challenge (Sharma & Jain, 2020). Resultantly, SSWM requires urgent attention (Hannan et al., 2020). Inappropriate handling of solid waste (SW) results in health concerns, environmental degradation and resource depletion. Effective SSWM practices are important for reducing pollution, mitigating the consequences of climate change, and preserving resources. SSWM falls under sustainable development goal (SDG) 12 (Opoku et al., 2022). In South Africa, laws and policies regarding the responsible disposal of waste are in place (Department of Environmental Affairs, 2013; 2016; 2018; 2020). Despite this, South Africa's waste management systems face several challenges (Adeleke et al., 2021). There is an urgent need to improve SSWM practices in South Africa (Sohan, 2021; Zondi et al., 2023).

Researching about the gaps in knowledge pertaining to successful strategies for SSWM can assist in highlighting areas where training, research and education can promote and establish a culture of resource conservation in the education system. Schools produce a large amount of

waste and should play an active role in encouraging effective SSWM (Valladolid & Blase, 2023). Schools can shape the future since they help develop citizens (Casma et al., 2023; Halliwell et al., 2020). Schools can help create different solutions for environmental challenges while promoting sustainable routines and values. Schools need to encourage and practice SSWM practices to promote SDG values with learners. Therefore, schools should promote SSWM through daily practices (Anokye et al., 2024; Keramitsoglou et al., 2023).

School personnel play a vital role in improving environmental knowledge, raising awareness, and developing activities for future generations. Therefore, it is important to establish school personnel's knowledge of SSWM practices. School personnel (SP) include parents, community members, school administrators, teachers and school management team members (Lim, 2024; Monus, 2022). The level of knowledge and awareness among SP about SSWM practices is important for effective SWM, disposal and reduction. For this reason, it is necessary to explore the extent of SP's knowledge of SSWM practices. Finding out more about SP's knowledge of SSWM is important for fostering environmental education and promoting sustainability within schools and communities.

The focus for this study will be SP, who are part of the school management and school governing body. Focusing on these SP is important because they shape the policies and practices and decide on allocating budgets and resources within schools (Ganon-Shilon et al., 2021; Masnawati & Darmawan, 2022). Knowing more about SP and their knowledge of SSWM practices will assist in advancing schools as role models for environmental stewardship in their communities.

1.3. Problem Statement

Schools generate a large amount of waste (Safo-Adu & Owusu-Adzorah, 2023), this emphasises the importance of advancing SSWM strategies at schools. However, the success of encouraging SSWM practices at schools relies on the knowledge and awareness of key education stakeholders, such as SP. Despite the role SP play in guiding the environmental practices of learners, there is limited research on their knowledge and attitudes about SSWM practices (Jerath, 2021; Valladolid & Blase, 2023).

It could be that this knowledge gap restricts the implementation of effective SSWM strategies at schools. Knowledge of SSWM practices may change behaviour and the ability to implement and promote environmental practices (Raghu & Rodrigues, 2020). Identifying the barriers, gaps and challenges SP faces in actioning and promoting SSWM practices is important.

Schools in areas such as Chatsworth KwaZulu-Natal face socio-economic, resource and infrastructure challenges (Matthew, 2023), which further limit their ability to implement SSWM practices. Limited resources, training, and policy enactment often leave schools unprepared to respond to and promote effective SSWM practices. These factors highlight the importance of exploring the contextual aspects that have an impact on the knowledge, attitudes and behaviour of SP in this area.

SSWM is not only about environmental conservation but also about encouraging responsibility among learners (Jerath, 2021). SP are influential role models and are in important positions to encourage environmental responsibility. However, this requires a good understanding of SSWM practices. Without suitable knowledge and understanding, the successful linking of SSWM practices to teaching and other school-based activities may not be achieved. In this way, the nurturing of environmentally responsible learners and communities is hindered. Responding to, bridging the knowledge gaps and preparing SP with the necessary skills, knowledge, awareness, and attitudes to advance sustainable transformation is vital.

1.4. Research Rationale

The increase in global concerns about the destruction of the environment and the increase in waste and pollution have endorsed the need for implementing sustainable practices in all parts of society, including education (Valladolid & Blase, 2023). Schools are important for influencing future generations. They have a significant role to play in nurturing sustainable behaviours, especially among young learners (Anokye et al., 2024). The rationale for this study is that it offers helpful insights into SP's knowledge of SSWM practices. SP are important stakeholders in the development of school policies and the management of budgets and resources. SP are also influential in nurturing a culture of environmental awareness within the school and wider community (Masnawati & Darmawan, 2022).

The success of SSWM practices in schools depends on the knowledge and commitment of SP. This study explored the levels of knowledge among SP in selected primary schools in Chatsworth, KwaZulu-Natal, South Africa. Knowing more about the SP's knowledge level of SSWM is key to detecting gaps in training, development and support. This study is aligned with SDGs, which emphasise the importance of responsible consumption, production (SDG 12) (Opoku et al., 2022) and quality education (SDG 4) (Greenland et al., 2023). Through the exploration of this knowledge gap, this study will add to the broader discussions on education for sustainable development. It is important to promote environmental awareness that could inspire policy recommendations and improve the success of school-based waste management strategies. As a result, this study contributes to the goal of encouraging environmentally aware SP. Accordingly, SP may contribute to a more sustainable future by educating learners and community members about SSWM practices.

Enhancing SP's knowledge about SSWM practices will assist in attaining SDGs 4 and 12 while promoting sustainability. This study is important for determining the current level of knowledge among SP regarding SSWM as well as identifying knowledge gaps, challenges and barriers that impede the success of SSWM. The insights gained from this study will reinforce the efforts of SP to encourage sustainability and promote a more sustainable future for learners, schools and the wider community. Schools can become agents of change in promoting SSWM practices (Mantawil & Dilangalen, 2021). Agents of change are influential in inspiring transformation. By integrating SSWM practices into school policies and daily activities, schools can become role models for environmental stewardship for learners, parents, and the broader community. Through curriculum incorporation, schools can teach learners about the value of SSWM and the importance of a circular economy (Nemani, 2024). Reducing, reusing, and recycling waste is necessary for preparing learners with the skills, knowledge, insights and awareness needed to tackle environmental issues. This emphasises the diverse roles schools play, they are spaces for learning and are also advocates of environmental sustainability in the broader community (Cebrian et al., 2022; Embree & Gilman, 2020).

To become successful advocates for environmental sustainability, SP need to have knowledge and understanding of effective SSWM practices. Limited knowledge and understanding among SP can hamper a school's efforts to nurture sustainable practices (Mzobe & Msezane, 2024). Consequently, by understanding the level of knowledge of SP regarding SSWM practices, this

study seeks to address the gaps in knowledge and propose targeted interventions to help schools become sustainable role models within the broader community.

1.5. Research Aim

The aim of this study is to explore the level of knowledge related to sustainable solid waste management among school personnel in selected primary schools in Chatsworth, KwaZulu-Natal.

1.6. Research Objectives

Research objective 1: To assess the level of knowledge of sustainable solid waste management among school personnel at selected primary schools in Chatsworth, KwaZulu-Natal.

Research objective 2: To explore how school personnel in selected primary schools in Chatsworth, KZN, navigate the challenges and barriers to implementing and sustaining effective solid waste management practices.

Research objective 3: To determine the importance of identifying the training and support needs of school personnel in selected primary schools in Chatsworth, KZN, for effectively implementing sustainable solid waste management practices.

1.7. Research Questions

Research question 1: What is the level of knowledge of sustainable solid waste management among school personnel in selected primary schools in Chatsworth, KZN?

Research question 2: How do school personnel in selected primary schools in Chatsworth, KZN, navigate the challenges and barriers to implementing and sustaining effective solid waste management practices?

Research question 3: Why is it important to identify the training and support needs for sustainable solid waste management practices among school personnel in selected primary schools in Chatsworth, KZN?

1.8. Delineation of the Study

This study focused on exploring the level of knowledge of SSWM among SP in selected primary schools within the Chatsworth area of KwaZulu-Natal, South Africa. The study was limited to twelve purposively selected Chatsworth public primary schools. The SP for this study included school management and school governing body members. This study explored the awareness, practices, strategies and understanding of SSWM concepts among the purposively selected SP.

This careful and deliberate selection of schools assured a precise understanding of the knowledge gaps and opportunities for improvement. This study excluded secondary schools, private schools and schools outside the Chatsworth area. This decision was made to ensure strict boundaries for the study were upheld (Demirbaga, 2024). Hence, a targeted and controlled scope was observed.

1.9. Limitations of the Study

This study offers important views about the level of knowledge of SSWM among SP in selected Chatsworth primary schools. However, the study is not without limitations. One limitation is the generalisability of the findings (Prabhu, 2020). This study was conducted at purposively selected schools in one area in KwaZulu-Natal, South Africa and may not be applicable to other primary schools in KwaZulu-Natal or other provinces in South Africa. The small sample size may also be a limitation (Simmonds et al., 2020). Twelve schools participated in this study; the findings of this study may not be pertinent to larger sample sizes. Further limitations are time and resource constraints (Akanle et al., 2020). Data could only be collected when participants were available and many participants had full teaching loads which meant that their time for participating in the study was limited. The researcher did not have a car and therefore hired a car for the purpose of data collection. Thus, the study was conducted in an area that was easily accessible by the researcher during a specific period. As a result, there were no opportunities for observations and exploration over a longer period. Nevertheless, this study provides an important basis for recommendations and future research possibilities.

1.10. Ethical Considerations for the Study

Important factors were considered to ensure ethical processes were followed for the study under focus (Wolfe, 2022). An ethical clearance application was submitted to the UNISA College of Agriculture and Environmental Sciences (CAES) Health Research Ethics Committee (Ref #: 2024/CAES_HREC/6231). Chatsworth primary school principals were approached, and the study was discussed in detail with each school principal. The school principals who agreed to participate in the study were asked to provide a stamped gatekeeper letter. An application was made to the Department of Basic Education in KwaZulu-Natal to carry out the study at selected primary schools in the province. Once all the necessary ethical clearance, gatekeeper and Department of Basic Education approval was given, each prospective participant was handed an informed consent form to read at their convenience.

This informed consent form provided prospective participants with the purpose of the study, their right to voluntary participation, the data collection phases, the time frames for each data collection phase and participants' right to leave the study at any time without any consequences. Steps to maintain confidentiality and anonymity were also included in the informed consent form (Xu et al., 2020). Prospective participants were provided with information about not being harmed during the study and not feeling any discomfort. Issues of honesty and integrity were included in the informed consent form. In addition, the contact details for the researcher, supervisor and CAES Health Research Ethics Committee chair was provided in this informed consent form. Only SP who agreed to participate and completed and handed in the signed informed consent form were included in the data collection processes (Agyemang-Badu et al., 2023). A transparent and ethical process for collecting data from prospective participants throughout the research process was maintained by taking these ethical considerations into account.

1.11. Structure of the Dissertation

Chapter One: Introduction: Chapter one is the introductory chapter. This chapter discusses the study background and focuses on the research problem and rationale for the study. The research aim, objectives, and delineation of the study are included in chapter one. The structure of the dissertation is also included in chapter one.

Chapter Two: Literature Review: Chapter two includes the Knowledge-Attitude-Behaviour model which is the underpinning theoretical framework for the research. Thereafter, a review of literature on environmental challenges and solid waste management, environmental education and awareness in primary schools, education for sustainable development, the role of schools in promoting sustainable solid waste management practices, school personnel and environmental sustainability is discussed.

Chapter Three: Research Design and Methodology: A discussion of the design and methodology used for this study is presented in chapter three. Next, the research paradigm, approach, research methods, instruments used, data collection process, sampling strategies, reliability, research bias, verification and limitations of the study are included.

Chapter Four: Presentation and Analysis of Research Results: This chapter presents the data collected using tables, graphs and excerpts from the interview transcripts. The analysis of the results of this study are reported.

Chapter Five: Synthesis of the Results: The results presented in chapter four are synthesised in this chapter. The synthesis of the results are written in response to the three research questions.

Chapter Six: Discussion, Implications, Recommendations and Conclusion: A discussion of the results, the implications of this study, the alignment of the results with the KAB model, the contribution of the study, limitations, recommendations and suggestions for further research possibilities are also included in this chapter. The chapter ends with a conclusion to the study.

1.12. Conclusion

In chapter one, the introduction and background of the study are provided. The problem statement and research rationale for this study have been included in this chapter. Furthermore, the aim of the study and research objectives that guide the study under focus are discussed. After that, the delineation of the study and the structure of the dissertation are included in chapter one. In the next chapter, chapter two, the literature review is presented and discussed.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

Chapter two begins with a discussion of the theoretical framework for the study, the knowledge-attitude-behaviour model. This is followed by a review of solid waste and solid waste management, environmental challenges and solid waste management, sustainability and sustainable solid waste management, education for sustainable development and environmental education and awareness in primary schools. Chapter two also provides an overview of the methodological approaches used by other researchers in the field.

2.2. Underpinning Theoretical Framework: The Knowledge-Attitude-Behaviour Model

The Knowledge-Attitude-Behaviour (KAB) Model is a theoretical framework used by researchers to understand the connection between a person's knowledge, attitudes, and behaviours. The KAB model was developed for health and nutrition education research to observe changes in behaviour (Teo et al., 2023). This model has been used successfully in research associated with environmental issues (Gunson et al., 2021; He et al., 2022; Thi et al., 2024). For this study, the KAB model will be useful in exploring how the knowledge levels among SP of SSWM affect their attitudes toward sustainability and, eventually, their behaviour in implementing sustainable and effective SWM practices. The KAB model suggests that while knowledge and attitudes are important, the behavioural aspect of the model is the biggest challenge (Thi et al., 2024). This implies that knowledge alone is not enough to change attitudes, and a change in attitude is essential to influence actions and behaviour (Gunson et al., 2021; Teo et al., 2023). If SP believe that their knowledge of SWM is important for encouraging sustainability and that projects and programmes that promote environmental sustainability are possible within their school context, they are increasingly inclined to endorse these projects and programmes.

In contrast, if SP are disinterested or if their attitudes are negative, regardless of their knowledge level of SSWM, their behaviour and actions may not change. For this reason, the KAB model will be a useful framework for this study. It will assist in revealing how SP knowledge of SSWM is linked to their attitudes about sustainability and whether or not these

attitudes drive SSWM strategies within the school context. Therefore, exploring the relationship between SP knowledge about SSWM practices and their attitudes about their knowledge is important. It is also important to understand how different factors influence their behaviour in using sustainable strategies for effective SWM at schools.

The KAB model for this study is shown in figure 2.1. This model highlights behaviour as the final result.

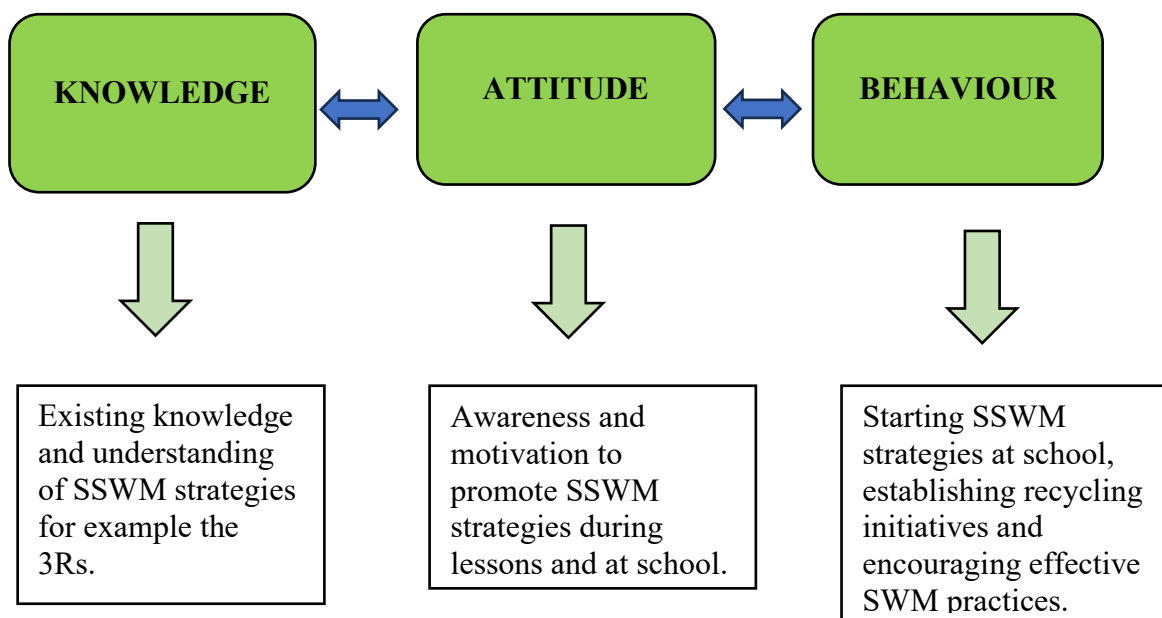


Figure 2.1: The KAB model guiding the study (Author's own, 2025)

Using this model as a guide for this, the actions taken by SP to promote SSWM will be examined. These actions could include teaching learners and the wider community about environmental sustainability, promoting recycling programmes, and advancing projects focusing on reducing the generation of waste. Changing behaviours often require strategies and plans that target both knowledge and attitudes (Thi et al., 2024). For this study, knowing about SSWM may not be sufficient unless the SP attitudes about sustainability are linked with positive actions, strategies and behaviour. Therefore, the KAB model is suitable as a theoretical framework for the study since it will assist in identifying strengths in existing SWM practices. The model will also help in revealing gaps in knowledge and recognising challenges that prevent the adoption of SSWM practices. Knowing more about gaps in knowledge and barriers to achieving SSWM practices will assist in planning future strategies for enhancing environmental sustainability (Bui & Tseng, 2022).

In addition to its focus on behavioural consequences, another key characteristic of the KAB model is the role of external factors. These external factors include policies, community engagement, education frameworks, and resource support (Gunson et al., 2021; Monus, 2022). While an individual's KAB is important for encouraging SSWM practices, external factors like school policies, resource availability, and curriculum implementation play an important role in strengthening or limiting behavioural change. For instance, if SP receive adequate resource support and clear policy frameworks that focus on SSWM, their knowledge, awareness and attitude regarding environmental sustainability will have a greater tendency to include positive SWM behaviours. Based on this linear progression of the KAB model, in the absence of a supportive environment, even well-informed SPs may have challenges applying environmentally sustainable practices successfully.

Apart from emphasising the linear progression of the model from knowledge to attitude to behaviour, researchers (Indiran et al., 2025; Thi et al., 2024) have also maintained that the KAB model may be dynamic. Behavioural changes can have an impact on knowledge and attitudes, which then leads to a circular process that either strengthens or weakens sustainable practices (He et al., 2022; Olech et al., 2025). For example, when SP initiate SSWM practices which result in a positive outcome, such as reduced waste, an increase in community support or enhanced learner engagement, their confidence in their knowledge and their attitudes toward SSWM may increase. This would encourage them to include other strategies. This progressive process implies that behaviour is not only the end purpose. Behaviour also serves as a motivation for developing understanding and establishing commitment. This motivation is necessary for transforming school-based EE and responsibility.

The flexibility of the KAB model makes the model suitable for responding to real-world challenges such as SWM at schools (Kanapathy et al., 2020; Olaitan, 2021). Schools are complex educational environments affected by cultural, social, environmental and institutional matters. The KAB model offers the ability to explore how individual and group behaviours arise. This model offers a framework that allows for considering the differences between schools. These differences include learner numbers, learner demographics, different leadership styles, and different levels of environmental knowledge and awareness. For this study, the KAB model provides the opportunity to explore what SP know and how they foster SSWM practices while considering how each school's context either strengthens or limits the ability of SP to use their knowledge to influence their behaviour (Anokye et al., 2024; Awino & Apitz, 2024).

In using the KAB model for this study, it is essential to consider the wider factors and contexts that influence the shift from knowledge and attitude to sustained behaviours. Understanding more about the external factors, school contexts, and their effect on the KAB of SP provides valuable information for selecting suitable methodological approaches. The KAB model has been used successfully in case studies focusing on waste management (He et al., 2022; Thi et al., 2024). Building on these ideas, it is important to look further at how other researchers in the field have explored similar issues linked to SWM.

2.3. Solid Waste and Solid Waste Management

2.3.1. Solid Waste

Solid waste refers to any unwanted, discarded or leftover items such as food, clothing, paper, electronic materials, glass and plastic. This type of waste is created by humans or industrial activities. Solid waste can be categorised by where the waste comes from. The most common categorisations are agricultural, commercial, industrial, medical, municipal and residential waste (Nanda & Berruti, 2021; Wang & You, 2021). These types of waste can include solid, semi-solid or non-soluble material. Agricultural waste is from agricultural procedures and includes organic matter such as animal manure, crop deposits, and pesticides (Bonciu et al., 2021). Commercial waste is made up of waste from offices, businesses, and other companies. Commercial waste includes e-waste, packaging material and paper. Industrial waste is waste that is generated from construction and manufacturing activities. This type of waste comprises of chemicals, by-products and metals. Medical service providers and hospitals produce medical waste. This type of waste includes used gloves, syringes, expired or underused medicines and biomedical refuse (Omo & Hassan, 2024). Waste that is collected from urban and suburban areas is referred to as municipal waste and includes waste generated in parks, alleys and streets (Kleszcz & Maciejko, 2020). Waste generated at homes is called residential waste. This type of waste includes used clothing, food waste, newspapers, and packaging material. Waste generated at schools is considered municipal waste. With respect to solid waste (SW), there has been an increase in the amount produced.

Globally, the amount of SW has increased because of an increase in consumption, the rise in in population and rapid urbanisation (Chen et al., 2020). Disposing of waste inappropriately causes environmental issues that lead to pollution, contamination and the rise in greenhouse gasses. Mor and Ravindra (2023) propose that due to the serious consequences of inadequate

waste disposal, it is important to manage SW effectively. Collaborative efforts by society, communities and businesses are important for the successful SWM. Promoting environmental awareness among learners and the broader community is an important role performed by SP (Malik, 2024). Therefore, knowing more about their level of knowledge of SSWM is important. From the discussion of the KAB model, it is evident that knowledge about SSWM would be useful to advance SP as important role players for fostering effective SWM strategies and preparing learners and the broader community with the necessary skills to ensure responsible SWM practices.

2.3.2. *Solid Waste Management*

Solid waste management (SWM) is correctly organising, collecting, transporting, processing, and removing waste so that the negative effects on the environment, humans and animals are reduced. The effective management, implementation and treatment of SW have been clearly outlined by the United Nations Environment Programme (2024). The rapid increase in urbanisation and human consumption requires the need for diverse SWM strategies. Research (Mahayuddin et al., 2024; Safo-Adu & Owusu-Adzorah, 2023) reveals that in the context of schools, well-organised SWM strategies are important since schools produce different forms of SW daily. Schools produce food leftovers, paper, glass, plastic, and electronic waste, such as broken computers and printers. If SW is not managed efficiently, this waste will add to environmental destruction and hinder strategies for encouraging sustainable routines among learners. For the successful implementation of SWM strategies, schools need to consider organising and separating waste, transitioning to eco-schools, following waste disposal policies, and participating in workshops and conducting education programmes. These initiatives will encourage the responsible and effective disposal of waste by learners and the broader community (Finnegan, 2023; Mpuangnan et al., 2023). Initiatives such as eco-schools, will ensure that environmental education (EE) is combined with school values and activities. Research (Kerret et al., 2020; Virsta et al., 2020) illustrates that eco-schools show a positive effect on learners and teachers by encouraging responsible SWM strategies. In this way, schools can encourage successful SWM strategies and promote environmental sustainability.

Regarding SWM strategies, the KAB model stresses the importance of knowledge about SSWM strategies. The KAB model supports the idea that an increase in knowledge about environmental challenges results in the development of positive attitudes about managing SW, which leads to responsible behaviours. Positive behaviour regarding SWM encourages

responsible practices (Eshete et al., 2023; Raghu & Rodrigues, 2020). This model is relevant to school environments where SP knowledge and awareness of SWM strategies can encourage learners to implement responsible SWM strategies. Without enough knowledge and awareness, there will be inadequate action. Therefore, ensuring SP have comprehensive knowledge about SWM is important for promoting environmentally responsible SSWM strategies (Anokye et al., 2024; Muhammad & Marzuki, 2024). Targeted training and development programmes, community-based environmental campaigns, workshops, and an effective process for tracking and monitoring SWM in schools can help bridge the divide between knowledge and practice. In this way, schools can transform and shape a future generation of environmentally aware members of society. This will ensure sustainable development through informed practice (Kioupi & Voulvoulis, 2022; Mahayuddin et al., 2024; Miao & Nduneseokwu, 2025). To be successful with this, schools must adapt their efforts to existing SWM legislation, regulations, and policies so that their practices are aligned with approved sustainability guidelines.

2.3.3. Legislation, Regulation, and Policies for Solid Waste Management

SWM is a policy and legal environmental concern guided by international, national and local frameworks (Muheirwe et al., 2022; Tsai et al., 2021). Policies and frameworks that encourage waste separation promote circular economy principles and promote waste reduction. United Nations Environment Programme (2024) reveals that can lead to a reduction in the negative effect of SW on the environment. The use of waste management policies and frameworks and encouraging participation of the wider community can promote SSWM practices. Legislation, regulation and policies about SWM are necessary to ensure that SW is managed efficiently. Effective SWM will limit health threats, protect the environment and encourage sustainable development. Legislation and policies inform the activities of institutions, including schools, pertaining to the need to align with environmental and Sustainable Development Goals (SDGs). Internationally, there exist global agreements such as the Basel Convention. These collaborations and agreements with international community's help address waste removal concerns across boundaries. These agreements motivate countries to implement environmentally safe waste disposal procedures. The Basel Convention agreement controls the movement and disposal of hazardous waste across borders (van Der Marel, 2022; Yang, 2020). This agreement is in place to safeguard and emphasise the importance of the correct handling and disposal of waste. Aligned with the SDGs established by the United Nations, more specifically SDG 12 (Responsible Consumption and Production), countries across the globe are encouraged to reduce, recycle and reuse materials to prevent excess waste generation (Akter

et al., 2022; Arora & Mishra, 2023). Yang, (2020) argues that challenges have been experienced in implementing the principles of these agreements, mainly due to a lack of awareness and carelessness when dealing with hazardous waste.

Apart from international agreements, in South Africa, the National Environmental Management Waste Act 59 of 2008 is an important legal guideline controlling waste management (Department of Forestry, Fisheries and the Environment, 2009). This act provides an overview of the responsibilities of institutions, communities and individuals related to SWM. The waste management hierarchy is included, and the consequences of waste reduction, recycling, reusing, and disposal is highlighted (Awino & Apitz, 2024; Roos et al., 2023). The act provides information for all waste producers to put in place strategies to reduce and manage waste responsibly. This act is also for schools and other institutions of education. The act is accompanied by the National Waste Management Strategy, which was revised in 2020 (Department of Forestry, Fisheries and the Environment (2020). This act offers a plan of action aimed at implementing SSWM strategies across all areas. It calls for active participation, workshops, training, education programmes, and encouraging awareness among community members. The act places schools as key stakeholders in environmental responsibility. Rules and regulations for municipal and provincial stakeholders provide clear guidelines for school-based waste management strategies. Research (Damoah & Adu, 2020; Damoah & Omodan, 2022) demonstrates that in South Africa, the Environmental Education Policy encourages the integration of EE into the school curriculum. This policy ensures that school activities that are linked to promoting environmental responsibility, such as the establishment of recycling units, eco-clubs, and other effective SWM initiatives, are promoted. Acts and policies are in place to ensure compliance and provide procedures for SP to follow so that they can promote SSWM practices. Having knowledge of and understanding these policies and acts is important for SP. This knowledge and understanding will help promote environmental responsibility among learners and the broader community with the hope of reducing environmental challenges caused by SW.

2.4. Environmental Challenges and Solid Waste Management

Globally, SSWM has become a serious issue. The growing increase in the amount of waste produced, compromises ecosystems, human health, and sustainable development (Kanade et al., 2024). SWM practices that are not effective, may cause serious problems. These problems

can lead to a negative impact on the environment, affect the quality of life and have negative consequences for plants and animals. The dumping or burning of SW, may lead to the release of harmful toxins into the air, soil and water. These toxins can cause health risks due to the spread of diseases (Kanade et al., 2024). Inappropriate SWM practices results in an increase in pollution, greater greenhouse gas emissions and a decrease in natural resources. Another environmental challenge is the result of waste treatment companies and landfills releasing many harmful gases (Bai et al., 2022). This has a negative impact on the environment and leads to environmental challenges for example, if these gases are not controlled appropriately, they can have a negative impact on the climate. Littering and the incorrect disposal of waste can have a negative environment impact on marine and wildlife life (Kanade et al., 2024). SWM strategies that are not sustainable and inappropriate can also affect the economy (Department of Environmental Affairs, 2018). The costs of cleaning up, addressing health risks and rebuilding affected areas can become a financial burden for communities and the government. The Department of Environmental Affairs (2018) exhibits that the increase in population growth and rapid urbanisation leads to more waste being produced resulting in an environmental challenge whereby valuable resources are lost when waste is not correctly managed.

Due to the environmental challenges caused by the ineffective disposal of SW, is important to promote responsible and SWM strategies. Research (Espuny et al., 2021; Mospan, 2024; Yang et al., 2023) supports this notion by maintaining that the correct collection, treatment and disposal of SW requires a change towards encouraging sustainable methods of SWM. Education plays an important role in successful SWM by endorsing the knowledge, awareness and skills that are required for encouraging and maintaining these practices. As a result, education is necessary to manage SW efficiently. Educating people about the advancements in different SWM strategies through the use of technology can reduce these environmental challenges. Digital tools and technology are being used to improve waste collection and monitoring which results in a decrease in environmental challenges caused of inefficient SWM. This view is supported by research (Bayramov, 2023; Bui & Tseng, 2022; Haleem et al., 2022; Mahayuddin et al., 2024) suggesting that using digital tools to monitor SWM strategies leads to the effective use of resources. By using technology to foster responsible SWM, teachers, learners and the wider community can advance SSWM practices and reduce the environmental challenges caused by improper SWM.

Apart from the use of technology to reduce environmental challenges, the implementation of a circular economy, that encourages reusing, recycling, and reducing waste production, can lead to a decrease in environmental challenges. Along similar lines research (Mpuangnan et al., 2023; Solihat et al., 2024) maintains that waste-to-energy strategies and composting offer diverse ways to deal with waste while producing energy and organic fertilisers. Community involvement is also necessary to reduce the challenges linked to SW and the environment. Community involvement and awareness is important for addressing the environmental challenges caused by SW. Research (Espuny et al., 2021) shows that working with communities to encourage responsible waste disposal behaviours, such as recycling, composting, reducing, and repurposing waste, can reduce the demand at landfill sites. Community engagement workshops, education programmes, sustainability programmes and environmental projects can support environmental sustainability initiatives and promote community responsibility. Additionally, working closely with business owners and other organisations can improve waste management structures, encouraging community members and business owners to use eco-friendly waste strategies (Solihat et al., 2024).

Addressing environmental challenges caused by improper SWM requires an all-inclusive plan that includes technology, education, policy implementation, and community action. By promoting the principles of sustainability and implementing diverse solutions, the community members can reduce the environmental challenges resulting from inappropriate waste disposal. The need to reduce incorrect SWM practices is important. Using inappropriate SWM practices will have a negative impact on the health of people, lead to economic instability and destroy environment (Kanade et al., 2024). Due to the serious environmental problems caused by improper SWM, encouraging knowledge and awareness of SSWM from an early age is needed. Education that encourages environmental awareness at the primary school level plays a key role in developing learners' knowledge of responsible and correct SWM. This knowledge will prepare learners with the skills and awareness that are needed to use sustainable practices in their everyday lives.

2.5. Sustainability and Sustainable Solid Waste Management

Sustainability is important for SWM and concentrates on meeting the needs of the current generation without having any impact on the needs of future generations. Sustainability includes looking into economic, environmental and social needs (Rosen, 2020). SSWM focuses

on reducing the production of waste by emphasising the 3Rs, i.e. reducing, reusing, and recycling (Ioannidis et al., 2021; Pandiyarajan et al., 2022). Similarly, Kowasch (2022) maintains that a circular economy is encouraged when waste is adapted for use for another purpose rather than thrown away. In schools, the 3Rs and a circular economy need to be encouraged, to promote environmental responsibility among learners, teachers and community members. Aside from the basic concepts of the 3Rs, the effective application of SSWM practices requires strategies that combine participation, policy and infrastructure. Research (Chiliza et al., 2021) supports this view and suggests that there is a need to strengthen sustainability programmes to encourage sustainable practices and support sustainable education. In a school environment, important infrastructure includes waste collection systems, waste sorting bins, and composting plans. This infrastructure plays an important role in encouraging SSWM practices. Research (Henyo, 2023; Wanjiru et al., 2020) agrees with this notion and suggests that while infrastructure is important, to be effective, infrastructure needs to be consistently used by both learners and SP. By developing a broader plan that includes active participation, using available infrastructure, working with existing policies and encouraging the commitment of SP, learners and other community members, will assist in promoting SSWM practices in school environments.

Involving SP, learners, and community members in SSWM practices supports the protection of the environment and promotes notions of shared responsibility. When SP, community members and learners engage in sustainable habits and adopt the basic ideas of the 3Rs, they become role models for the wider community (Anlimachie et al., 2025; Zakariah et al., 2024). These sustainable habits can have a positive effect on households, other schools in the area and local businesses. In this way, schools become catalysts that inspire a more sustainable future. The implementation of SSWM practices within school activities is aligned with the objectives of SDG 12. This SDG focuses on responsible consumption and production. Research (Kiely et al., 2021; Yuan et al., 2022) is in agreement, that SDG 12 emphasises the importance of strategies and solutions to reduce the negative environmental impact of schools. Integrating SSWM practices within school activities also encourages the development of problem-solving and critical thinking skills. This occurs when SP and learners work together to find different ways to manage SW sustainably. The effects of these collaborations provide a supportive foundation for education for sustainable development. Education for sustainable development is a strategy used to promote the attitudes, skills and knowledge that are necessary to make informed and responsible decisions about the economy, environment and society (Ferguson et

al., 2022; Nousheen et al., 2020). Education for sustainable development inspire schools and community members to introduce aspects of sustainability within school curricula and daily life. Thus, discussions focussing on education for sustainable development is important for the current study. Knowledge about education for sustainable development will encourage the use of SSWM practices at schools.

2.6. Education for Sustainable Development

Education for Sustainable Development (ESD) at schools promotes the ideas about SDG 12 which focuses on responsible consumption and production. Accordingly, ESD is a strategy used to link the principles of sustainability into teaching and learning (Ferguson et al., 2022; Nousheen et al., 2020). Schools provide the foundation for promoting environmental responsibility by introducing education about SWM into curricula and other activities. Activities such as waste-recycling programmes, sustainability programmes, professional development for teachers and setting up eco-schools assist in improving knowledge and awareness. These activities encourage of waste reduction within school contexts (Finnegan, 2023; Mpuangnan et al., 2023). The inclusion of ESD in schools is necessary to advance sustainable and responsible behaviours among teachers, learners, and the broader community. Likewise, Ferguson et al. (2022) maintains that ESD in schools endorses the knowledge, skills, attitudes, and values that are important to promote a sustainable future. Central to ESD is teaching learners to make well-thought-out decisions and take actions that encourage social, environmental, and economic considerations. By nurturing these concepts early on in primary schools, ESD helps to lay a strong foundation for environmental awareness and sustainability. This can influence learners' behaviours and attitudes (Olaitan, 2021), while research (Laius et al., 2024; Ongon et al., 2021) suggests that ESD encourages the development of interactive lessons that are relevant to real-world contexts.

Interactive lessons support and guide learners as they make choices about managing, reducing, reusing and recycling waste, which leads to the responsible use of energy. These choices lead to a greater positive impact on the environment. Research (Ferguson et al., 2022; Olaitan, 2021) contends that ESD is not recognised as a formal topic in primary schools, therefore teachers need to use their experience to link ESD to sustainability programmes and topics within different subjects. For example, through natural science and technology, learners may learn

about climate change, while life skills can cover content related to communities, inequality and social justice. This interdisciplinary strategy emphasises concepts linked to sustainability and reveals the link with global concerns. SP are also key for promoting ESD goals by encouraging a school and community culture that focuses on sustainability. SP can start school and community-wide projects, for example, school gardens, recycling and sustainability programmes (eco-clubs), and promoting energy-reducing strategies. In this way, SP are important for creating an environment where learners, teachers and community members practice sustainable behaviours daily. ESD in schools encourages community engagement with parents, local businesses and government organisations in sustainability projects. These engagements ensure that the impact of sustainable activities is extended outside the school (Ferguson et al., 2022). By including sustainability as an important value of the school, SP ensure that ESD is a guide the school and the wider community.

Moreover, combining ESD into the primary school curriculum encourages problem-solving and critical-thinking skills among learners. Teaching about environmental challenges helps learners as they develop the ability to explore varied situations, reflect on diverse viewpoints, and construct solutions that take into account economic, environmental and social aspects. This broad strategy equips learners to participate actively and meaningfully in activities that promote sustainable development for the future (Ferguson et al., 2022; Nousheen et al., 2020). Collaboration, cooperative groupwork activities, and project-based learning reinforce team building and communication skills. These skills are important for addressing local and global sustainability challenges.

Research (Anor, 2024) indicates that other important skills are those linked to indigenous knowledge systems (IKS) which include skills linked to sustainable practices. Many indigenous communities use traditional practices that encourage environmental responsibility, protection and conservation of resources. An important part of ESD is the inclusion of IKS in sustainability education. Integrating these traditional practices and skills into classroom discussions helps learners gain greater understanding of traditional practices that have been practised previously (Anor, 2024; Mavuru & Ramnarain, 2020). This approach reinforces culture and advances solutions to current environmental challenges. This approach nurtures respect for different viewpoints and the recognition that sustainability is established in cultural settings. Teacher training and development about integrating IKS and using traditional practices to promote effective SWM strategies is important.

Teacher training and development also plays an important role in the effective integration of ESD in primary schools. Parry and Metzger (2023), argues that teachers need access to learning opportunities that prepare them with the knowledge and teaching methods to teach sustainability concepts successfully. Workshops, education programmes, seminars, and courses can help teachers include sustainability in their lesson plans, teaching, assessments and other activities. Encouraging a whole school culture of sustainability, where teachers lead by example, strengthens the values of ESD. Schools that promote environmentally friendly strategies, such as recycling, reducing waste, eco-clubs, and repurposing materials, promote sustainability. The values of ESD can also be promoted through the use of technology.

The importance of technology in enhancing the principles of ESD is evident in virtual field trips, and simulations which offer different ways to inspire learners to participate in sustainability topics (Petersen et al., 2020; Sahabuddin & Makkasau, 2024). Technology helps learners to interact with and investigate environmental contexts, predict the impact of human activities on the environment, and learn more about the impact of climate change. Technology can assist in providing all this information for learners while they are learning within their classrooms. Through technology, ESD and the role schools play in encouraging SSWM practices are all linked. Schools act as educational contexts for introducing and showcasing environmentally responsible behaviours to learners. Including education about SWM in the curriculum fosters ideas about promoting sustainability. Schools motivate learners to adopt attitudes and behaviours such as recycling, reusing and reducing, which add to future sustainability and environmental preservation. In this way schools promote environmental education and awareness. ESD and environmental education are interlinked since ESD advances from the notions of environmental education.

2.7. Environmental Education and Awareness in Primary Schools

2.7.1. Environmental Education

The South African National Curriculum and Assessment Policy Statement (CAPS) includes Environmental Education (EE) as a theme that is infused across the curriculum (Damoah & Omodan, 2022; Wagner, 2024). Teachers need to consider including aspects linked to EE when teaching languages, life skills, mathematics, natural science, social sciences and technology. The purpose of including EE within the CAPS in South Africa (SA) is to develop environmentally literate learners who understand the relationship between humans and the

environment. The goal of EE is to advance awareness of environmental problems, promote the development of critical thinking skills, and encourage responsible environmental behaviour throughout society (Damoah & Omodan, 2022). This awareness will assist learners in making informed, responsible and environmentally responsible decisions. Raising environmental awareness among learners will help them to participate actively in conserving natural resources and promote environmental sustainability. Including EE at the school level in SA is a purposeful attempt to enhance the quality of life for all of society through responsible and sustainable environmental practices.

Education that promotes environmental sustainability and effective SWM practices is important. Likewise, Olaitan (2021) highlights that EE and awareness are key aspects for promoting sustainable behaviours within school communities. For primary schools, EE provides learners and teachers with introductory knowledge about ecological topics, including waste management, sustainability and conservation. By including the principles of environmental awareness and education within the curriculum, schools can advance an understanding of the importance of SSWM in school environments. Fostering the importance of SSWM in schools is a positive way for encouraging environmental responsibility in primary schools.

Nurturing the importance EE can demonstrated by carefully developing learning activities and integrating them into other school subjects to guide and encourage SSWM practices. These learning activities promote a shared responsibility for managing natural resources effectively (Ongon et al., 2021). Including EE at the primary school level raises awareness about environmental responsibility. It prepares learners with critical thinking and problem-solving skills, which are important for addressing environmental challenges in the real world (Miao & Nduneseokwu, 2025). When learners are exposed to workshops, projects and education programmes linked to effective SWM practices, they learn to critically reflect on these issues. Learners become more aware of the implications of inadequate SWM and discuss different solutions and ideas to address these issues. Preparing learners at an early age to discuss SWM challenges promotes environmental literacy (EL) (Kuswendi & Arga, 2020). EL helps learners make informed and responsible decisions about conserving, reducing, reusing and recycling waste. Along similar lines, Sewak et al. (2021) proposes that using a problem-based learning approach encourages learners to participate creatively and helps them to develop their solutions to SWM challenges within their context.

Apart from fostering learners' awareness, incorporating EE in primary schools promotes collective activities, shared responsibility and teamwork. School-based activities and projects, for example, competitions, environmental clubs, and recycling programmes, can inspire a culture of environmental mindfulness and commitment (Smith, 2020). These activities and projects promote collaboration and teamwork between learners, teachers, and community members to promote environmental responsibility and SSWM. Including learners in SWM decision-making processes inspires positive environmental behaviours that goes beyond the school context.

Highlighting the importance of EE promotes the opportunity for encouraging the incorporation of IKS into sustainability practices. As discussed earlier in this chapter, IKS include sustainable methods, which can motivate learners to use environmentally friendly strategies (Anor, 2024). For example, teaching learners about the use of traditional indigenous practices for conserving resources and composting methods provides a better understanding of the different approaches for promoting sustainability. This also promotes discussions on profitable methods to promote SSWM strategies in schools and the wider community.

EE in primary schools offers a way of encouraging behaviours and attitudes that nurture sustainable approaches to SWM. Damoah and Omodan (2022) implies that learners who have this knowledge at an early age are more prone to continue with this behaviour and attitude as they become adults, which would lead to environmentally responsible decision-making in the future. When schools include EE in their activities and curricula, they encourage a future generation of learners who will promote aspects of sustainability in their daily lives. The impact of EE emphasises the importance of promoting a sustainable future. By developing environmental responsibility and awareness about SWM practices in primary schools, EE provides strategies for a better commitment to sustainability and is linked ESD. ESD strives to prepare learners with the skills, knowledge and values necessary to respond to global sustainability challenges. When working with the ideas of EE, it becomes important to examine the knowledge levels and awareness of SP about SWM to transform education into sustainable practice.

2.7.2. Knowledge and Awareness of Solid Waste Management

Knowledge and awareness of SWM are essential in influencing behaviours and attitudes towards effective SWM. Kwauk and Casey (2022) reveals that by encouraging knowledge and

awareness, developing skills, shaping policies, and transforming behaviours, education can promote sustainable practices that benefit the environment and the economy. While Liu and Tobias (2024), proposes that EL, which includes knowledge, skills, and the motivation to effectively participate in SSWM practices, is important for promoting SSWM at schools.

For advancing SSWM at schools, SP are vital stakeholders since they are responsible for managing resources, implementing policies, and making important decisions within schools (Espiritu, 2024). SP who are knowledgeable and aware of SSWM are likely to encourage the use of effective waste-reduction strategies and promote an environmentally friendly school context. These SP also tend to initiate collaborations and partnerships with business owners and other organisations to receive support and access to training and resources for school-based environmental initiatives.

Regarding the link between knowledge and environmental awareness, previous research (Goldman et al., 2021; Ozkan, 2022; Yusuf & Fajri, 2022) indicate that SP with a greater level of environmental awareness encourage waste reduction approaches and positively influence learners' waste-related behaviours and attitudes. While Sewak et al. (2022) intimates that knowledge and awareness of SSWM practices also inspire SP to model sustainable behaviours and engage learners and the larger community in environmental programmes. Schools with environmentally aware SP will incorporate sustainability into school policies and promote a commitment to EE among teachers, learners, and the broader community (Monus, 2022). When SP support EE, they nurture responsibility towards the environment and encourage participation in SSWM practices at both school and home (Zainal Abidin et al., 2023). This strategy highlights the importance of ESD and makes SSWM an important part of the school's philosophy. However, misunderstandings and gaps in knowledge and awareness about effective SWM practices often limit the successful implementation of SSWM initiatives at schools. Knowing more about and enacting policies for SWM within the school context is important for supporting and steering effective strategies to align with national environmental priorities.

2.7.3. Policies for Waste Management in Schools in South Africa

In South Africa, key policies include the National Environmental Management Act No. 107 of 1998 and the National Environmental Management Waste Act No. 59 of 2008 (Sohan, 2021; De Villiers et al., 2020). These policies provide a legal framework for protecting the

environment and encouraging effective waste management. Schools need to use these policies to implement structured waste management systems and incorporate sustainability principles into teaching and extracurricular activities. The inclusion of EE highlights the need for SP to have knowledge and awareness about successful SWM practices. Although Monus (2022) cautions that the effectiveness of integrating EE within schools is dependent on the extent to which SP are aware of and committed to enacting the key principles of the relevant policies.

Schools with environmentally aware SP will most probably combine sustainability into school policies and promote a commitment to EE among learners, and the wider community (Monus, 2022). When SP support EE, they nurture a responsibility towards the environment and encourage learners, and community members to participate in SSWM practices at schools and home (Zainal Abidin et al., 2023). This approach advances the emphasis on ESD and makes SSWM a fixed part of the school's philosophy. As is evident, understanding the key concepts for this study is important to ensure that schools participate meaningfully in SSWM practices in order to preserve and manage the environment. This understanding of these important concepts provides the foundation for examining the key role that schools play in fostering SSWM in their communities.

2.7.4. The Role of Schools in Promoting Sustainable Solid Waste Management

As discussed earlier in this chapter, SWM is a global challenge with considerable environmental, economic, and social impacts (Asad et al., 2022). In SA, there are existing policies and guidelines governing SWM practices (Department of Environmental Affairs, 2013; 2016; 2018; 2020; Department of Environment, Forestry and Fisheries, 2020). Concerning education, in 1992, the Environmental Education Policy Initiative (EEPI) was developed to promote the incorporation of EE into the school curriculum (Damoah & Omodan, 2022). This initiative gave rise to including EE as an essential idea in the 1995 White Paper on Education and Training, thereby contributing formally to South Africa's curriculum (Reddy, 2021).

The South African curriculum offers learners the chance to be taught about SWM practices, the protection of resources, and sustainable development. Guidelines in the policies include information for schools to start recycling programmes, promote waste reduction initiatives, and restrict the use of single-use plastics (Janse van Rensburg, 2022). The policies also promote hands-on activities and encourage interdisciplinary learning. The findings of Damoah and

Omodan (2022) support this view and implies that the linking of SWM practices with school subjects is strengthened. By providing opportunities and support for promoting sustainable practices, education policies play an important role in encouraging the use of effective SSWM practices. For primary schools in SA, SSWM indicates the methods used for reusing, reducing, recycling, and responsibly managing waste within the school environment. These practices are adhered to in order to reduce the negative impact on the environment. SSWM encompasses the use of environmentally responsible procedures in daily running of schools. This includes, for example, separating waste, encouraging the use of reusable items, and teaching learners about the meaning of sustainability. By encouraging ideas about sustainability, primary schools can sustain resources and promote environmentally conscious behaviour among learners (Janse van Rensburg, 2022).

Schools are major waste producers and centres for education and innovation in sustainable practices (Kowasch, 2022). Through creating and implementing targeted training, education and sustainability programmes, schools can introduce knowledge and skills linked to the concepts of reducing, recycling and reusing from an early age. Hands-on, real-world activities and projects can be created at the school level. Schools are strategically placed to be catalyst of change for more sustainable education and community engagement (Laius et al., 2024). With the rapid progress in technology and different approaches to teaching and learning, schools can increase their SSWM activities. The use of interactive digital maps, activities and games makes learners' experiences of learning about SWM more interesting (Anokye et al., 2024). The use of artificial intelligence and evidence-based research can help schools track their progress towards achieving the SDGs. The integration of SWM practices with school subjects can encourage learners to think about different types of solutions related to the challenges of SWM. Schools play an important role in implementing SSWM activities within school contexts.

Research (Anokye et al., 2024; Asad et al., 2022) reveals that schools are significant in shaping the attitudes and behaviours of future generations. By encouraging the ideas linked to sustainability, schools can encourage societal changes concerning sustainability. Schools serve as role models for communities. Through the integration of SSWM practices in daily operations, activities and curriculum, schools can promote sustainability within communities (Kowasch, 2022; Tiippana-Usvasalo et al., 2023). This includes aligning with sustainable procurement policies, instigating efficient SWM systems, and inspiring behavioural changes among teachers, learners and community members.

Kowasch (2022) proposes that knowing more about SP knowledge of SSWM practices can help identify knowledge gaps and develop targeted training programme to encourage and support the use of SSWM practices within a school context. In this way, policies, curricula, education, training and development that encourage sustainability is promoted. Apart from the immediate school context, schools can inspire wider changes in society by encouraging collaboration with local businesses, governments and other environmental establishments. These collaborative initiatives can help with setting up recycling projects and setting up educational programmes and community workshops for learners, teachers and the broader community. Tiippana-Usvasalo et al. (2023) illustrate that these activities and strategies highlight the importance of promoting sustainable development beyond the school context.

Schools become centres for ESD and help nurture SSWM practices to advance environmentally and socially responsible communities. SP can model environmentally and socially responsible behaviours by including aspects of sustainability in their teaching and daily life. Teachers can be supported in developing their knowledge, attitudes and understanding of SSWM practices through teacher training and development workshops. Teacher education, training and professional development will ensure that the ideas about sustainability become an important characteristic of the school ethos (Kowasch, 2022). This bridges the gap between schools, SP and environmental sustainability.

2.7.5. School Personnel Training, Leadership and Environmental Sustainability

School personnel (SP) play a crucial role in advancing environmental sustainability within school settings (Acton, 2022; Espiritu, 2024). They are instrumental in promoting policies and practices that foster environmental responsibility. It is important to provide targeted training focussing on promoting environmental sustainability at schools (Boateng et al., 2023). This training will support SP to encourage and implement sustainable practices within the education sector (Damoah & Omodan, 2022; Dzerefos, 2020). Their knowledge and awareness of environmental sustainability shape teaching and community engagement (Anokye et al., 2024). Knowing more about their knowledge of SSWM can provide important insights into the current state of SWM practices at schools and suggest areas for improvement. It can also reveal gaps in knowledge, emphasise successful practices, and help identify barriers, challenges and areas that require further research and development (Raghu & Rodrigues, 2020). This important information provides the platform for developing further targeted training, and development, to advance school policies that promote SSWM practices.

SP ought to be provided with targeted training so that they can serve as leaders in promoting environmental sustainability at schools. SP should collaborate with government to initiate education programmes focusing on effective SWM (Nabor & Cruz, 2022). This notion is supported by previous research (Dzerefos, 2020; Shabalala, 2024; Smith, 2020) which reveals that SP can establish environmental sustainability in school culture by linking their leadership practices with environmental responsibility. This includes promoting energy and resource conservation, recycling, and sustainable management of resources (Espiritu, 2024). SP play an important role in encouraging partnerships and collaborations that support learner-led sustainability projects. These projects have shown an increase in environmental knowledge and awareness and have led to environmentally responsible behaviours among learners (Acton, 2022; Buriro et al., 2023). Working with SP can reveal how schools can use SSWM practices to become leaders in sustainability within their communities.

SP are role models and leaders, and they can guide their learners to think critically about how they use and manage resources effectively. They are responsible for including EE and awareness into the curriculum, which supports practical skills for living sustainably (Qureshi, 2020). By being role models for sustainable behaviours and practices and supporting environmentally friendly projects and practices, SP enhances the school environment. They motivate learners to use sustainable values that positively influence the wider community (Espiritu, 2024). SP can lead by example and encourage practical initiatives, such as reusing supplies and materials and recycling. SP can support and help learners gain practical skills by promoting activities, such as repairing and reusing broken items, encouraging the use of digital/e-textbooks, reducing the use of plastic, and supporting sustainable school policies.

SP are leaders in schools that educate our future leaders. If future leaders are encouraged to think about responsible SWM practices, this will assist in a shift to more sustainable practices in wider society (Sewak et al., 2021; Smith, 2020). The current study supports this notion, and regards SP as key to promoting effective SWM practices by guiding learners, implementing sustainable practices, and engaging with the wider community to promote sustainability. Apart from working with existing school policies, SP can also nurture a school culture that includes the use of sustainability principles in daily school activities and decision-making (Damoah & Omodan, 2022; Dzerefos, 2020). They can support the implementation of eco-structures made up of learners, and community members. These eco-structures can identify environmental challenges the school faces and discuss how best to respond to these challenges (Acton, 2022;

Buriro et al., 2023). These practices can lead to an improvement in the school's SWM strategies and also encourage the ideas of shared environmental responsibility within the community (Damoah & Omodan, 2022). Attending targeted training programmes about effective SWM practices can help SP initiate educational programmes and activities centred around EE. These programmes will ensure that learners and community members are prepared with the skills, knowledge, attitudes and strategies needed to incorporate sustainability into various school subjects and activities.

The active participation of SP in sustainability activities is important in the context of the KAB model. SP awareness and knowledge of environmental sustainability affect their attitudes towards using sustainable practices (Damoah & Omodan, 2022; Ferguson et al., 2022). This leads to a transformation in their behaviour when developing and maintaining sustainability plans. By reinforcing sustainability knowledge and encouraging a positive attitude among community members and learners, SP can drive changes in behaviours that advance long-term environmental accountability within schools and the broader community. Drawing on the key role SP play in promoting sustainability, it is important to explore how their knowledge, attitudes and behaviours, as discussed in the KAB model, have an impact on the effective implementation of SSWM strategies in schools.

Building on these ideas, it is important to look further at how other researchers in the field have explored similar issues linked to SWM. Previous research in the field will assist in guiding the design and methodology for this study. The methodological approaches used by other researchers are discussed in more detail in the section that follows.

2.8. Methodological Approaches Used by Other Researchers in the Field

2.8.1. Previous Research on Exploring Solid Waste Management Practices at Schools

The approaches used by other researchers in the field were examined to inform the research design and methodology for this study. This section discusses the approaches used by other researchers in the field. Other researchers in the field have used case studies. These case studies used qualitative, quantitative and mixed-method research designs. Case studies have been used to explore education stakeholders' practices of SWM in developing countries. For example, a study conducted at secondary schools in Africa used a qualitative approach to look at strategies used in schools to manage waste (Nnonyelu & Dongjie, 2024). A Philippines case

study was conducted to find out more about the involvement of stakeholders in SWM practices at primary schools. The Philippines study used a quantitative approach. The study involved the distribution of a questionnaire to school principals, parents, learners, government and non-government officials (Valladolid & Blase, 2023). In another case study, research was conducted in secondary schools in SA. In this study, focus group interviews, observations and individual interviews were conducted with teachers and learners (Mzobe & Msezane, 2024). Another case study conducted in the Philippines used a mixed-method approach. This approach was guided by a sequential explanatory technique (Sambat et al., 2024). The current study was guided by previous research in the field (Nnonyelu & Dongjie, 2024; Valladolid & Blase, 2023) and included a questionnaire and an interview with purposively selected participants to find out more about participants' awareness and practices of SSWM.

Other researchers have used action research to look into SWM strategies at schools. Exploring research problems while trying to find solutions to the problem is effective (Alves et al., 2021), and often involves researchers identifying the research challenges and then initiating specific solutions that would work in that context. For example, research (Bukirwa et al., 2022) conducted in primary schools in Masaka City, Uganda, showed that researchers, teachers, learners, support staff and local community members worked collaboratively to find solutions to reduce solid waste. In the study in Uganda, pre- and post-surveys, photographs, interviews and reflective journals were used to look into how effective the SWM strategies were in reducing solid waste. This type of research encouraged environmental responsibility and sustainability.

In a study conducted in Tokyo (Izumi et al., 2020), ethnography was used to find out more information about SW activities, practices and attitudes in school lunchrooms. Collecting data by observing, taking photographs, and having conversations with people to learn more about their habits assists with learning more about people and their activities (Eckert & Rial, 2023). In the Tokyo study, through observations, conversations, reviewing documents, and interviews, it was evident that cultural ideas, attitudes and behaviours had an effect on the behaviours and attitudes about SWM in schools. The use of ethnographic research assisted in obtaining a distinct understanding of how waste was managed within specific contexts.

2.8.2. Previous Research on Exploring the Level of Knowledge of Solid Waste Management at Schools

With previous research on the levels of knowledge of SWM, researchers used interviews, observations, photos, questionnaires and surveys. In a study conducted in KZN, SA, interviews observations and photos were used to find out more about teachers' and secondary school learners' knowledge and awareness of SWM (Mzobe & Msezane, 2024). The findings of this study showed that learners and teachers were aware of and knew effective SWM, and they were knowledgeable about the environmental impacts of waste. However, they had limited knowledge and awareness of effective SWM strategies that could be used at schools. Similarly, in a study conducted in the Philippines, a survey was conducted with Grade 6 learners, and interviews were conducted with teachers and principals. The purpose of the study was to collect more information about the levels of knowledge and attitudes towards SWM (Nabor & Cruz, 2022). The results of this study revealed that there were gaps in knowledge about SWM at primary schools. The schools in this study did not have clear guidelines or policies for SWM. These research studies (Mzobe & Msezane, 2024; Nabor & Cruz, 2022). reveal the gap in literature that the current study explores. Guided by these previous studies, the current study uses interviews with participants to generate data focussing on knowledge, attitudes and behaviours related to SSWM practices in primary schools.

In another study conducted in the Philippines, the researchers used a questionnaire to collect data about learners' attitudes and awareness about SWM (Reyes & Madrigal, 2020). The researchers for this study used descriptive statistics to analyse the data. The key findings revealed that there was a connection between attitude and awareness. Moreover, in another study conducted in Malaysia, a questionnaire was given to secondary school learners to obtain more information about knowledge levels and awareness of SWM (Mahayuddin et al., 2024). The findings of the study showed that learners knew the 3Rs. Although the learners were actively engaged in recycling activities, there were gaps in their knowledge about reusing and reducing. Based on the gaps in knowledge identified in the previous studies (Mahayuddin et al., 2024; Reyes & Madrigal, 2020), the current study used a questionnaire to collect data about participants' knowledge and attitudes about SSWM practices at primary schools.

From the discussions so far, the methodological approaches used by other researchers researching SWM at schools are important. Knowing more about the methodological approaches used by other researchers will assist in ensuring the most appropriate research

design and methodology for the study under focus. The review of methodological approaches by other researchers reveals various approaches used to explore key education stakeholders' practices and knowledge of SWM. It must be noted that previous studies have considered contextual factors, knowledge, behaviour and attitudes, especially when working with diverse school communities.

Qualitative methods, for example, individual interviews, focus group discussions, use of photos and observations, provide in-depth data (Adeoye-Olatunde & Olenik, 2021; Creswell, 2013). Quantitative approaches, for example, experiments, questionnaires and surveys offer widespread data and enable researchers to collect data from a larger sample size and more research sites (Boateng et al., 2023; Nipah et al., 2024). A mixed-method approach provides the strengths of qualitative and quantitative data. Based on the research and knowledge gained from the methodological approaches used by other researchers, this study is a case study involving selected primary schools in Chatsworth, KZN, SA. Guided by previous research in the field (Adeoye-Olatunde & Olenik, 2021, Boateng et al., 2023; Nipah et al., 2024), the choice of the mixed-method approach for this study allows for the triangulation of data collected. Including different data collection strategies will assist in obtaining a better understanding of the level of knowledge of SSWM amongst school personnel in selected Chatsworth primary schools. The quantitative data will assist in collecting measurable data on knowledge and practices, and the qualitative data will assist in acquiring in-depth information about SP experiences, practices, perceptions and challenges regarding SSWM. This methodological approach will ensure a balanced view of the selected primary schools. The use of purposive sampling for the qualitative aspect, will ensure that the study focuses on SP directly involved in applying SWM practices. In this way, the collected data will be applicable for informing future research possibilities.

2.9. Conclusion

Chapter two examined the relationship between existing research and the study under focus. The Knowledge-Attitude-Behaviour (KAB) Model was introduced and discussed in the context of this study. In this chapter, a literature review focusing on national and international research linked to this study was provided. Additionally, this chapter offered a discussion of the methodological approaches used by other researchers in the field. The next chapter provides a discussion about the research design and methodology for this study.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

A well thought out research design and methodology chapter is important for a research study. This chapter provides a clear and detailed description of the plan for organising the research. This chapter ensures that the study can be duplicated or replicated by other researchers in their contexts. This chapter presents the planned approach for conducting the study under focus. In this study, the research design and methodology provide a framework for the logical approach used to explore the level of knowledge of SSWM among SP in selected Chatsworth primary schools. A suitable research design and methodology is key to ensure the trustworthiness of the findings. In this chapter, a detailed discussion of the research paradigm, approach, population and sample, sampling method, data collection, validity, reliability and data analysis for this study is provided. By carefully describing the research design and methodology, this chapter justifies the procedures used in this study.

3.2. Research Approach

This study followed a mixed-method case study approach that focused on exploring the level of knowledge of SSWM amongst SP in selected Chatsworth primary schools. An explanatory sequential design was used. A mixed-method case study using an explanatory sequential design has been used by other researchers working with SWM practices (Bowen, 2023; Li et al., 2024; Sambat et al., 2024). This design is considered useful when exploring unknown ideas using a mixed-method technique. A case study that follows an explanatory sequential design begins with collecting quantitative data. After that, the quantitative data is analysed before the collection of qualitative data starts. The collection and analysis of the qualitative data guide the interpretation of the data from the cases under study (Espuny et al., 2021).

An important characteristic of the explanatory sequential design that was valuable for this study is its ability to increase the validity of findings by combining both numerical data and qualitative perspectives (Dzawanda & Moyo, 2022). In phase one of the data collection, the quantitative data collected from the completed questionnaires established the patterns and trends in the level of knowledge of SSWM amid SP. In phase two of the data collection, the qualitative interview data, allowed for a better understanding of these findings by exploring the

perspectives, reasoning and experiences of the participating SP. This explanatory sequential mixed-methods design was applicable in the context of research about SSWM. Insights and awareness of sustainability issues can be influenced by various aspects such as individual ideas and values, policies, school values, and community ideals. By using both qualitative and quantitative methods to collect data, ensured that the study encouraged a comprehensive interpretation of the data (Abdulfatah, 2023). Through the use of qualitative and quantitative methods levels of SSWM knowledge and the contextual factors that influenced this knowledge was obtained.

Firstly, a questionnaire was handed out to all SP applicable for this study (school management team and school governing body members). Analysing the questionnaire helped to purposively select participants for the next stage of the study (Fadhullah et al., 2022). Secondly, the purposively selected participants were invited to participate in individual semi-structured interviews. Afterwards, the interview data was transcribed and analysed. This study took into consideration the importance of highlighting SSWM knowledge within the specific educational and environmental background of Chatsworth primary schools. The management of SW in a sustainable manner is not only a logistical matter but also a socio-cultural concern that requires active collaboration, changes in attitude and behaviour (Raghu & Rodrigues, 2020). Therefore, exploring the level of knowledge of SSWM among SP provides the opportunity to identify gaps in knowledge and awareness, expose barriers that impede the promotion of SSWM practices and reveal important prospects for implementing suitable interventions. The perceptions gained from this study can encourage the advancement of carefully planned approaches for encouraging SSWM education in primary schools. This will eventually nurture the value of sustainability within schools. The blending of quantitative and qualitative methods assisted in advancing a good understanding of the cases under focus. Quantitative data assisted in offering statistical awareness, and qualitative data provided individual experiences, knowledge, and awareness of sustainable SWM practices (Tsai et al., 2020).

3.3. Research Paradigm

This study, explored the level of knowledge of SSWM amongst SP in selected Chatsworth primary schools in KZN. The interpretivist paradigm was followed since this paradigm focuses on personal meaning-making and interpretation (Pervin & Mokhtar, 2022). This paradigm stresses that reality is constructed through shared and individual experiences and

understanding. The interpretivist paradigm emphasises on research conducted with people rather than with objects.

The bias when using this paradigm creates disadvantage since research findings may be influenced by the researcher's own interpretations, (Alharahsheh & Pius, 2020, Pervin & Mokhtar, 2022). To circumvent the bias of research findings being influenced by the researcher's own interpretations, for the current study, multiple methods for collecting data were used to triangulate the research findings to alleviate this bias in this study. Data was collected through the use of a questionnaire and semi-structured individual interviews. The advantage of this paradigm is that it offers the researcher the chance to provide descriptions and understanding of phenomena within specific social settings. Previous studies have used this paradigm due to this advantage (Alharahsheh & Pius, 2020; Cuthbertson et al., 2020; Pervin & Mokhtar, 2022). These studies have focussed on the value of personal interpretations and meanings grounded in individual experiences. For this study, this paradigm was used to unpack the practical strategies and personal experiences that SP used to mitigate the barriers or challenges they encountered when promoting SSWM practices at their schools. This paradigm has been used successfully by other researchers working with SWM practices (Abdulfatah, 2023; Nguyen et al., 2023). A review of these studies, justifies the use of the paradigm for this study.

To further justify using the interpretivist paradigm for this study, it was necessary to understand how this paradigm enabled an in-depth exploration of the individual experiences of SP about SSWM. By concentrating on the explanations of each participant, this paradigm allowed for the collection of individual and collective insights, perceptions, and strategies about SSWM in primary schools. The interpretivist paradigm assisted in revealing how each participant made meaning of their individual SWM and their understanding of promoting ideas about sustainability. This information was useful to uncover in a school environment where varied viewpoints and strategies existed. It was important to understand how diverse experiences had an impact on engagement with and promotion of SSWM strategies.

The interpretivist paradigm places emphasis on research methods that allow for an in-depth understanding of the experiences of participants. By using questionnaires and semi-structured interviews, this study explored the knowledge, awareness, attitudes, behaviours and strategies SP used to encourage SSWM within their own school contexts. The semi-structured interviews

in this study offered the participants the opportunity to answer the questions in their own words, which assisted in providing detailed explanations of their experiences (Adeoye-Olatunde & Olenik, 2021). The use of different research instruments for this study strengthened the trustworthiness of the findings. This ensured that the study provided a detailed description of the SP experiences and views. By using the interpretivist paradigm, a detailed exploration of the research problem was provided.

3.4. Study Area

The study was located in Chatsworth. Chatsworth is a suburb of Durban in KZN, SA. In this section, maps relevant to the study are presented in figure 3.1. The map of KZN in SA is represented by the dotted red line in Map A (Google Maps, 2025d). The map of Durban is shown in Map B (Google Maps, 2025c). Chatsworth is located about 15 km, South West of Durban (South African History Online, 2025). Chatsworth is a densely populated area and is shown within the dotted red line in Map C (Google Maps, 2025a). The location of all primary schools in the study site is shown in Map D (Google Maps, 2025b).

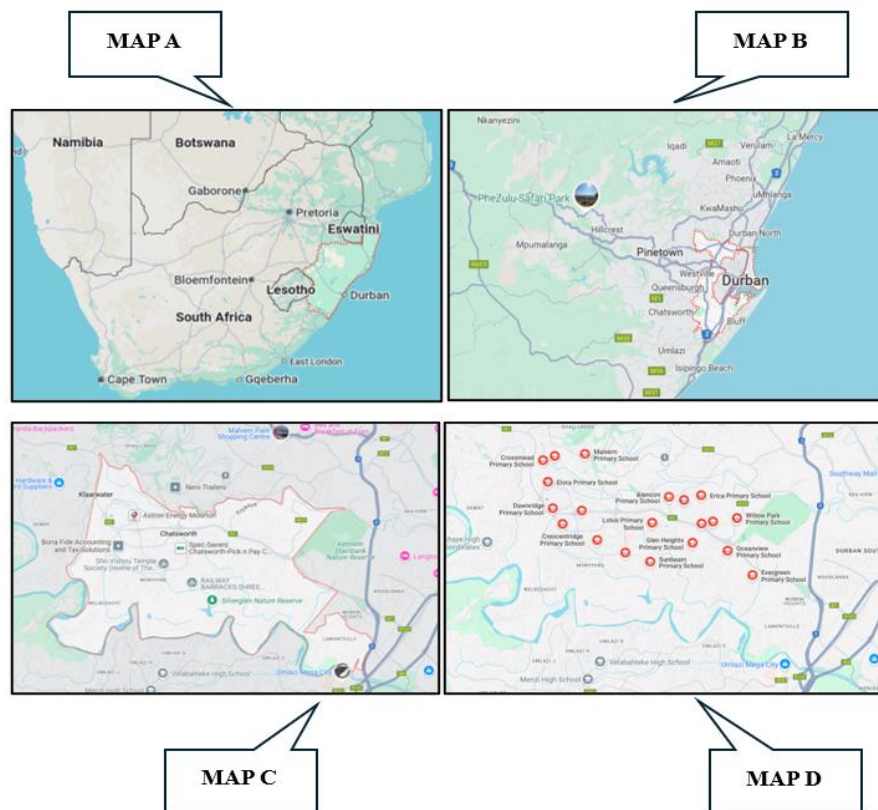


Figure 3.1: Study area

Primary schools in Chatsworth, KZN, were chosen for this study due to its combination of urban and suburban attributes (Matthew, 2023). Urban areas are densely populated with a larger number of buildings and structures. These areas are closer to the town centre and central business district (Carson et al., 2022). A suburban area is a less densely populated area than an urban area. Suburban areas are located just outside the city or town centre (Diamond et al., 2021). The combination of urban and suburban features provides the ideal setting for examining challenges in EE. Chatsworth is a densely populated area, and densely populated areas often experience many challenges with SWM (Gandu & Abubakar, 2023; Victoire et al., 2020). Chatsworth encounters various challenges including overcrowded households, expansion of informal settlements and increasing unemployment rates (Matthew, 2023). These socio-economic issues have an effect on learner enrolment whereby the schools enrol learners from both working-class households and informal settlements. The current waste management practices in this area are reliant on basic municipal collection, however this area is prone to illegal dumping due to the rise in informal settlements (Chikodzi et al., 2021). Thus, Chatsworth is an appropriate location and exploring the levels of knowledge of SSWM amongst SP can provide suggestions for promoting sustainability within the community. The study area is described in more detail in the section that follows.

There are thirty-six primary schools in Chatsworth (Schools 4 South Africa, 2022), and stratified sampling was used to divide the schools into two strata: urban and suburban. The selected schools were located in urban and suburban areas within Chatsworth. Chatsworth was established in the late 1960s as a residential area for the Indian population (Matthew, 2023). Currently, Chatsworth does have a large Indian population, but Black, Coloured and White residents also reside in the area (SA Venues, 2025). In table 3.1, statistics from the 2015 Census in South Africa reveal the data about the population in Chatsworth, SA.

Table 3.1: Statistics for Chatsworth, Durban South Africa (City Facts, 2015)

Area of Chatsworth	61.5 km ²
Population	221 627
Male Population	107 643 (48.6%)
Female Population	113 984 (51.4%)

The most recent statistics from the Census 2022 for the suburb is still being processed. Phase one of this process provides general information about population statistics for provinces and not suburbs (Statistics South Africa, 2023). The study focussed on SP at selected primary schools in Chatsworth, KZN. The reason for focusing on SP is that they are currently leaders at schools and work closely with parents, learners, and community members. In school settings, SP are important because they are key in developing school policies, allocating school budgets and managing resources (Ganon-Shilon et al., 2021; Masnawati & Darmawan, 2022). By exploring the knowledge levels of SP, this study hopes to uncover knowledge gaps and areas for development. In this way, the incorporation of SSWM practices that benefit the school, learners and community members is encouraged. Details regarding the sampling method are provided in the following section.

3.5. Sampling Method

In this explanatory sequential mixed-method study, stratified and purposive sampling was used to select the schools for the study. Stratified sampling involved dividing the population into smaller groups before the sample was chosen (Creswell, 2009). The stratified sampling method provided the opportunity to capture diverse perspectives while ensuring the sample was representative of the broader population (Tsheleza et al., 2022). Public schools in South Africa are classified according to five quintiles based on a poverty index and this index is used to establish funding allocations for schools. Quintiles 1, 2 and 3 are classified as no fee-paying schools while Quintiles 4 and 5 are fee paying schools (Maistry & Africa, 2020).

The stratification criteria used was the geographic location and quintile of the schools. The thirty-six schools were divided into two groups/strata: urban and suburban. The strata for this study were defined as urban schools and suburban schools. These schools were further classified according to quintiles. Based on these criteria (urban, suburban and quintile of the school), equal purposive sampling was used to balance the sample. Purposive sampling is a non-probability sampling process that is used to select participants focussing on particular requirements (Lissah et al., 2021; Nzalalemba & Simatele, 2020). All 36 primary schools were invited to participate in the study. Fourteen schools accepted the invitation to participate. Six schools from the urban school group were selected based on their willingness to participate in the study. There was an equal distribution of Quintile 3 and 4 schools in this sample. Six schools from the suburban school group were selected based on their willingness to participate

in the study. There was an equal distribution of Quintile 3 and 4 schools in this sample. Two quintile 3 schools (one urban and one suburban) participated in the pilot study. Details of the selected schools for the main study (n= 12) are shown in table 3.2. Details for each of these schools have been obtained from the Department of Education (KZN Department of Education, 2023). For this study, pseudonyms have been used to protect the identity of the schools.

Table 3.2: Schools participating in the study

School	Type	Number of Learners	Number of Educators	Number of SP	Quintile
Alder Primary	Suburban	621	27	9	Q3
Bramble Primary	Suburban	573	21	8	Q3
Cedar Primary	Suburban	281	15	7	Q4
Dawn Primary	Suburban	540	18	8	Q4
Elm Primary	Suburban	573	20	8	Q3
Fern Primary	Suburban	265	16	7	Q4
Grove Primary	Urban	412	18	7	Q4
Hazel Primary	Urban	270	14	7	Q3
Ivy Primary	Urban	356	15	7	Q4
Juniper Primary	Urban	321	14	7	Q4
Kale Primary	Urban	303	13	7	Q3
Lake Primary	Urban	475	15	7	Q3

The sample of schools in table 3.2 helped obtain diverse views across urban and suburban schools. This ensured that the collection of data from different contexts was manageable. The study employed a purposive sampling method to select participants from the schools listed in table 3.2. This approach ensured that participants who are part of the school personnel (school principals, heads of departments (HODs) and school governing body (SGB) members) were included. This ensured that these participants were able to provide insights into the level of knowledge and practices related to SSWM. In the quantitative phase of the main study, collecting data from SP at purposively selected schools was large enough to determine patterns in the data while still being possible in terms of time, logistics and resource considerations.

The sample size for the questionnaires was planned as follows:

Group 1: School Principals: This study included twelve schools. Therefore, 12 school principals were invited to participate in the study and complete a questionnaire.

Group 2: Heads of Departments (HoDs): Each school has, on average, three HoDs. Therefore, for 12 schools, 36 HoDs were invited to participate in the study and complete a questionnaire.

Group 3: School Governing Body (SGB): Each school has, on average, four SGB parent members. Therefore, for 12 schools, 48 SGB members were invited to participate in the study and complete a questionnaire. The total sample size for the questionnaire was: Group 1: 12 + Group 2: 36 + Group 3: 48 = 96 participants were invited to participate and complete the questionnaire.

However, due to personal reasons only 74 participants agreed to participate in the study. These 74 participants completed and handed in the questionnaire. It must be noted that it is not about obtaining the largest response rate, but rather to ensure that the responses received for the items on the questionnaire are appropriate for the study (Holtom et al., 2022). For this study, the 77% response rate was a good response rate (Booker et al., 2021) and the participants' responses were appropriate for this study.

For the qualitative part, in homogenous populations where the individuals are similar with respect to the requirements for the study, a smaller sample is appropriate (Hennink & Kaiser, 2022; Scărneci-Domnişoru, 2024). In this study, the population is homogenous. They are all SP (school principal, heads of departments and school governing body members) at public primary schools in the same geographical location. The participants for the semi-structured interviews are the same participants who completed the questionnaire. After an analysis of the questionnaires, participants were invited to participate in interviews.

The sample size for the semi-structured interviews was planned as follows:

Group 1: School Principals: Twelve schools. Therefore, 12 school principals who completed the questionnaire were invited to participate in the interviews.

Group 2: Heads of Departments (HoDs): One HoD from each school who completed the questionnaire was invited to participate in the interview. Therefore 12 HoDs were invited to participate in interviews.

Group 3: School Governing Body (SGB): One SGB member from each school who completed the questionnaire was invited to participate in the interview. Therefore 12 SGB members were invited to participate in interviews.

The total sample size for the semi-structured interviews: Group 1: 12 participants + Group 2: 12 participants + Group 3: 12 participants = 36 participants who completed the questionnaire were invited to participate in semi-structured individual interviews.

However, due to personal and other work commitments, only 28 participants agreed to participate in interviews. Research (Magaldi & Berler, 2020; Karatsareas, 2022) indicates that not all participants who are invited to participate in semi-structured interviews will respond positively. Researchers need to keep this in mind when inviting participants to participate in interviews. Response rates for interviews are generally 70-80% (Petrescu et al., 2017). For this study 28 participants were an acceptable 78% response rate. Creswell (2013) also suggested that 20-30 interviews are adequate to reach saturation. This is supported by Gentles et al. (2015), at least 25 interviews will be sufficient for qualitative research. The interviews were conducted at a place and time that was convenient for the participants. The purposive sampling of 28 SP from the purposively selected schools for the study provided a chance for in-depth discussion without overpowering the analysis. The purpose of the purposive sampling method was to concentrate on particular requirements that would help respond to all research objectives and research questions. For this study, purposive sampling was followed to ensure that the participants for the semi-structured individual interviews have knowledge of SSWM practices. This information was determined from the analysis of the responses to the questionnaire.

The size of the sample for this study was justified based on the need to obtain viewpoints from key decision-makers at schools. Including SP from different schools ensured a diverse representation of practices and knowledge levels. The focus on SP also allowed for the exploration of knowledge and application of SWM practices. The sample size for this study was manageable and aligned with resource availability. The sample size was sufficient to collect the data required to answer the research objectives and research questions effectively. For this study, the main areas of exploration included SP current knowledge levels as well as the barriers, challenges and opportunities to using SSWM practices at their schools. Other researchers have used stratified (Tsheleza et al., 2022) and purposive sampling (Lissah et al., 2021; Nzalalemba & Simatele, 2020) when researching about SWM practices. These sampling methods were also appropriate for this study. Data collection started during the first and second school term (March-June) of 2025. Data was collected with a questionnaire and semi-structured individual interviews.

3.6. Data Collection

Primary data was collected for this study. Data is considered primary because it is original and first-hand information collected by the researcher (Mazhar et al., 2021). Primary quantitative

and qualitative data for this study was collected with a questionnaire and semi-structured individual interviews. The collection of multiple types of data assisted with the triangulation of the data collected (Natow, 2020).

A pilot study was conducted before starting the main study. Conducting a pilot study offered the chance to assess and revise the research instruments before using them in the main study. This improved the quality of research (Gallardo et al., 2021; Nyampundu et al., 2020). The pilot study was conducted at two primary schools with similar characteristics to the schools in the main study. One urban quintile 3 and one suburban quintile 3 school was selected for the pilot study. All SP from the schools selected for the pilot study were given the questionnaire to complete. After the questionnaire was collected and analysed, semi-structured interviews were held with five purposively selected participants. These participants were selected after analysing their completed questionnaire. The purpose of the pilot study was to determine the feasibility of the research design and methodology. This helped to ensure that the research instruments were appropriate for the main study and responded adequately to the research objectives of this study. The pilot study was conducted over a period of three weeks. The participants who participated in the pilot study did not participate in the main study. The main study included a questionnaire and an individual semi-structured interview. The questionnaire responded to research objectives 1 and 3 and the semi-structured interview schedule responded to research objectives 1, 2 and 3. A description of the multiple data collection methods and instruments is included in the sections that follow.

3.6.1. Questionnaire

A questionnaire with five closed-ended questions and a five-point Likert scale was used. The questionnaire was given to all SP at the participating schools. The questionnaire was divided into three sections. The sections focussed on biographical and general information, knowledge of sustainable SWM and attitude towards sustainable SWM. The KAB model guided the design of the research instruments. For the questionnaire, two domains of the KAB model, i.e. Knowledge and Attitude informed the questionnaire design. Thus, carefully designed questions were included in the questionnaire to assist in determining each participant's knowledge (Section B of the questionnaire) and attitude (Section C of the questionnaire) towards sustainable SWM. The questionnaire was an important research instrument for this study. Analysing the questionnaire helped in identifying and purposively selecting participants for semi-structured interviews. Participants took approximately 10 minutes to complete the

questionnaire. The questionnaire assisted in answering research questions one and three. The questionnaire is included in the List of Appendices section.

3.6.2. *Semi-structured Individual Interviews*

From the answers received and analysed for the 15 items on the questionnaire, semi-structured individual interviews were completed with purposively selected SP. These semi-structured interviews helped explore qualitative aspects. Purposive sampling provided the opportunity to choose specific participants who were able to express their views about their knowledge of sustainable SWM. Ten carefully designed questions guided the semi-structured individual interviews. The interview questions were guided by the three domains of the KAB model, i.e. Knowledge, Attitude and Behaviour. Thus, the interview questions focussed on exploring the SP's knowledge, practices, and challenges related to sustainable SWM within their school context. The interviews questions were designed to explore the level of SP's knowledge of sustainable SWM, the practices they implemented, and how they encouraged learners, and other individuals in these efforts. Throughout the interviews, participants answers were carefully probed. The semi-structured individual interviews assisted in answering research questions one, two and three. The semi-structured individual interview were approximately 45 minutes long. The interviews were scheduled at a time and place suitable for the participants. The semi-structured individual interview is included in the List of Appendices section.

3.7. Validity and Reliability

Validity and reliability are important to consider. Quality research guided by interpretivist paradigm can be assured by looking at the issues of transferability, credibility, construct validity and trustworthiness (Enworo, 2023; Rose & Johnson, 2020). Important measures were used to enhance the quality of the study and ensure validity and reliability:

- **Transferability:** Transferability was taken into consideration by providing a detailed description of the context and location of the study. The environment, the participants, the sampling procedure, the methods of data collection and the data analysis processes was discussed in detail. In this way, other researchers will be able to decide if they can transfer or apply the results of this study to their contexts (Ahmed, 2024; Nyirenda et al., 2020).

- **Credibility:** The credibility of this research study was supported by using different methods of collecting data. This helped to triangulate the data collected. Transcriptions of all interviews ensured the data was accurately captured, reliable and credible (Patkin, 2021; Rowlands, 2021).
- **Construct validity:** To ensure construct validity, a pilot study was conducted at two primary schools. These school had characteristics similar to those of the primary schools in the main study. During the pilot study, the data collection instruments was piloted to ensure that they were suitable for the main study (Bertram & Christiansen, 2020; Gallardo et al., 2021). After the pilot study, the research instruments were assessed and revised based on the results of the pilot study. This helped to ensure that they were suitable for use in the main study. The opportunity to test and revise the research instruments before using them in the main study improved the quality of this study.
- **Trustworthiness:** Trustworthiness for this study was supported by using triangulation (Koiwanit & Filimonau, 2023; Nyampundu et al., 2020). Multiple methods of data collection were used for the study. Data collection included a questionnaire and semi-structured individual interviews. Using different methods to collect data allowed for the cross-examination of data collected. This cross-examination ensured that trustworthiness was increased.

3.8. Data Analysis

Data analysis is a systematic process of using statistical and other techniques to describe, summarise, and examine data. The purpose of data analysis is to identify which information is useful for the study. Data analysis allowed the researcher to arrive at conclusions and support interpretations. Data analysis involved various stages. These stages included data cleaning and coding. This resulted in the interpretation and presentation of data. A sequential explanatory design was used. This design entailed collecting data by first using a questionnaire.

Excel was used for analysing the descriptive statistics to have a basic understanding of data distribution for the quantitative analysis. The Knowledge and Attitude domains derived from the KAB model guided the analysis of the questionnaire data. Section B of the questionnaire focused on the participants knowledge of SSWM and Section C of the questionnaire focused

on participants attitudes towards SSWM. The mean was calculated to identify which options participants were selecting. Subsequently, the mode was calculated for each item in the questionnaire to identify the most frequent answer. The mode helped in identifying the common patterns in the data. Frequency was calculated to see how often each response was selected. The questionnaire responses informed the purposive selection of participants for the interviews. The questionnaire responses also guided the interview questions.

Thematic analysis was used to analyse the qualitative data. The Knowledge, Attitude and Behaviour domains of the KAB model guided the qualitative data analysis. Analysing qualitative data thematically using the KAB model as a guide, assisted in identifying patterns and themes about the levels of knowledge, attitudes, behaviour and practices of the participants pertaining to SSWM. The transcribed data from the interviews was given to the participants for verifying. After the participants confirmed their transcripts, a thorough reading of each transcript was done. The preliminary thoughts, ideas and (inductive and deductive) coding of the initial reading of all the interview data was noted. The NVivo software programme helped in the thematic analysis of the qualitative data (Fernando & Zutshi, 2023). The interview transcripts were inductively and deductively coded first. The NVivo software programme was then used to double-check and confirm the inductive and deductive codes and themes. The NVivo programme assisted in organising the interview transcripts that were uploaded to the programme. NVivo was then used to identify the most frequently occurring words in the uploaded interview transcripts and a word cloud was created. This word cloud provided an image of the most frequently used words or phrases in the uploaded data. These words were displayed in the word cloud in bold and large orange coloured text to show importance. The most frequently used words and phrases (bold, bigger orange coloured text) were checked against the preliminary inductive and deductive codes, thoughts and ideas. Words and phrases used in everyday conversation were carefully considered in the context of the interview transcript and how these words were directly related to the study. Themes and subthemes were then finalised to reflect the data accurately.

3.9. Conclusion

Chapter three provides an overview of the study's research methodology and design. The interpretivist paradigm guided this study and helped with interpreting the data collected. The study followed a mixed-method case study approach. A sequential explanatory design was

used. Stratified and purposive sampling was used to choose the twelve primary schools for this study. After that, primary data was collected using a questionnaire. Collecting and analysing the questionnaire took place first, then semi-structured individual interviews were scheduled with purposively selected participants. All ethical processes and procedures were followed before data collection started. Data was analysed using Excel and the NVivo software programme. In the next chapter, the results for this study are presented and analysed.

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF RESEARCH RESULTS

4.1. Introduction

This chapter presents and analyses the research results of the questionnaire and interview data that were collected. The quantitative data was analysed using Excel. Quantitative data from the questionnaire were captured on Excel spreadsheets and presented in this chapter using frequency tables and bar graphs. Thereafter, the qualitative data were transcribed, checked with the participating SP and presented using inductive and deductive thematic coding. NVivo was used to organise the data and confirm initial codes and themes. For this chapter, the research results for the quantitative data are presented and analysed first, followed by the research results and analysis of the qualitative data.

4.2. Quantitative Research Results and Analysis

This section focusses on the presentation and analysis of the quantitative research results and as such, this section is guided by the questionnaire. The synthesis of the results in response to each research question is provided in chapter five. It is important to provide an overview of the pseudonyms and participant labelling used. This contributes as a basic step to ensure ethical integrity and serves as a map to follow individual responses without comprising the anonymity and confidentiality of the participating schools and SP. The participants were labelled according to the order in which the completed questionnaires were collected. The first completed questionnaire that was collected from Alder Primary was labelled as A1, the third completed questionnaire that was collected from Bramble Primary was labelled as B3 and so on. The pseudonyms and labelling used for this study are presented in table 4.1. Placing table 4.1 in this chapter and not in the previous chapter is a deliberate attempt to provide easier access to key information guiding the participant responses presented and analysed in this chapter.

Table 4.1: School pseudonym and participant labelling for the questionnaires

School Number	School Name (Pseudonym)	Participant Labelling	# of Participants
1	Alder Primary	A1-A7	7
2	Bramble Primary	B1-B6	6
3	Cedar Primary	C1-C5	5
4	Dawn Primary	D1-D7	7
5	Elm Primary	E1-E7	7
6	Fern Primary	F1-F5	5
7	Grove Primary	G1-G7	7
8	Hazel Primary	H1-H5	5
9	Ivy Primary	I1-I7	7
10	Juniper Primary	J1-J5	5
11	Kale Primary	K1-K6	6
12	Lake Primary	L1-L7	7
Total			74

The questionnaire comprised three sections. Sections A, B, and C. Results for each of these sections are presented and analysed in the following sections.

4.2.1. Section A: Describing the Biographical and General Information of School Personnel

The biographical and general information in section A, focused on gender, formal school leadership position, duration of membership on the school personnel (school management and school governing body) team, involvement in curriculum decision-making, training received in sustainability or environmental education and whether or not the participants implemented any sustainability or environmental education programmes at their respective schools. The research results for each question in section A are presented in the tables and figures that follow. Table 4.2 indicates that 46 females (62%) and 28 males (38%) participated in this study.

Table 4.2: Gender of participants

Gender	Frequency	Percentage (%)
Female	46	62
Male	28	38

Table 4.3 indicates that 48 participants were in formal school leadership positions while 26 participants were not. This is aligned with the questionnaire distribution for this study, whereby school principals (n=12), heads of departments (n=36) and parent members of the school governing body (n=26) participated and submitted completed questionnaires. Parent members are generally not part of the formal school leadership team. The formal school leadership team generally comprises the school principal and the heads of departments and are vital stakeholders who make key curriculum and resource management decisions at schools (Espiritu, 2024).

Table 4.3: Formal school leadership position of participants

Formal school leadership position	Frequency	Percentage (%)
Yes	48	65
No	26	35

Table 4.4 indicates that 56 participants were on the school personnel team for more than two years, while 18 participants were on this team for less than 2 years.

Table 4.4: Duration of school personnel membership

Duration of SP membership	Frequency	Percentage (%)
0-2 years	18	24
More than 2 years	56	76

Table 4.5 indicates that 61 participants were active curriculum decision-makers, while 13 participants were not curriculum decision-makers. It was important to interview the participants who indicated that they were not part of the formal school leadership team, implying they were parent members of the school governing body. Yet, some of these participants (n=13) indicated they were part of the curriculum decision-making. Members of

the formal school leadership team comprising of teachers, head of departments and the school principal make curriculum decisions aligned to policies (Espiritu, 2024).

Table 4.5: Involvement in curriculum decision-making

Involvement in curriculum decision-making	Frequency	Percentage (%)
Yes	61	82
No	13	18

Table 4.6 indicates that 42 participants received training in sustainability or environmental education, while 32 participants did not receive any training. The Department of Basic Education (DBE) introduced Environmental Education (EE) and have promoted the value of Education for Sustainable Development (ESD) at schools. Primary schools are encouraged to include EE and ESD within existing subjects (Monus, 2022). Based on the interviews with the participants, the DBE provides workshops and training to help teachers integrate EE and ESD in existing school subjects.

Table 4.6: Training received in sustainability or environmental education

Received sustainability/ environmental education training	Frequency	Percentage (%)
Yes	42	57
No	32	43

Table 4.7 indicates that 42 participants implemented sustainability or environmental education programmes at the school, while 32 participants did not implement any programmes linked to sustainability or environmental education. This is linked to the data shown in Table 4.6. The participants who did not receive training on sustainability or EE did not implement programmes at their schools. This is aligned with research (Anokye et al., 2024) which indicates that knowledge and awareness of EE and sustainability shape teaching practices. Also, knowledge of SWM practices may change behaviour and the likelihood of implementing and promoting environmental practices (Chiliza et al., 2021; Raghu & Rodrigues, 2020).

Table 4.7: Implementation of sustainability or environmental education programmes

Implementation of sustainability or environmental education programmes	Frequency	Percentage (%)
Yes	42	57
No	32	43

4.2.2. Section B: Presenting and Describing School Personnel's Knowledge of Sustainable Solid Waste Management

Section B consisted of Likert Scale questions with five scale responses (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree). The results for each item in section B are presented as follows. To demonstrate their understanding of what SSWM entails, Figure 4.1 shows that the majority of participants (n=48) agreed they had knowledge and understanding of SSWM, 13 participants strongly agreed, 11 participants provided a neutral response, and two participants indicated that they did not have knowledge and understanding of SSWM. Participants who gave a neutral response were probed during the interviews. The participants indicated they were not sure about SSWM. They had knowledge of SWM strategies but did not understand fully how to sustain these SWM strategies. Similar results have also been found by other research in the field (Mzobe & Msezane, 2024), participants who are unsure or have insufficient knowledge about a question, will select a neutral/safer option. Research also indicates that there is a positive relationship between knowledge about environmental challenges, attitudes and behaviour toward promoting effective SWM strategies (Reyes & Madrigal).

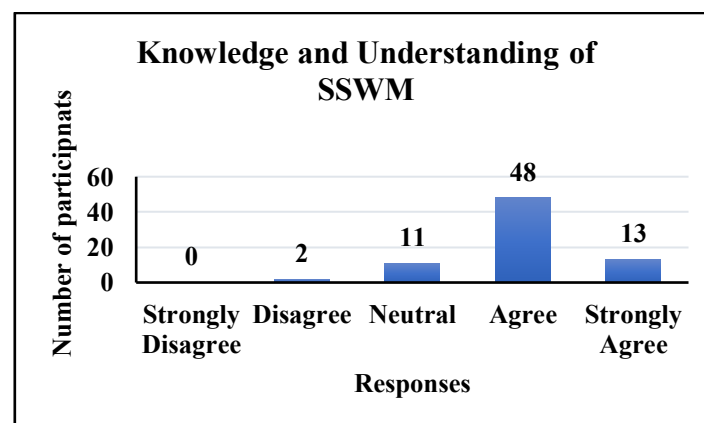


Figure 4.1: Knowledge and awareness of SSWM

The second statement in Section B, was about knowledge regarding the different types of waste generated in schools and the impact on the environment. Figure 4.2 illustrates that the majority of participants (n=46) agreed they knew the types of waste and their impact on the environment, 18 participants strongly agreed, eight participants provided a neutral response, and two participants indicated that they did not know the different types of waste and their impact on the environment. The large number of participants who responded positively is an indication that the participants were knowledgeable about the negative impact of SW on the environment. Having SP with adequate knowledge of SWM is important for promoting sustainable SWM strategies (Anokye et al., 2024; Chiliza et al., 2021).

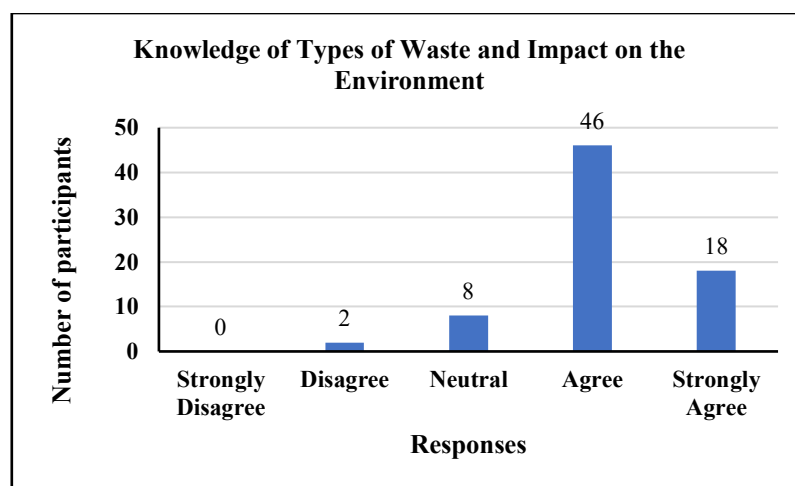


Figure 4.2: Knowledge of types of waste and their impact on the environment

The participants were asked about their awareness of SWM policies and guidelines. Figure 4.3 shows that the majority of participants (n=29) agreed they were aware of the policies and guidelines related to SWM, 26 participants provided a neutral response, 10 participants disagreed with the statement, and nine participants strongly agreed. Awareness of policies about SWM and the integration of EE in schools is important if schools want to implement effective SWM strategies at schools (Damoah & Omodan, 2022; Monus, 2022).

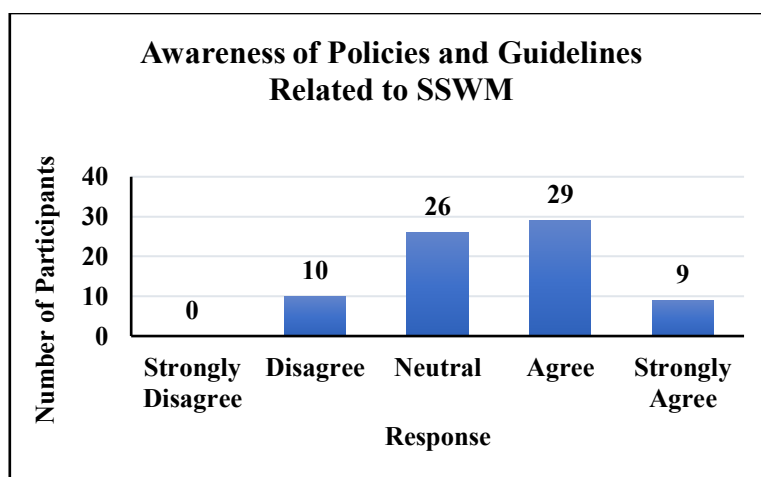


Figure 4.3: Awareness of the policies and guidelines related to SSWM

To find out more about the participant's confidence to educate staff and learners about SSWM practices, Figure 4.4 reveals that the majority of participants (n=31) agreed they were confident, 26 participants provided a neutral response, 11 participants strongly agreed, and six participants disagreed with the statement. A large number of participants provided a neutral response. This indicates that although participants had knowledge and awareness of SWM strategies and the types of SW, they were not confident in educating colleagues or learners about this knowledge. While knowledge and awareness of SWM is crucial to influence behaviour and attitudes towards SSWM (Kwauk & Casey, 2022), having the confidence to promote this knowledge is also important.

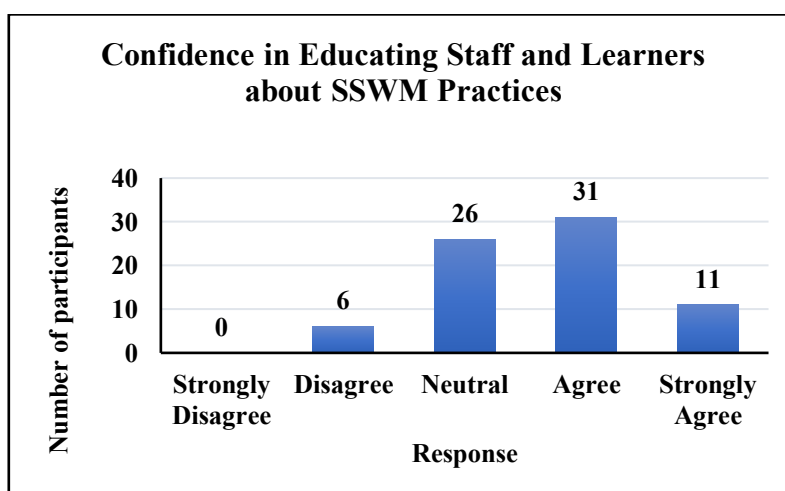


Figure 4.4: Confidence in educating staff and learners about SSWM practices

Regarding sufficient training received on SSWM, Figure 4.5 demonstrates that the majority of participants (n=34) were neutral about this statement, 17 participants disagreed with this

statement, and 16 agreed. Six participants strongly agreed, while one participant strongly disagreed. It must be noted that this statement was the first statement in Section B that any participant strongly disagreed with. This indicates that there is a need for more training and workshops that prepare SP with the necessary knowledge and teaching methods to teach about effective SWM at schools (Parry & Metzger, 2023).

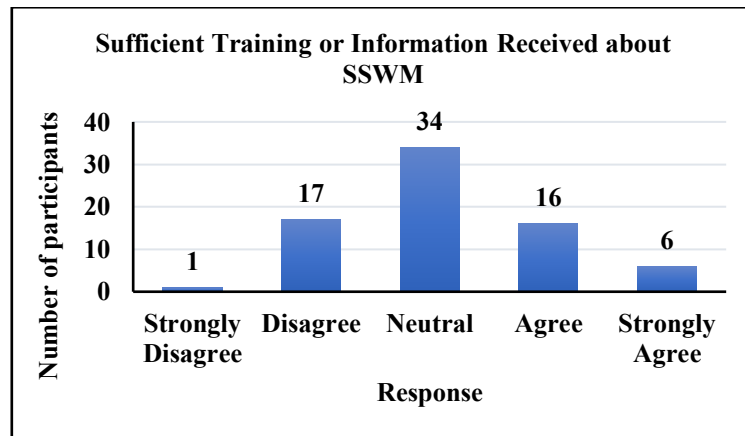


Figure 4.5: Sufficient training or information received about SSWM

4.2.3. *Section C: Presenting and Describing School Personnel's Attitude Towards Sustainable Solid Waste Management*

Section C also consisted of Likert Scale questions with five scale responses (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree). The results for each item in section C are presented and analysed in this section.

The importance of SSWM at schools is illustrated in Figure 4.6. Figure 4.6 shows that the majority of participants (n=40) strongly agreed that SSWM is essential at schools, 33 participants agreed, and one participant strongly disagreed. Research in the field reveals that SP who value the importance of effective SWM practices will prepare learners from an early age to make responsible decisions about SWM (Kuswendi & Arga, 2020).

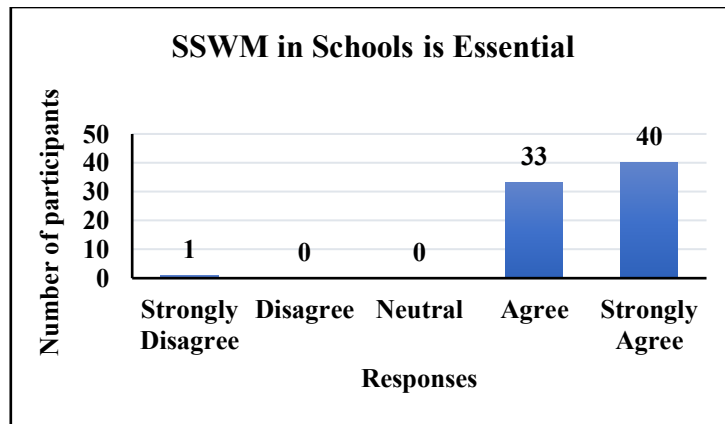


Figure 4.6: SSWM is essential for a healthy school environment

Figure 4.7 exhibits that the majority of participants (n=38) agreed that SP are responsible for promoting SSWM at schools, 28 participants strongly agreed, six participants were neutral, and two participants disagreed. This finding is aligned with research in the field which shows that while SP are responsible for promoting and encouraging good SWM practices at schools there were gaps in knowledge (Nabor & Cruz, 2022).

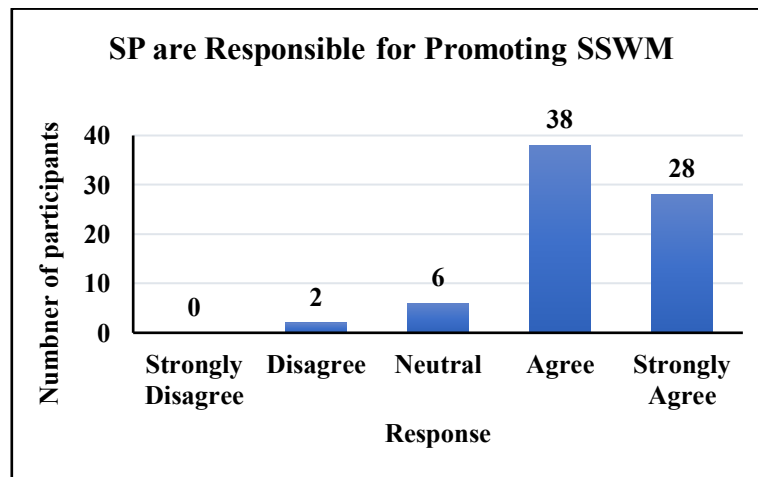


Figure 4.7: School personnel are responsible for promoting SWWM practices

The majority of participants responded positively to the statement about the importance of resource allocation for SSWM. Figure 4.8 demonstrates that the majority of participants (n=47) agreed with this statement, 19 participants strongly agreed, six participants were neutral, one participant disagreed, and one participant strongly disagreed with this statement. Research in the field shows similar results, resource allocation for encouraging SSWM strategies at schools is important (Janse van Rensburg, 2022; Mpuangnan et al., 2023; Solihat et al., 2024).

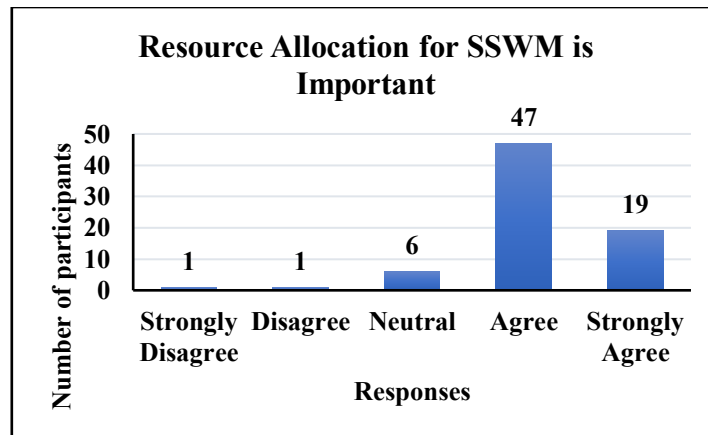


Figure 4.8: Resource allocation for SSWM is important

Concerning the positive impact of implementing SSWM at schools, Figure 4.9 reveals that the majority of participants (n=41) strongly agreed with this statement, 20 participants agreed, and 13 participants gave a neutral response. These findings about the positive impact of implementing SWM strategies at schools has also been revealed by other research in the field (Janse van Rensburg, 2022; Laius et al., 2024).

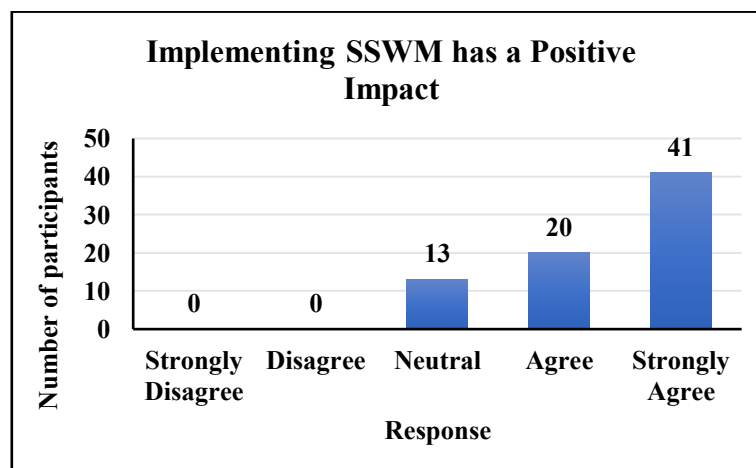


Figure 4.9: Implementing SSWM has a positive impact

Participants were of the view that SSWM is important. Figure 4.10 demonstrates that the majority of participants (n=39) agreed with this statement, 33 participants strongly agreed, six participants strongly disagreed, and one participant provided a neutral response for this statement. This finding is aligned to research in the field in that teaching about SWM is important to promote sustainability within schools and communities (Kowash, 2022; Tiippana-Usvasalo et al., 2023).

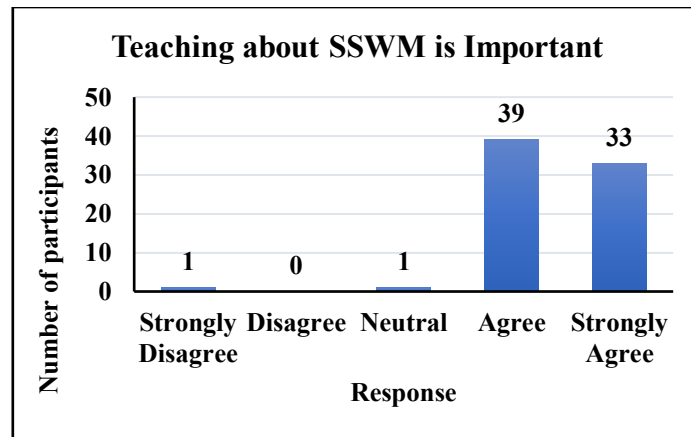


Figure 4.10: Teaching learners about SSWM is important

4.2.4. Relationship Between Leadership Experience and Their Implementation, Knowledge, Understanding and Awareness of Sustainable Solid Waste Management

Excel was used to summarise and present the relationship between the participants' leadership experience, implementation of sustainability programmes, training received, knowledge, understanding and awareness of SSWM practices and policies. The relationship between school leadership (SL) experience and the implementation of sustainability programmes is represented by table 4.8. The statistics show that there is a connection between leadership experience and the implementation of sustainability programmes. Of the 74 participants, 56 have more than two years of SL experience, and 35 of these SP (62.5%) implement sustainability programmes at their schools. Eighteen SP have less than two years SL experience and only seven (39%) implement sustainability programmes at schools. In general, 42 (57%) of the participating SP implement sustainability programmes at their schools. This finding also resonates with other research, SP who have more experience are more likely to implement EE, ESD and effective SWM practices in schools (Nabor & Cruz; Smith, 2020).

Table 4.8: Relationship between leadership experience and implementation of sustainability programmes

Years in Leadership	Implementation of sustainability programmes at schools		Total
	Yes	No	
Less than two years	7	11	18
More than two years	35	21	56
Total	42	32	74

The relationship between SL experience and the implementation of sustainability programmes at schools is shown in figure 4.11. This figure shows that there is a connection between SL experience and the implementation if sustainability programmes. This is aligned to research in the field (Nabor & Cruz, 2022; Valladolid & Blase, 2023).

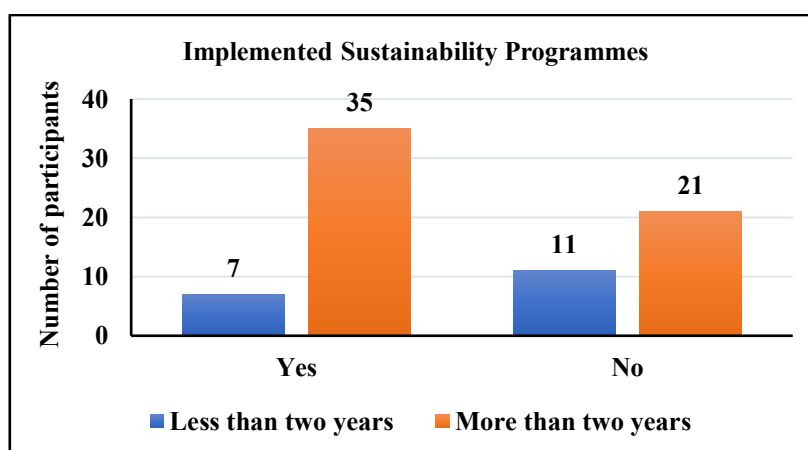


Figure 4.11: Leadership experience and implementation of sustainability programmes

The relationship between SL experience and sustainability training received is shown in table 4.9. From the 74 participants, 56 have more than two years of SL experience, and 30 (53.6%) of these participating SP received training about aspects related to sustainability. From table 4.9 it is evident that 18 participants have less than two years leadership experience and 12 (67%) of these SP received training related to sustainability. Research also shows the integration of EE and ESD in schools have been promoted by the Department of Basic Education (Damoah & Omodan, 2022; Wagner, 2024).

Table 4.9: Relationship between leadership experience and training received

Years in Leadership	Received training on sustainability		Total
	Yes	No	
Less than two years	12	6	18
More than two years	30	26	56
Total	42	32	74

Figure 4.12 illustrates relationship between training received on sustainability and years of SL experience. Figure 4.12 shows that in general, regardless of years of SL experience, a larger number of participants (n=42) received training on sustainability. This finding is linked to

research which indicates that integrating EE and ESD in schools is important for promoting responsible behaviours concerning SWM (Olaitan, 2021; Qureshi, 2020).

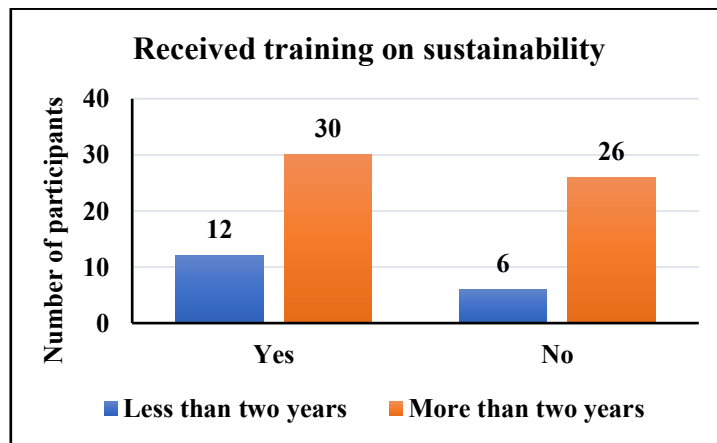


Figure 4.12: Leadership experience and training received on sustainability

Table 4.10 signifies the relationship between SL experience and knowledge and understanding of SSWM. Of the 74 participants, 56 have more than two years of SL experience, and the majority (n=35) agreed that they had sufficient knowledge of SSWM, 12 strongly agreed, 8 gave a neutral response, and 1 disagreed. The remaining participants (n=18) had less than two years of SL experience, and the majority of these participants (n=13) also agreed that they had knowledge and understanding of SSWM. From these statistics, it is evident that regardless of years of experience in SL, participants had knowledge and understanding of SSWM. Knowledge and understanding of SSWM can promote responsible SWM at schools and encourage SSWM practices (Kwauk & Casey, 2022; Monus, 2022).

Table 4.10: Relationship between school leadership experience and knowledge and understanding of SSWM

Knowledge and Understanding of SSWM			
	Less than two years	More than two years	Total
Strongly Disagree	0	0	0
Disagree	1	1	2
Neutral	3	8	11
Agree	13	35	48
Strongly Agree	1	12	13
Total	18	56	74

The relationship between SL experience and knowledge and understanding of SSWM is represented in figure 4.13. It is visually evident from Figure 4.13, the majority of participants (n=48) agreed that they had knowledge and understanding of SSWM. Research in the field indicates that SP do have knowledge and understanding of effective SWM practices, however gaps in knowledge do exist (Kowasch, 2025; Nabor & Cruz, 2022).

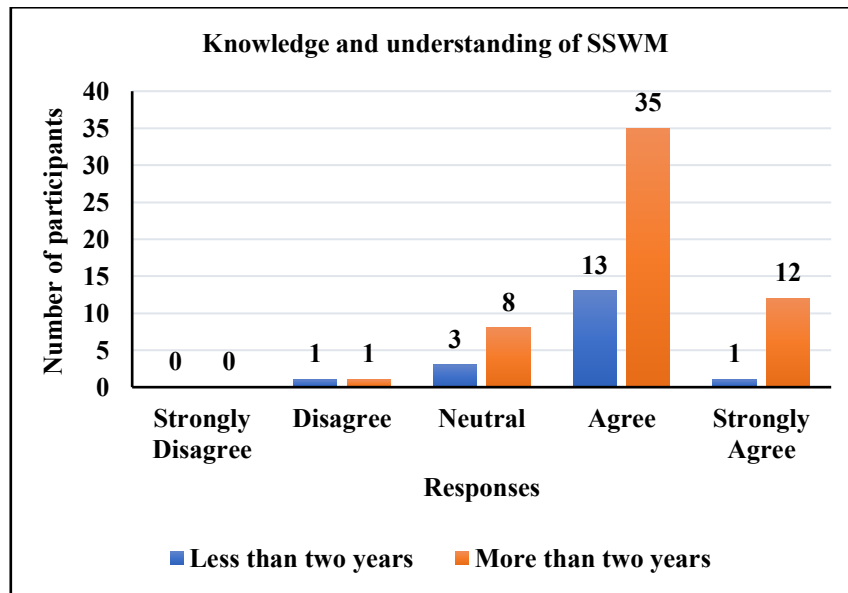


Figure 4.13: Leadership experience and knowledge and understanding of SSWM

Table 4.11 shows the relationship between SL experience and knowledge and awareness of policies. Of the 74 participants, 56 had more than two years of SL experience, and the majority (n=23) agreed that they were aware of policies, nine strongly agreed, 18 gave a neutral response, and six disagreed. The remaining participants (n=18) had less than two years of SL experience, and the majority of these participants (n=8) provided a neutral response, six agreed, and four disagreed. From these statistics, it is evident that regardless of years of experience in SL, the majority of participants (n=38) were aware of the policies. The effective integration of EE within schools is dependent on SP enacting the key ideas of the relevant SWM policies (Monus, 2022).

Table 4.11: Relationship between school leadership experience and awareness of policies

Awareness of SWM policies			Total
	Less than two years	More than two years	
Strongly Disagree	0	0	0
Disagree	4	6	10
Neutral	8	18	26
Agree	6	23	29
Strongly Agree	0	9	9
Total	18	56	74

Figure 4.14 illustrates relationship between SL experience and awareness of policies. It is visually evident from Figure 4.13, the majority of participants (n=29) agreed that they were aware of policies on SWM. Members of the SP who have knowledge and awareness of SWM policies can use these policies to link school subjects with effective SWM practices (Damoah & Omodan, 2022).

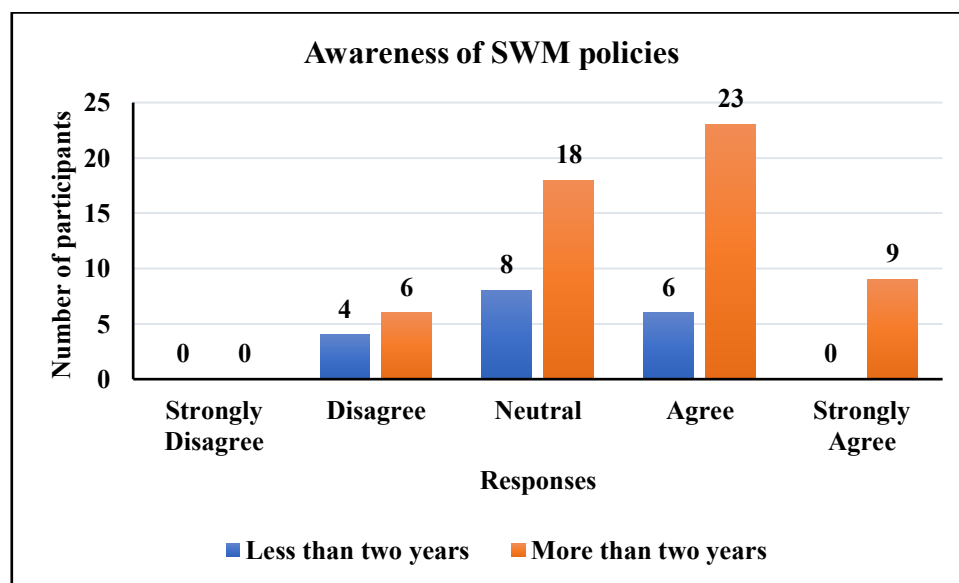


Figure 4.14: Leadership experience and awareness of policies

4.3. Qualitative Research Results and Analysis

This section focusses on the presentation and analysis of the qualitative research results and as such, this section is guided by the semi-structured interviews. It is important to provide an overview of the pseudonyms and participant labelling used. This contributes as a basic step to ensure ethical integrity and serves as a map to follow individual narratives without comprising the anonymity and confidentiality of the participating schools and SP. The same labels for the participants that were used for the questionnaire were also used for the interviews. The pseudonyms and labelling used for the interviews are presented in table 4.12. Placing table 4.12 in this chapter and not in the previous chapter is a deliberate attempt to provide easier access to key information guiding the narratives presented and analysed in this section. The synthesis of the results in response to each research question is provided in chapter five.

4.3.1. Overview of Qualitative Data Collection and Profile of Participants

Based on an analysis of the quantitative data, thirty-six participants were invited for semi-structured individual interviews. Twenty-eight responded positively and were interviewed during May and June of 2025. Interviews took place at the 12 participating schools during times that were convenient for the participants. Each interview took between 35 and 45 minutes. The interviews were anonymised to protect the identity of the participants. The same labelling of participants that was used for the questionnaires was retained for the interviews. The labelling of interviewed participants is shown in Table 4.12.

Table 4.12: School pseudonym and participant labelling for the interviews

School Number	School Name (Pseudonym)	Participant Labelling	# of Participants
1	Alder Primary	A1 and A3	2
2	Bramble Primary	B1, B2 and B3	3
3	Cedar Primary	C3 and C5	2
4	Dawn Primary	D2, D4 and D5	3
5	Elm Primary	E1 and E2	2
6	Fern Primary	F2 and F4	2
7	Grove Primary	G1 and G4	2
8	Hazel Primary	H1, H2 and H3	3

9	Ivy Primary	I1 and I4	2
10	Juniper Primary	J1 and J3	2
11	Kale Primary	K3, K4 and K5	3
12	Lake Primary	L1 and L3	2
Total			28

After interviewing the participants, the interview data were transcribed and the participants were asked to check the transcripts to ensure that they were accurate. Checking and verifying interview transcripts with participants is important to ensure validity, reliability and accuracy of the interviews (Rowlands, 2021).

4.3.2. Qualitative Data Analysis Framework: A Hybrid KAB Method

The qualitative data for this study was analysed using a hybrid thematic analysis strategy, whereby, inductive and deducting coding was used while following a thematic analysis approach (Braun & Clarke, 2019). The three key domains of the KAB module i.e. knowledge, attitudes and behaviour guided the deductive coding. In addition, inductive coding was used to encapsulate challenges, contextual issues and any other unexpected views that were not aligned with the three domains of the KAB model. The interview data were carefully read, inductive findings were integrated together with the deductive findings to construct key themes.

Themes were identified by manually highlighting answers to the questions and identifying which answers were most common. This manual process helped inductively and deductively identify what participants had in common regarding their answers. To ensure that the themes were accurately capturing what participants had said, the interview transcripts were uploaded into NVivo, and a word cloud was developed. NVivo helped to ensure that important information from the interviews and the most frequently occurring phrases or words were not left out. The word cloud is shown in figure 4.15. The word cloud assisted in identifying which words and phrases were most frequently used and helped to finalise the themes for the study. Firstly, the common words and phrases were manually checked against the interview transcripts to see the context in which they were used. Secondly, the common words and phrases that were directly related to responding to the research objectives and research questions were noted when finalising the themes and subthemes for this study.

H2: *“...to find ways to minimise environmental damage...preserve our natural resources... provides the learners with practical experience...promotes eco-friendly behaviour.”*

J1: *“Sustainable solid waste management...is very important...waste materials should be removed in an eco-friendly manner from the school environment to ensure a healthy and safe setting for our learners...it will inform their practices as well...”*

K3: *“...handling and disposing of solid waste in a way that reduces negative environmental impact...conserving resources...proper disposal methods to protect human health and the ecosystem...a wide range of waste, reducing the school’s environmental footprint...”*

L3: *“... efficient handling, reduction and disposal of waste in an environmentally friendly manner...implementing practices that minimise waste generation, encourage recycling and composting, and to educate learners and the community on responsible waste disposal...”*

From the sample interview transcripts presented, it was evident that participants were concerned about their school environment and were trying their best to ensure that the learners and community members were engaged in practices to dispose of SW appropriately. This finding is supported by research in the field, teachers. Research conducted in Uganda, revealed that teachers, learners and community members worked collaboratively to find solutions to reduce SW in primary schools (Bukirwa et al., 2022). The participants valued promoting SSWM within the school environment and believed that this would assist in conserving natural resources, foster a safer and cleaner environment and promote sustainability. Effective SWM practices positively impacts the environment and improves resource conservation (Kiely et al., 2021; Ongon et al., 2021). Participants highlighted the importance of reusing items and practicing the 3Rs to reduce waste. This is evident in the sample interview transcripts excerpts that follow.

B2: *“...reduce, reuse, recycle...essential to teach and involve learners in this process...they can become better champions of the environment and keep it clean.”*

C3: *“...sustainable solid waste management is how waste is disposed of without having harmful consequences to the environment.”*

D4: *“... the practice of using resources and materials for a longer period of time by promoting recycling, reusing, and reducing the materials...encourages learners to*

practice the three Rs and how to be responsibly promote environmentally safe procedures...”

F2: *“...highlighting the effectiveness of reducing waste, reusing the material and recycling to protect the environment...”*

The views articulated by the participants are also aligned to research (Ioannidis et al., 2021; Pandiyarajan et al., 2022) in the field. Similarly, Kowasch (2022) claims that a circular economy is promoted when waste is adapted for use for another purpose rather than thrown away. Attendance at other SWM training and workshops helped improve the participant’s awareness of effective SWM practices. This is evident in the sample interview transcript excerpts presented.

B3: *“...attended workshops organised by the department...has improved my understanding of the waste cycle and how it should be implemented at the school level...”*

F4: *“...through training by the department, I learned about the importance of reducing waste at the source and how to implement strategies to minimise waste generation. I gained a deeper understanding of recycling, composting processes and how to properly sort and manage different types of waste.”*

H1: *“...workshops and conferences on sustainable solid waste management, policies and new technologies...online course on waste to energy...helps me in implementing effective waste reduction and recycling strategies. Community assistance was increased, and behavioural changes in learners and community members were promoted.”*

J3: *“...a small workshop was conducted by the school...the training has been effective.”*

K5: *“Training ...at university level...Natural Science workshops were held, including topics such as recycling, reusing...”*

From the sample interview transcripts presented, it is evident that prior training and workshops influenced the participants in promoting the implementation of SSWM practices at schools. Training and workshops linked to EE and SE encourages SP to implement and promote SWM strategies and practices at schools (Ferguson et al., 2022; Kerret et al., 2020).

4.3.4. Solid Waste Management Practices Currently in Use

The SWM practices, as discussed by the participants, focused on the strategies they implemented, the tools, resources, and materials they used, and how these practices aligned with principles linked to sustainability. Examples of excerpts taken from the interview transcripts are presented below.

A1: “...curb littering by assemble talks...class clean-up programmes...use recycled material for projects...Mandela Day, 67 minutes of clean-up of the school...awareness campaigns.”

B2: “...collected bottles and paper to be recycled...taken learners to a landfill so that they are educated in the processes involved in waste management...personally use recycled paper in art and drawing paper...used recyclables to make containers, boxes at the projects.”

C3: “We have a recycling container whereby plastic bottles, containers...are collected...different containers placed in the office area for disposing of plastic, paper, glass...”

D4: “...encourage reusing school items, for example paper, bottles and book covers.”

E1: “...educating learners...impact of waste management...assembly talks and school solid waste management projects...engaging with the community...assist the school by sending collectable items...recycling and fundraising...establishing a recycling program...discussion of the importance of recycling during lessons.”

G1: “Recycling of paper, cardboard, and plastic at a designated area in school...”

H2: “...reducing the use of paper when giving notes and reducing paper waste by printing on both sides...encouraging learners to share books and equipment...online resources...I follow EPA’s sustainable waste management programme, ‘Think Green’, it offers educational materials and activities for learners.”

I4: “...recycle paper on an annual basis...use water stored in JoJo tanks in the toilets to help reduce the use of natural resources such as water... encourage learners to recycle items at home to assist in minimising waste disposals at landfills.”

J1: “...end of the year, all the used books, workbooks and worksheets are sent to recycling plants to be recycled...daily learners bring plastic containers and we work closely with PETCO to teach our learners the importance of plastic recycling. Cardboard is also brought to school for recycling.”

K3: “...use waste bins and containers for the collection and storage of waste.”

L1: *“...embarked on getting our learners, community members, and staff to bring in all their unused plastic containers, bottles, milk cartons, bottle caps and plastic containers.”*

L3: *“Talks on recycling are incorporated in Life Skills and Life Orientation lessons.”*

From the examples of the interview transcripts presented, it is evident that recycling programmes are in place at each of the participating schools. Encouraging recycling programmes is important for nurturing effective SWM practices at schools (Espuny et al., 2021; Mpuangnan et al., 2023). The participants actively used different strategies, including posters, social media platforms, and technology, to support the promotion of SWM. This is evident in the sample interview transcripts that follow.

E2: *“...social media to encourage more participation... use posters.”*

F4: *“...use educational materials such as posters, brochures and videos to raise awareness about waste management and promote sustainable practices among learners and community members...”*

J3: *“...via our school social media platforms and encourage our learners during the school assembly.”*

K4: *“Promote digital learning, use a lot of practical work and technology, this allows for curriculum integration.”*

The use of technology has also proved useful in encouraging SWM practices that are successful at schools. (Bayramov, 2023; Haleem et al., 2022). For this study, it was important to find out whether or not these strategies were effective in promoting SSWM. Data regarding the effectiveness of SWM practices as discussed by the participants during the interviews are presented in the next section.

4.3.5. Effectiveness of Current Solid Waste Management Practices

The participants were probed during the interviews to find out whether or not the existing SWM strategies that they implemented at schools were effective. This was done to allow participants to reflect, assess or measure the impact and success of the SWM strategies. Examples from the interview transcript data are presented below.

A1: *“...cleanliness of classes and school provide evidence of effectiveness, due to the reduction in waste at school, I think that the waste management strategies are effective.”*

B1: *“Success is noted in the number of learners collecting recyclable materials.”*

C5: *“...can see how effective it is by a change in our learners’ knowledge and habits with solid waste management in the school.”*

D4: *“...lessons on recycling at assemblies, many learners have been practising the three Rs...has been effective.”*

E2: *“...assessed by the amount of funds coming back into the school from recycling...”*

F4: *“...effective, we see a reduction in the amount of waste collected by Durban Solid Waste during pick up on bin days.”*

G4: *“We check the volume of waste generated weekly...look at the types and quantities of waste generated...look at learner behaviour and attitude towards waste management to see if there are any changes...get feedback from teachers who keep a waste management checklist.”*

H3: *“...measure the reduction in waste generated over time... the waste recycled...evaluate the level of participation and enthusiasm among learners and staff.”*

I4: *“It is effective, but would be more effective if we had more manpower, it could be a more positive and sustainable programme...time also plays a huge factor as there are deadlines to meet with the curriculum and other work obligations.”*

J1: *“...effective to a certain extent because children who are collecting the waste are aware that they are making a difference to the environment. They can also see that ‘cash’ can be made from trash. I assess by looking at the surroundings and checking if it is cleaner...”*

K5: *“...record how much waste is being recycled on a regular basis to check effectiveness...observe changes in learners’ behaviour towards practising solid waste management strategies in school and evaluate the school cleanliness over a period of time.”*

L1: *“Learners are tested by a natural science curriculum through assessments and tests. Through their responses, we assess if the project is effective...determine the effectiveness of the project by checking the amount of resources brought to school.”*

Based on the sample interview transcript excerpts presented, the participants monitored and evaluated the effectiveness of their existing SWM practices. They evaluated the effectiveness through observations of learner attitudes, the school environment, and the amount of SW collected for recycling. Observing learner attitudes, behaviours and the cleanliness of the school environment is important. Ensuring infrastructure for SWM is used helps schools monitor and evaluate the effectiveness of existing SWM strategies at schools (Henyo, 2023; Wanjiru et al., 2020). Participants also recorded the number of recycling items brought to school to see whether or not this number increased over time. In this way, they could assess the effectiveness of their current SWM practices as well as how involved the relevant stakeholders were in this process.

4.3.6. *Involvement and Participation of Key Stakeholders*

For SWM practices to be successful, it is important to ensure participation by all relevant stakeholders. In a school environment, key stakeholders include teachers, learners, parents and other community members (Lim, 2024; Monus, 2022). During the interviews, participants were asked about how they encourage and involve participation by key stakeholders. Examples of interview excerpts are presented below.

A3: *“...encourage the school community by involving learners and teachers in waste management efforts, this promotes a sense of school responsibility...”*

B3: *“...we talk to parents to buy in bulk to reduce packaging ... use recycling bins at school for paper, plastic and milk cartons...set up compost bins where learners deposit their leftover lunch... reuse all school supplies when our stocks run out ...integrate waste management in all subjects...”*

C5: *“...learners and educators contribute towards the recycling program we have at school...”*

D2: *“...educators and classes are provided with boxes and bin packets to ensure that they put all their used worksheets and books inside the box for recycling.”*

E1: *“Integration into the curriculum...setup of recycling area with bins...assembly talks to encourage learners to recycle...collection of recyclable objects for fundraising...encourage SGB [School Governing Body] and community involvement.”*

F4: *“...have competitions...class that collects the most recyclable waste receives an incentive...flyers are sent to parents to drop off waste in the designated areas...parents receive incentives for their support...”*

G4: *“...training sessions and workshops on sustainable waste management practices...follow-up meeting and discuss feedback...work with teachers to develop lesson plans and activities...incorporate waste management theme...communicate the school’s sustainability goals and initiative through newsletters, parent teacher meetings and social media...”*

H3: *“...use training and workshops and encourage teachers to incorporate waste management in their lesson plans and curriculum...educate learners about the importance of sustainable waste management practices through the assembly’s common workshops, awareness programmes and classroom activities... engage with the local community members and businesses to promote waste management practices and encourage community involvement.”*

I1: *Learners and teachers, as well as caretakers, are encouraged to collect used paper into white sacks to send in for recycling...teachers are encouraged to print on both sides of the page...learners are required to use mostly recyclable materials for technology projects.”*

J1: *“Teachers motivate their learners by having class talks on recycling...every child who brings recycling material is called up on stage during assembly and acknowledged as the recycling champions for the day...parents have been informed of our collections as a means of fundraising and they also collect and send recycling items...”*

K5: *“Teachers include sustainable waste management as part of the Natural Science syllabus...includes educating and creating awareness...community becomes involved by sending items to school to recycle or even reuse...”*

L3: *“...parents are encouraged to send their plastic bottles and caps to school for recycling...educate learners on environmental protection, health, and hygiene... try to create a positive learning atmosphere that contributes to a healthier planet...”*

From the interview excerpts, it is evident that the participants encouraged parents, learners, community members, and other staff to recycle, reuse and reduce waste. Parental and community involvement is important to ensure the success of SWM strategies at schools (Espuny et al., 2021; Sambat et al., 2024). Participants said they used competitions, awareness

campaigns, posters, recycling programmes, curriculum integration and incentives to ensure that stakeholders were actively participating. The participants were probed to determine if they experienced any challenges when they were trying to engage with and encourage stakeholder participation. Challenges that were experienced are represented by examples of participant interview transcript excerpts that are presented and discussed in the section that follows.

4.3.7. Challenges Experienced in Implementing Sustainable Solid Waste Management Practices

For this part of the interviews, the researcher probed participants about the challenges and barriers to the effective implementation of SSWM practices at the participating schools. Participants were keen on implementing SSWM practices at their schools but were hindered by both internal and external challenges. Examples taken from the interview transcript excerpts are presented as follows.

A1: “...lack of time and manpower [staff size at the school is small] ...constantly receive negative feedback from parents who do not want learners involved in clean-up programmes...need the assistance of community members, further education on...sustainability workshops and seminars.”

B3: “Not all members of staff are actively involved...through constant awareness and engagement...teachers participate in the collection of recyclable materials by interacting with the community and parents...we lack funds to continue with this project.”

D2: “Lack of facilitators and equipment to implement...practices at school...need for recycling bins to be placed all over the school.”

E1: “Insufficient waste collection infrastructure, for example bins...lack of awareness by the community...lack of funding to sustain projects...limited coverage in the curriculum on waste management...lack of staff to enforce policies at school...lack of monitoring and control.”

F4: “...requires significant investments in infrastructure, equipment and personnel...challenge for schools with limited budgets...challenges in accessing expertise and technical assistance to... implement effective ...practices.”

G4: “Lack of awareness and understanding by learners and staff... parents may not fully understand the importance of sustainable waste management...resistant to change...limited resources and funding...budget constraints on purchasing

necessary equipment... finding time for curriculum integration within an already packed curriculum.”

I1: *“Learners have to be constantly reminded about not littering and polluting the environment...community served by the school has an attitude of not caring about the huge litter problem in the community...school’s efforts are not sustained at the homes of learners.”*

J1: *“...lack of interest on the part of the learner to make a difference. Sometimes their home environment...means that they don’t see anything wrong with seeing trash lying around...getting 100% support is challenging, especially when teachers also have many other tasks to see to.”*

As is evident, the limited staff at the participating schools and commitment from parents and the community are key factors that hinder the implementation of SSWM practices at the participating schools. In addition, the limitations linked to insufficient resources also had a negative impact of using SSWM strategies. This is evident in the sample interview excerpts that follow.

C3: *“Transportation of learners...if learners could be taken on an excursion to streams and beaches to realise ways to stop harming and fix our environment...”*

H1: *“Inadequate waste storage areas...poorly maintained waste disposal facilities. Lack of awareness and education...rodent infestations that can compromise waste management practices.”*

K3: *“Budget constraints for necessary equipment...resistance to change from learners and parents...community engagement is lacking.”*

L1: *“Time constraints...lack of parental involvement...poor funding to sustain projects...lack of human resources...need teachers to be capacitated by experts...cannot rely on curriculum coverage...need more awareness and roadshows to highlight the benefits of the sustainable waste management, training and support...communities are not aware of recycling, reusing and reducing waste material...”*

Resources and budget allocations are important for implementing SSWM practices at schools (Ganon-Shilon et al., 2021). Apart from implementing SWM practices at schools, it is important to monitor and evaluate the impact of the SWM practices currently in use

(Mahayuddin et al., 2024). Furthermore, limited space at schools and the lack of secure spaces to store recycled material for onward submission to recycling companies was also a challenge. This hindered the ability to follow and maintain SSWM practices. These notions are evident in the sample interview excerpts that follow.

G4: *“...insufficient space for waste segregation and not collected timeously...”*

H3: *“Insufficient funding, limited budget for implementing and maintaining...practices...lack of participation and engagement...space constraints.”*

J3: *“...large collection of recyclable waste material being collected and stored at ...our school...our stored recyclable waste was stolen.”*

Teacher time and ability to integrate SSWM practices within the overloaded curriculum are also barriers. The issue of resources required to promote SSWM practice at schools was probed, and participants shared their insights on the resources that they required. The sample interview excerpts and discussions concerning the resource needs are presented in the next section.

4.3.8. Resources Needed to Promote Sustainable Solid Management Practices

From the interviews, it was evident that participants required support and resources and had a vision and recommendations to advance SSWM practices at their schools. Resources are important to ensure the success of SWM initiatives at schools (Masnawati & Darmawan, 2022). Participants shared their vision and insights on what they felt was necessary to promote their efforts in implementing SSWM practices at their schools. Examples of excerpts taken from interview transcripts are presented as follows.

A1: *“...colour-coded bins to separate waste into different categories...encourage learners to participate in waste sorting, and collaboration with local companies is necessary.”*

A3: *“...future where sustainable solid waste management in schools...cornerstone of environmental education and practices...learners to take ownership...driving innovation and behavioural change.”*

B2: *“...recycling education of the community, recycling bags and bins to be provided...with more resources and awareness, learners and parents, and the community can become greater champions... if this happens, I am sure that future generations can have a greater impact and involvement in managing...solid waste.”*

C5: *“Funding, sponsorship, motivation for learners and teachers...more incentives...implement the three Rs...encourage learners to use reusable containers for lunch...communities should be more involved...”*

D5: *“More recycling bins and more awareness programmes are needed... workshops for teachers.”*

E2: *“...containers for recycling of all materials...companies can give more back to our schools...every learner must be involved to create an environmentally friendly school...great if the Department of Education can become more involved in solid waste management at schools.”*

F4: *“Invest in adequate infrastructure...offer incentives and rewards...need more engagement from the local community, including parents, businesses and organisations to promote sustainable solid waste management practices and encourage participation in our initiatives.”*

G1: *Clearly labelled recycling bins for different waste types...composting...grow more vegetable gardens...need to leave the Earth behind us just as it was intended to be.”*

H1: *“...grants and funding from government agencies...adequate recycling bins and containers...workshops and training for learners and teachers...introducing composting and creating... school culture... values sustainability, waste reduction...preserving the environment...learners aware of this and... integrating... my lesson plans.”*

I1: *“...workshops or training programmes...conducted to educate teachers and equip them well enough to implement such strategies in schools. Campaigns should be done in schools for learners...aware of Environmental education... set up a compost site and maybe a gardening patch...”*

J1: *“Learners can form clubs... envision my school to be a healthy and safe space...waste is effectively controlled...learners form habits during childhood...at this age...must learn their roles as responsible citizens in our global world.”*

K3: *“...staff training, and education...financial resources, educational materials and community partnerships...composting food waste, integrating waste education into the curriculum and actively monitoring and improving waste management practices...”*

L1: *“...more funding...need experts on SWM to...demonstrate practically...capacity building workshops for learners and parents...support from NGO's, businesses, and all other stakeholders involved in solid waste management. Gifts or cash from*

sponsors...needed to have competitions...learners will need to be motivated through road shows...visits to the beach for beach clean-ups, or do some planting at school...”

From the interviews, participants believed that more colour-coded recycling storage containers and other infrastructure need to be in place at schools, funding to support schools to foster recycling programmes, eco-clubs, and awareness campaigns is needed. Recycling resources and bins are important to ensure that SW is managed effectively at schools (Henyo, 2023). Participants also suggested offering incentives and rewards to all active participants of SSWM initiatives. Further suggestions for further education and training, composting, growing vegetable gardens, and obtaining greater support from the Department of Basic Education, parents, community members, and local businesses were also mentioned during the interviews. Starting vegetable gardens and implementing eco-clubs have promoted successful SWM practices at schools (Dzerefos, 2020). The additional resources, infrastructure, incentives, and support would assist in advancing SSWM practices at schools to ensure the promotion of a healthy school environment that can be sustained in the future.

4.4. Conclusion

This chapter presents the research results and analysis for the questionnaire and semi-structured one-on-one interviews. The quantitative results were presented and analysed using frequency tables and bar graphs. The results of the qualitative data were presented and analysed by using selected excerpts from the interview data. The quantitative research results that were presented in this chapter were first captured in Excel and analysed. The qualitative data presented in this chapter were transcribed into a Word document, inductively and deductively coded guided by the KAB model and then uploaded into NVivo. NVivo assisted in confirming initial codes and themes after the themes were manually identified by the researcher. In the next chapter, chapter five, the analysed results that are presented in this chapter are synthesised in response to the three main research questions.

CHAPTER FIVE: SYNTHESIS OF RESULTS

5.1. Introduction

In this chapter the results for this mixed-method study that was presented and analysed in chapter four is synthesised. The synthesis of the data responds to the three main research questions. The aim of this study was to explore the level of knowledge related to sustainable solid waste management among school personnel in selected primary schools in Chatsworth, KwaZulu-Natal. The study examined the specific challenges and barriers school personnel encountered in adopting and sustaining effective solid waste management strategies. In addition, the study also explored the training and support needs necessary to enhance the knowledge and application efforts of SP.

To achieve the aim of the study, three research objectives and three main research questions guided the study.

Research objective 1: To assess the level of knowledge of sustainable solid waste management among school personnel at selected primary schools in Chatsworth, KwaZulu-Natal.

Research objective 2: To explore how school personnel in selected primary schools in Chatsworth, KZN, navigate the challenges and barriers to implementing and sustaining effective solid waste management practices.

Research objective 3: To determine the importance of identifying the training and support needs of school personnel in selected primary schools in Chatsworth, KZN, for effectively implementing sustainable solid waste management practices.

The three research questions were directly linked to the research objectives.

Research question 1: What is the level of knowledge of sustainable solid waste management among school personnel in selected primary schools in Chatsworth, KZN?

Research question 2: How do school personnel in selected primary schools in Chatsworth, KZN, navigate the challenges and barriers to implementing and sustaining effective solid waste management practices?

Research question 3: Why is it important to identify the training and support needs for sustainable solid waste management practices among school personnel in selected primary schools in Chatsworth, KZN?

The section that follows includes an integration and synthesis of the results of the quantitative and qualitative results in response to the three main research questions.

5.2. Synthesis

To achieve the aim of this study, a questionnaire and interview were used to collect data from participants. The questionnaire was guided by the KAB model and included three sections. Section A (item number 1-5) focused on the biographical and general information of each participant. Section B (item number 6.1-6.5) concentrated on participants knowledge of SSWM. The last section on the questionnaire, Section C (item number 7.1-7.4) was about the participants' attitudes towards SSWM.

The interview was guided by the KAB model included ten questions and participants answers were probed as the interviews progressed. The interview questions were based on exploring responses of participants to the questionnaire items. Participants were asked to elaborate about their knowledge and understanding of SSWM, practices used to promote SSWM at schools, involvement of learners and other stakeholders, and the resources and materials used to promote SSWM at schools. Interview questions also included challenges, barriers and key factors that hinder the implementation of SSWM practices at schools, the effectiveness of current SSWM practices, training SP received to implement SSWM practices and how SP envision the future of SSWM at their school. The focus of the interviews was to gain a better understanding of SP knowledge and attitudes related to SSWM practices. In addition, participant's answers were probed to gain a better understanding of how their knowledge and attitudes about SSWM practices informed their behaviour in promoting the use of SSWM strategies at their schools. In the section that follows, the results of this study have been synthesised by responding to each of the three research questions.

5.2.1. Research Question 1: What is the Level of Knowledge of Sustainable Solid Waste Management Among School Personnel in Selected Primary Schools in Chatsworth, KZN?

To answer the first research question on the level of knowledge of sustainable solid waste management among SP in selected primary schools in Chatsworth, KZN, results from the questionnaire and interview are discussed. The results of Section, A of the questionnaire is presented in chapter four (Section 4.2.1), 65% (n=48) of the participants were in formal school leadership (SL) positions (Table 4.3) and 76% (n=56) were in SL for more than two years (Table 4.4). The majority of the participants (82%, n=61) were involved in curriculum decision making (Table 4.5) and 57% (n=42) received training linked to SSWM (Table 4.6). From an analysis of the data, 57% (n=42) implemented Environmental Education (EE) programmes at their schools (Table 4.7). Training and development are important for promoting EE and Environmental Literacy (EL) to support the implementation of SSWM at schools (Liu & Tobias; 2024). SP are key stakeholders and are responsible for making important curriculum and resource management decisions at schools (Espiritu, 2024). These decisions are established on knowledge and awareness of SSWM.

The results of the questionnaire data (Section B, item number 6) indicated that most of the participants are aware of and have knowledge of SSWM practices (Section 4.2.2). This is evident from 82% (n=61) of the participants who strongly agreed or agreed on item number 6.1 (Figure 4.1), they had knowledge and understanding of SSWM practices. It was also evident that regardless of years of experience in SL, participants had knowledge and understanding of SSWM (Table 4.10 and Figure 4.13). From these statistics, it was also evident that regardless of years of experience in SL, a number of participants (n=38) were aware of the policies linked to SSWM (Table 4.11 and Figure 4.14). Knowledge and understanding of SSWM can promote responsible SWM at schools and encourage SSWM practices (Kwauk & Casey, 2022; Monus, 2022). Moreover, when SP encourage sustainable habits and promote the ideas of recycling reducing and reusing (3Rs) they become role models in the community (Zakariah et al., 2024). These ideas are aligned to the findings of item number 6.2 of this study, 86% (n=64) of the participants were aware of the different types of waste and its impact on the environment (Figure 4.2). From the interview data, the majority of the SP in this study are aware of SWM strategies, the value of a circular economy and the importance of the 3Rs. The interviews also suggest that the participants are aware of and understand the impact of SW on the environment.

These ideas were evident during the interviews where participants discussed the importance of teaching learners about reducing, reusing and recycling (Section 4.3.1). The participants also mentioned the importance of encouraging a responsible way of managing SW at schools. This suggests that SP have a positive attitude towards the responsible management of SW. A positive attitude toward effective SWM promotes responsible environmental behaviour (Eshete et al., 2023, Raghu & Rodrigues, 2020). This finding also aligns with the ideas of the KAB model (Section 2.2). The KAB model suggests that knowledge and attitude is essential to bring about a change in behaviour and actions (Gunson et al., 2021; Teo et al., 2023).

Knowledge and awareness of policies and guidelines linked to SSWM are also important and are considered as external factors that influence actions (Monus, 2022). Regarding awareness of policies and guidelines which was item number 6.3 in the questionnaire, 51% (n=38) of the participants agreed or strongly agreed with this statement (Figure 4.3). The remaining 49% of participants disagreed (n=10) or provided a neutral (n=26) response to item 6.3 (Figure 4.3). This suggests that some participants had knowledge and awareness of policies and documents concerning SWM at schools while others did not. Knowledge and understanding of SSWM can promote responsible SWM at schools and encourage SSWM practices (Kwauk & Casey, 2022; Monus, 2022).

In SA, the CAPs document includes EE as an idea to be integrated across the curriculum (Damoah & Omodan, 2022; Wagner, 2024). The findings from the questionnaire suggests that there are gaps in participants' knowledge, awareness and implementation of policies. This gap could have a negative impact on the enactment of policies which are required by schools on a national level. These policies are in place to promote ideas of shared social environmental responsibility. To conserve natural resources, learning activities that promote shared responsibility for protecting the environment should be encouraged at the school level (Ongon et.al., 2021). If SP are not aware of policies, these important learning activities will not be implemented in the curriculum and could negatively affect the conservation of natural resources. There exists a connection between awareness, attitude and behaviour (Reyes & Madrigal, 2020).

Not being aware of SSWM policies and guidelines also limits SP from integrating these important documents in teaching and learning. Nevertheless, for item number 6.4 on the questionnaire, more than half (57%, n=42) of the participants indicated that they were confident

in sharing their knowledge about SSWM with others (Figure 4.4). From the interviews it was evident that SP initiated SWM competitions, education programmes, assembly talks my invited guests and workshops at their schools (Section 4.3.1). Based on the interview data, participants also shared their knowledge gained from workshops and courses they attended with learners and the community. These workshops and courses SP attended were facilitated by Universities, the Department of Basic Education, Non-Governmental Organisations and businesses (Section 4.3.1). Working closely with business and other organisations can improve SW practices and encourage the use of environmentally aligned SW strategies (Solihat et al., 2024). Research in the field reveal similar results, knowledge and awareness of sustainable practices shape teaching and learning (Anokye et al., 2024). In response to research question one, despite having knowledge and awareness of SSWM, other challenges and barriers limited participants from implementing SSWM at schools. The challenges and barriers and how participants navigate them are discussed in more detail in the section that follows.

5.2.2. Research Question 2: How do School Personnel in Selected Primary Schools in Chatsworth, KZN, Navigate the Challenges and Barriers to Implementing and Sustaining Effective Solid Waste Management Practices?

This section discusses the results in response to the second research question on how SP in selected primary schools in Chatsworth, KZN, navigate the challenges and barriers to implementing and sustaining effective solid waste management practices. For this research question, data from the questionnaire (Section 4.2.3) and interview (Section 4.3.5) assisted in discussing the findings. For item 7.1 on the questionnaire, SP were asked to indicate the importance of SSWM for maintaining a healthy environment. The majority of participants (99%, n=73) strongly agreed or agreed with this statement (Figure 4.6). Teaching about SSWM is important to promote a healthy environment (Malik, 2024; Mor & Ravindra, 2023). For the next item, item 7.2, SP were asked if it was their responsibility to promote SSWM at schools. The majority of participants (89%, n=66) strongly agreed or agreed with this statement (Figure 4.7). This finding is supported by research, the promotion of eco-schools, sustainability programmes and EE by SP can promote environmental sustainability (Kerret et al., 2020; Virsta et al., 2020). This finding is also supported by the KAB model (Section 2.2), an increase in awareness and knowledge about environmental challenges promotes positive behaviours concerning the environment. Encouraging positive SWM behaviours fosters responsible practices (Eshete et al., 2023; Raghu & Rodrigues, 2020).

For item 7.3 on the questionnaire SP were asked about the importance of resource allocation to implement SSWM practices. The majority of participants (89%, n=66) strongly agreed or agreed with this statement (Figure 4.8). To ensure that SWM strategies are successful resources and infrastructure are important. Digital tools and resources are important for managing SW effectively (Bui & Tseng, 2022; Haleem et al., 2022). For item 7.4 on the questionnaire, participants were about the impact of teaching about SSWM on learners and the community. The majority of participants (82%, n=61) strongly agreed or agreed with this statement (Figure 4.9). Parent and community participation in SWM initiatives are important to sustain SWM initiatives. Working with local communities, can increase positive SWM practices for example composting, recycling, reducing and reusing items (Espuny et al., 2021). For item 7.5 of the questionnaire, participants were about the importance of teaching SSWM in the school curriculum. The majority of participants (97%, n=72) strongly agreed or agreed with this statement (Figure 4.10). Integrating aspects of EE within the curriculum will promote environmental awareness and responsible environmental behaviour (Damoah & Omodan, 2022).

During the interviews the participants were probed further regarding their responses. From the interviews it was evident that while participants valued the importance of promoting a healthy school environment and took responsibility for encouraging SSWM practices, challenges were experienced (Section 4.3.5). These challenges including lack of participation and interest by learners, school staff and parents. Also, SP indicated they were faced with the challenges of limited space and time in the curriculum to include or promote SWM initiatives. Since teaching learners at an early age about SWM is important for fostering EL (Kuswendi & Arga, 2020), SP can use real world contexts and a problem-based approach to promote active learner participation and interest (Sewak et al., 2021). Integrating EE within school subjects is also an important strategy for promoting effective SWM practices among learners (Ongon et al., 2021).

Further barriers included the lack of recycling bins and infrastructure to manage SW as well as limited funding to implement and maintain SSWM practices (Section 4.3.6). Often recycled waste was stolen since they could not be securely stored at the school. As is evident, resources and infrastructure are important for promoting successful SWM strategies. To be effective, infrastructure and resources need to be used consistently by learners and SP (Henyo, 2023). SP need to develop holistic plans and also need the necessary training to use resources and infrastructure effectively. The active participation of SP in sustainability initiatives is supported

by the KAB model (Section 2.2). SP knowledge and awareness of environmental sustainability influence their attitudes and behaviour toward sustainable practices (Damoah & Omodan, 2022; Ferguson et al., 2022). The training needs and support required by the participants are discussed in the section that follows. The section that follows responds to research question three.

5.2.3. Research Question 3: Why is it Important to Identify the Training and Support Needs for Sustainable Solid Waste Management Practices Among School Personnel in Selected Primary Schools in Chatsworth, KZN?

This section discusses the results of the study that answers the third research question on why it is important to identify the training and support needs for sustainable solid waste management practices among SP in selected primary schools in Chatsworth, KZN. Based on the analysis of the questionnaire participants attended workshops and courses on SWM. Item 6.5 on the questionnaire focused on a response from SP about receiving sufficient training and information on SSWM. In response to item 6.5, 70% (n=52) of the participants strongly disagreed (n=1), disagreed (n=17) or were neutral (n=34) for item number 6.5 (Figure 4.5). This finding is aligned to the results of other research in the field. Other research indicates that while SP have knowledge and awareness of SWM, they do not have clear knowledge about the guidelines or policies (Nabor & Cruz, 2022).

For this study there was an alignment between school leadership experience and the implementation of sustainability programmes, for example eco-clubs, recycling programmes and awareness campaigns. Based on the data collected and analysed, the majority of SP who had more than two years leadership experience implemented programmes related to sustainability at their schools (Table 4.8 and Figure 4.11). The findings further suggest that regardless of years of SL experience, a number of participants (n=42) received training on sustainability programmes regarding EE awareness workshops, recycling programmes, setting up eco-clubs and growing vegetable gardens (Table 4.9, Figure 4.12 and Section 4.3.6). However, research indicates that SP do not have enough training on how to use SWM strategies effectively at schools (Mzobe & Msezane, 2024). Encouraging training and development about SWM will help bridge theory and practice. In this way, sustainable development is fostered through informed practice (Kioupi & Voulvoulis, 2022; Miao & Nduneseokwu, 2025).

During the interviews, participants were probed further about their training and support needs (Section 4.3.5 and Section 4.3.6). The participants indicated that they required staff training, education and educational materials about effective SWM practices. The participants indicated that while their existing SWM practices of ensuring classrooms are clean, the school environment is healthy and evaluating the number of recyclables collected, they need more staff to monitor the effectiveness of their SWM strategies. For staff to be involved in these activities, they need to have knowledge and awareness of SSWM practices. These views are linked to other research, the professional development of teachers and starting eco-school programmes increases knowledge and awareness of Education for Sustainable Development (ESD) which in turn leads effective SWM at schools (Finnegan, 2023 & Mpuangnan et al., 2023). It is important for SP to have access to education programmes, educational materials and workshops about how to integrate sustainability concepts into teaching and learning, this will prepare them with the necessary content and skills (Parry & Metzger, 2023). These views are also supported by the KAB model (Section 2.2), knowing more about the impact of external factors such as resources available and effective curriculum implementation play an important role in behavioural change (Gunson et al., 2021 & Monus, 2022). A school's context and resource availability can also limit or strengthen the ability of SP to foster effective SSWM practices (Anokye et al., 2024; Awino & Apitz, 2024).

From the interviews, it was evident that SP need support and training to set up school-based activities, recycling programmes, environmental clubs and competitions, these types of activities will foster the ideas of environmental awareness and responsibility (Smith, 2020). The training and support needs of SP are important to address, as they are key to ensuring SSWM strategies are effectively implemented at schools. By carefully developing plans on how best to integrate EE in schools (Ongon et al., 2021) and preparing learners with critical thinking and problem-solving skills will assist in addressing real-world environmental challenges (Miao & Nduneseokwu, 2025).

5.3. Conclusion

In this chapter the results of this study have been synthesised by responding to each of the three research questions. In chapter six that follows, a discussion of the results, alignment of the results with the KAB model, implications of the study, limitations, recommendations, future research, contribution of the study and conclusion of this study is provided.

CHAPTER SIX: DISCUSSION, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

6.1. Introduction

The purpose of this study was to explore the level of knowledge of sustainable solid waste management among school personnel in selected primary schools. The study was conducted at 12 primary schools located in Chatsworth, KwaZulu-Natal. Data for this study were collected by using a questionnaire and semi-structured one-on-one interviews with purposively selected participants. In this chapter, the results that were synthesised in chapter five are discussed and the alignment of the results with the KAB model that guided the study is provided. Thereafter the implications, limitations, recommendations, future research, contribution and conclusion for this study is provided.

6.2. Discussion of the Results

This section provides a discussion of the results for this study. The results indicate that SP have knowledge and awareness of SSWM. However, there are gaps in knowledge regarding how to integrate policy into practice. One reason for this is that SP have gaps in knowledge about policies that focus on SSWM. For those participants that have knowledge of policies, they feel that the curriculum is overcrowded and they do not have the know-how of how to integrate these policies effectively into teaching and learning. This study shows a correlation with other research in that awareness of policies about SSWM is key to the effective integration of SSWM strategies in schools (Nabor & Cruz, 2022). The presentation, analysis and discussion of the results for this study is supported by the KAB model, knowledge has an effect on attitude which results in changes in behaviour (Gunson et al., 2021; Teo et al., 2023).

Apart from gaps in knowledge and awareness, for this study challenges and barriers also had an impact on how SP implemented SSWM practices at schools. The data suggests that the lack of learner, parental and community interest, lack of time and space in the curriculum and limited funding and resources had an impact on promoting SSWM initiatives at schools. This finding is supported by research in that working hand in hand with parents and the wider community is important for encouraging responsible SWM strategies (Espuny et al., 2021).

Moreover, research (Solihat et al., 2024) suggests that working closely with organisations and businesses can improve SWM infrastructure and increase funding and resources which are crucial to effectively manage SW at schools. The findings of this study also link to the findings of other studies which show that to alleviate time and space limits of the curriculum, integrating ESD within the curriculum of different school subjects encourage SP to include several interactive lessons linked to SWM and real-world contexts (Lauis et al., 2024; Ongon et al., 2021). These findings correlate with the KAB model, knowing more about external factors linked to research support and community engagement and their impact on the ability of SP to change attitudes and behaviour is important (Gunson et al., 2022; Monus, 2022).

The results of this study also indicate that more training and support is required by SP to help them encourage SSWM practices at schools. The data suggests that SP require more workshops, education programmes, educational infrastructure and resources to effectively promote SSWM at schools. This finding is linked to other research in the field, professional training and development are crucial to effectively manage SW at schools. Professional development, teacher training and education linked to effective SWM is important to bridge the gap between schools and environmental sustainability (Kowasch, 2022). Supporting SP with education, training and support are critical for encouraging sustainable practices at schools (Damoah & Omodan, 2022; Dzerefos, 2020). These ideas are supported by the KAB model, in that knowledge is important to influence attitudes and change behaviour (Teo et al., 2023).

6.3. Alignment of the Results with the KAB model

This study was guided by the KAB model which has been illustrated in figure 2.1 of this thesis. Based on the results of this study a revised model has been developed to illustrate the alignment of the results with the KAB model as shown in figure 6.1.

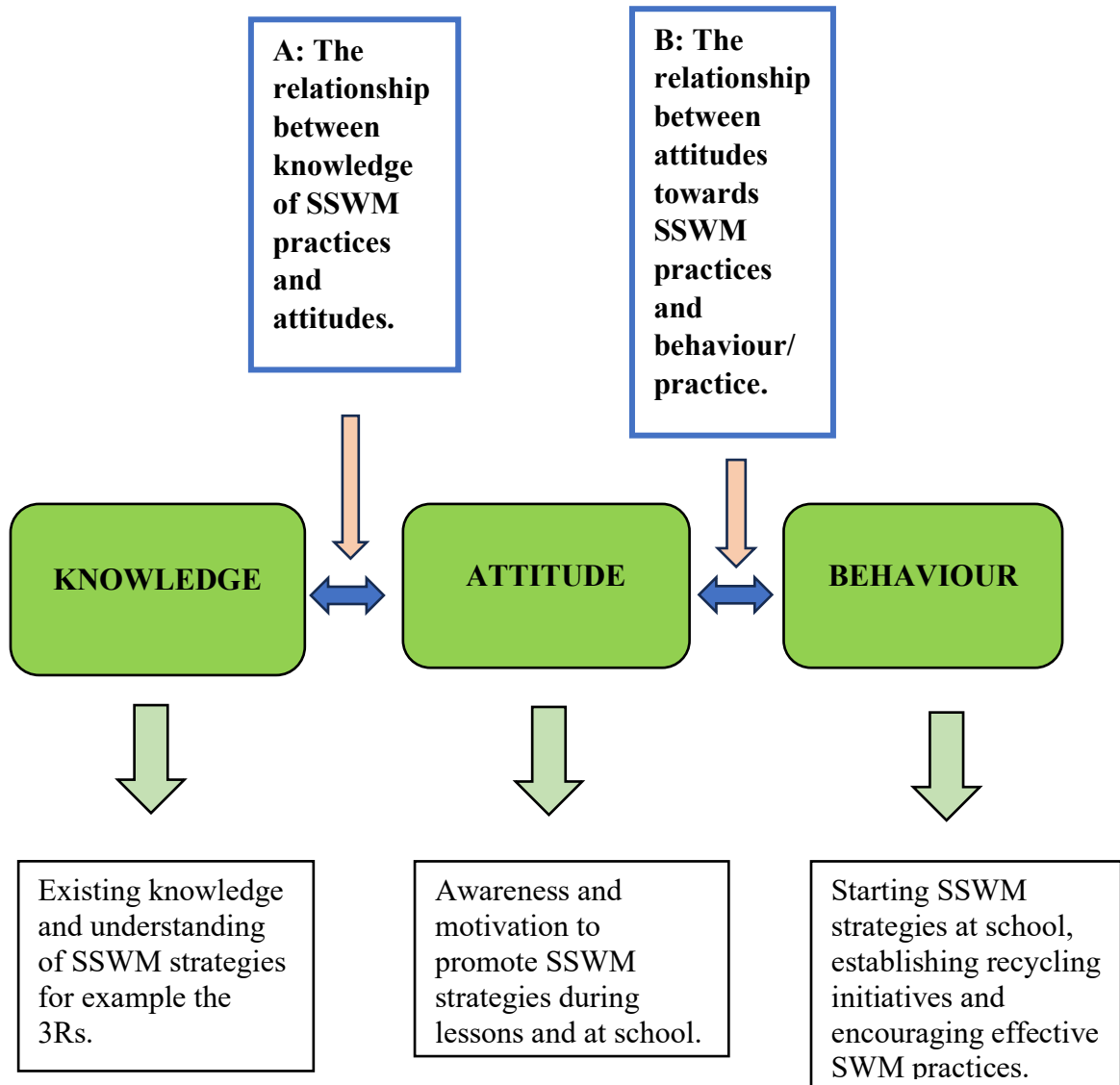


Figure 6.1: Alignment of the results with the KAB model (Author's own, 2026)

In figure 6.1, two text blocks have been included. Block A shows the relationship between knowledge and attitudes. The results of this study show that the participants had knowledge and awareness of SSWM strategies. This knowledge was acquired through their undergraduate studies, attendance at workshops as well as their own research. Based on this knowledge participants were aware of the importance of SSWM. Based on this importance, the participants were motivated to share SSWM with the parents, the community and learners. The participants were inspired to promote SSWM strategies at their schools. Block B signals how the participants used their knowledge and positive attitudes about SSWM strategies at their schools. The participants included ideas of sustainability and education for sustainable development in their lessons, they encouraged assembly talks and recycling projects at their

schools. Participants evaluated the types and amount of solid waste generated at their schools. Furthermore, participants promoted competitions and encouraged the use of recycling bins at their schools. This alignment of the results of the study would the KAB model proposes important implications for theory, policy and practice. These implications are discussed in the section that follows.

6.4. Implications of the study

6.4.1. Theoretical Implications

Based on the national and global literature reviewed for this study, most literature focussed on Higher Education institutions and Secondary Schools. Research in secondary schools concentrated on parent, community members and learners' views about solid waste management. Thus, while research in the field highlights the importance of solid waste management in diverse educational environments, there is limited research that concentrates specifically on the knowledge levels of school personnel in primary schools. The current study focussed on the level of knowledge related to sustainable solid waste management among school personnel in the selected primary schools. The empirical evidence from the current study will add to existing knowledge in the field.

6.4.2. Policy Implications

Based on the findings of this study, local municipality can consider using current data to develop context specific waste reduction strategies for urban and suburban schools. This will avoid the generalised policy currently in place. Local vendors, spaza shops and tuck-shops surrounding schools can use the findings of this study to consider reducing the use of single use plastic to encourage the use of more sustainable packaging. The implementation of policies needs to be workshopped with teachers. Teachers need to be invited to training workshops to ensure policies are implemented for maximum benefit.

6.4.3. Practical Implications

The results of this study highlight the importance of resources and infrastructure. The results of this study signal the importance of optimising the placement of bins and colour coded recycling bins. The results of this study showcase the importance of initiating eco-clubs and recycling campaigns at their schools. This implication directly responds to the knowledge-gaps

as identified in the current study. Another result of this study indicates the need to identify the exact types and quantity of solid waste generated at each school. This will inform future composting projects, sustainability projects and partnerships with local recycling vendors to lower the cost of fees for solid waste disposal.

6.5. Limitations

The study did have limitations. It was beyond the scope of the study to observe or monitor the effectiveness of the SP SWM initiatives. It was also not part of the study to observe learner, parent and local community members' attitudes and behaviour after the SWM initiatives were implemented. The study is a small-scale study that focused on twelve schools. In this regard the findings of the study have limited generalisability.

6.6. Recommendations

The study offers recommendations based on the findings and conclusions reached. These recommendations pertain to SP professional development and training, clear guidelines focusing on policy implementation, the deliberate integration of SSWM strategies within the school curriculum, fostering engagement with relevant stakeholders, providing the essential resources for ensuring the success of effective SWM strategies and effective monitoring and evaluation of SWM initiatives at schools.

6.6.1. Professional Development and Training for SP

From the findings and conclusions of this study it is evident that SP are open to further training and professional development activities focussing on encouraging SSWM initiatives for schools. The Department of Basic Education should work in collaboration with SP to identify specific targeted professional development and training needs. If the training and professional development needs of SP are met, this would support the implementation of SSWM initiatives at schools.

6.6.2. Guidelines and Implementation of SSWM Policies in Schools

Based on the findings and conclusions of this study it is evident that policies concerning Sustainable Development Goals (SDG), Education for Sustainable Development (ESD),

Environmental Education (EE) and effective Solid Waste Management (SWM) strategies for schools need to be reviewed. The Department of Basic Education should work collaboratively with SP to ensure that clear guidelines concerning SDGs, ESD, EE and effective SWM at schools is discussed and implemented. SP should work closely with the Department of Basic Education to focus on including aspects of environmental sustainability within school curriculum and school improvement strategies. SSWM topics should be integrated within different school subjects across the school curriculum. In addition, projects focussing on SSWM should be encouraged at all schools. This includes the fostering of eco-clubs, recycling campaigns and projects.

6.6.3. Active Engagement Between SP and Stakeholders

Findings and conclusions of this study indicate that SP need active engagement with the relevant stakeholders. Relevant stakeholders include businesses, local community members, parents and the Department of Basic Education. Stakeholders should be motivated to actively engage with SP and support SWM initiatives. Stakeholders should be encouraged to participate in clean-up activities, recycling projects and awareness campaigns. These initiatives will strengthen collaborations between schools, parents and the wider local community.

6.6.4. Providing SWM Resources for Schools

In this study, SP indicated that they required resources to ensure the success of their SWM strategies. Some of the resources mentioned by the participants included recycling bins, infrastructure to store recycled materials and tools to support the set-up of eco-clubs. The Department of Basic Education should work closely with local businesses, community members and schools to try to provide these essential resources. The allocation of SWM resources to schools will support schools as they promote SSWM strategies within their schools.

6.6.5. Monitoring and Evaluation of SWM Initiatives at Schools

Another key finding of this study is related to the monitoring and evaluation of SWM strategies. To evaluate the impact of SWM strategies at schools, SP should develop dedicated monitoring procedures for their schools. These monitoring procedures and tools should be used on a regular basis to assess the impact of specific SWM strategies implemented by each school. The SWM monitoring and evaluation strategies should be integrated within the development and improvement plan for each school.

6.7. Contribution of the Study

The contribution and importance of the study lies in the important information uncovered regarding the selected SP knowledge and understanding of SSWM practices. The study revealed that although SP acknowledge that SWM is a challenge, they have limited awareness and knowledge of effective SSWM strategies and policies. The findings of this study can assist in revealing the knowledge gap. Knowing more about the knowledge gap among SP will assist in developing and advancing specific strategies and education programmes to promote effective SSWM strategies at primary schools. These targeted interventions will support SP enhance existing SWM strategies. Improving existing SWM practices will lead to a healthier school environment, diminish environmental ruin and foster a sustainable future.

6.8. Future Research

Based on the discussion, implications, recommendations and contribution of this study, further research could explore a longitudinal study. The longitudinal study would offer the opportunity to evaluate the changes in attitude, behaviour and practices of learners before and after SWM initiatives are implemented by SP. For the longitudinal study to be effective, it would first include training and professional development of SP. To be useful, the training and professional development will need to include strategies on how to integrate aspects pertaining to SSWM into the school curriculum. The longitudinal study will also need to explore the fostering of stakeholder engagement and access to resources for example recycling bins, service providers to collect recycled items from schools and additional personnel to monitor, evaluate and support recycling initiatives at schools.

6.9. Conclusion to the Study

This study was conducted at twelve primary schools in Chatsworth KwaZulu-Natal, South Africa. The aim of the study was to explore the level of knowledge related to sustainable solid waste management (SSWM) among school personnel in the selected schools. The study followed a sequential explanatory mixed methods approach. A questionnaire was handed out and semi-structured interviews were conducted with purposively selected participants.

Based on the results of the study, it can be concluded that the SP who participated in this study have knowledge and awareness of SSWM. They are aware of the circular economy and practice the 3Rs by promoting the reducing, recycling and reusing of material (Ioannidis et al., 2021; Pandiyarajan et al., 2022). SP have a positive attitude about ensuring they promote SSWM practices and strategies at their schools. The SP were effective in promoting SWM strategies at schools. The results of the study show that the participants are willing to integrate SWM practices into the curriculum (Monus, 2022), but they need workshops and training to ensure they can implement SWM initiatives effectively. Gaps in knowledge were also revealed, these gaps were related to policies about promoting SWM at schools (Nabor & Cruz, 2022).

The results of the study also imply that while the participants value teaching about SSWM to promote sustainability, participants are often faced with curriculum and time constraints. This creates barriers to ensuring SSWM aspects are integrated effectively and successfully within the curriculum. Apart from training and professional development linked to effective SWM strategies, the participants also require resources and support to sustain SWM practices at their schools. SP felt that they needed more engagement and support from parents, learners and local community members to ensure successful SWM strategies (Solihat et al., 2024). SP also mentioned challenges and barriers linked to resources that are needed to ensure that their SWM strategies are effective and sustainable for the future. If the recommendations and future research possibilities of this study are considered, this could lead to a positive change in the level of knowledge and understanding of school personnel in primary schools. A small change at primary schools at a national level may lead to positive changes at a global level and promote a sustainable future worldwide.

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APPENDICES

Appendix A: Informed Consent Letter

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number: 2024/CAES_HREC/6231

_____ 2025

Title: Exploring the Level of Knowledge of Sustainable Solid Waste Management Amongst School Personnel in Selected Chatsworth Primary Schools, KZN

Dear Prospective Participant

I, Kalin Nolan Naidoo am doing research with Dr U van Den Berg, a senior lecturer in the Department of Environmental Sciences. I am studying towards a MSc in Environmental Management at the University of South Africa. We are inviting you to participate in a study entitled *Exploring the level of knowledge of sustainable solid waste management amongst school personnel in selected Chatsworth primary schools, KZN*.

The purpose of this study is to explore and assess the level of knowledge related to sustainable solid waste management among school personnel in selected primary schools in Chatsworth, KwaZulu-Natal. This study intends to examine the specific challenges and barriers encountered by school personnel in adopting and sustaining effective solid waste management strategies. In addition, the study intends to determine the training and support needs necessary to enhance knowledge and application efforts.

The research site for the study is Chatsworth, KwaZulu Natal, South Africa. Information for all primary schools in Chatsworth has been obtained from the KwaZulu-Natal Department of Education's list of schools. Your school has been selected because it is a primary school located in Chatsworth. The school principal has been contacted regarding the participation of the school personnel in this study. Since you are in the school management team/school governing body, I am inviting you to participate in this study. There are 12 primary schools and 100 school personnel who are being invited to participate in this study.

The study will entail the collection of data by using a questionnaire and an interview. Participants will first complete a questionnaire with five closed-ended questions and ten Likert style questions. The questionnaire will be hand delivered and collected at a time that is convenient for each participant. The questionnaire will take approximately 10 minutes to complete. Following this, purposively selected participants will be invited to semi-structured individual interviews to find out more about their knowledge and attitudes about sustainable solid waste management. The interviews have ten questions, answers to questions will be probed if necessary. The individual interview will take approximately 45-60 minutes. Interviews will be conducted at a time and place convenient for each participant. All data collected will be anonymized to ensure confidentiality, and informed consent will be obtained from all participants before data is collected.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. There are no incentives or financial rewards for participating in this study.

Please note that confidentiality agreements will be submitted to the UNISA Research Ethics Review Committee for consideration. Your answers may be reviewed by people responsible for making sure that research is done properly, including the supervisor and members of the UNISA Research Ethics Review Committee. Otherwise, records that identify you will be available only to me and my supervisor.

A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. To maintain your anonymity; your name will not be recorded anywhere. To maintain your confidentiality, your answers will be given a code number, or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

The benefit of this study is raising awareness among school personnel about environmental responsibility. It can help school personnel to promote eco-friendly strategies, reduce waste, conserve energy and encourage recycling. Additionally, it can help school personnel initiate effective waste management strategies. These strategies can encourage environmental

responsibility and assist in contributing to a cleaner and more sustainable environment for future generations. There are no potential risks to participating in this study.

Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard/filing cabinet in a secure office for future research or academic purposes; electronic information will be stored on a password protected computer. After five years all hard copies will be shredded, and all electronic copies will be permanently deleted from the hard drive of the computer.

This study has received approval from the Research Ethics Review Committee for the College of Agriculture and Environment Sciences (CAES) [2024/CAES_HREC/6231], Unisa. A copy of the approval letter can be obtained from the researcher if you so wish. After the study has been completed, all participants will be provided with feedback regarding the findings. Feedback procedures will entail sharing findings with school personnel through interactive presentations and a short report. The report will provide findings based on the strengths of current strategies in place at the schools as well actionable recommendations for improvement.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact me: Kalin Nolan Naidoo: Cell Number: 0658784783, Email address: 25036068@mylife.unisa.ac.za. Should you have concerns about the way in which the research has been conducted, you may contact my supervisor: Dr U Van Den Berg: Office Number: 011 471 3093, Email address: vdberu@unisa.ac.za. If you have any ethical concerns and wish to contact the research ethics chairperson of the College of Agriculture and Environmental Sciences Health Research Ethics Committee. Details of the chairperson are as follows; Prof MA Antwi: Email address: antwima@unisa.ac.za

Thank you for taking time to read this information sheet and for considering participating in this study.

Yours sincerely



Kalin Nolan Naidoo: Student: MSc: Environmental Management Student (UNISA)

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname..... (please print)

Participant Signature.....Date.....

Researcher's Name & Surname.....(please print)

Researcher's signature.....Date.....

Appendix B: Questionnaire

Questionnaire for applicable School Personnel (SP)

Participant Code: _____

Gender: _____

Section A: Biographical and General Information

Please respond to each question by using a ✓

1. Do you hold any formal leadership positions at the school?	Please tick (✓)
1.1. Yes	
1.2. No	
2. How long have you been a member of the SP?	Please tick (✓)
2.1. 0-2 years	
2.2. Greater than 2 years	
3. Are you involved in making curriculum decisions for your school?	
3.1. Yes	
3.2. No	
4. Have you participated in any training focusing on sustainability or environmental education?	
4.1. Yes	
4.2. No	
5. Have you implemented any programmes or initiatives focusing on sustainability or environmental education at your school?	
5.1. Yes	
5.2. No	

Section B: SP's knowledge of sustainable solid waste management

6. Please respond to each question by using a ✓

Item	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
6.1. I have a clear understanding of what sustainable solid waste management entails.					
6.2. I am knowledgeable about the various types of waste generated in my school and their impact on the environment.					
6.3. I am aware of the policies and guidelines related to sustainable solid waste management applicable to our school.					
6.4. I feel confident in my ability to educate staff and learners about sustainable waste management practices.					
6.5. I have received sufficient training or information on sustainable solid waste management in my role as a school leader.					

Section C: SP's attitude towards sustainable solid waste management

7. Please respond to each question by using a ✓

Item	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
7.1. I believe that sustainable solid waste management is essential for a healthy school environment.					
7.2. It is the responsibility of school personnel to promote sustainable waste practices among learners and staff.					
7.3. My school should allocate resources specifically for sustainable solid waste management.					
7.4. I feel confident that implementing sustainable solid waste management practices can positively impact our school and the wider community.					
7.5. Teaching learners about sustainable solid waste management is as important as teaching other subjects.					

Appendix C: Interview Schedule

Interview schedule for purposively selected school personnel (SP)

Initial Stage:

Before the interview starts, I will prepare the participant for the interview. I will ensure that participants are at ease and comfortable. I will remind participants about:

Their rights as participants in the research.

The purpose of the interview.

The reason for their selection.

The anticipated duration of the interview.

That consent must be of their own free will.

Participants can withdraw at any stage without prejudice.

Should the participant feel uncomfortable at any point in the interview, they should please notify the researcher so that the cause of the uncomfortableness can be addressed.

The interview location, will be the choice of the participant;

The researcher will always have refreshments such as water.

The researcher will make it clear that the participant may take a break when needed and if the participant prefers that the interview be sectioned in shorter sessions;

The researcher will strive to develop a positive regard throughout the interview.

The Interview:

In this section the questions I intend to ask the school personnel:

Can you describe your understanding of sustainable solid waste management and its importance in a school setting?

What specific practices related to sustainable solid waste management have you implemented in your school?

How do you involve teachers, learners, and other stakeholders in your school's waste management practices?

What resources or materials do you use to guide your school's waste management initiatives?

What challenges or barriers have you encountered in implementing sustainable waste management practices at your school?

How do you assess the effectiveness of the solid waste management strategies in your school?

Have you received any training related to sustainable solid waste management? If so, how has it influenced your practices?

In your opinion, what are the key factors that hinder effective solid waste management in your school?

What support or resources do you think are necessary for improving sustainable solid waste management practices in your school?

How do you envision the future of sustainable solid waste management in your school, and what steps do you think are necessary to achieve that vision?

Final Stage

In the final stage the interview, I will ask the participants if they would like to add anything before the interview is concluded.

Appendix D: Example of the Systematic Analysis Guiding the Study

Participant Labelling	Interview Transcript Excerpt	Deductive Coding Guided by the KAB model	Inductive Coding	Final Theme
A3	“...solid waste management is important in schools...it reduces pollution, teaches environmental responsibility and creates a clean and safe learning environment...”	Knowledge (K): Understanding and awareness of solid waste management policies, activities, programmes, etc	• Environmental Responsibility • Clean • Safe Learning Environment	Knowledge and Understanding of Solid Waste Management
G4	“My understanding of sustainable solid waste management in a school setting revolves around creating an environmentally responsible system to manage waste that aligns with the educational goals of the school.”		• Environmental Responsibility • School Goals	
H1	H1: “...workshops and conferences on sustainable solid waste management, policies and new technologies...online course on waste to energy...helps me in implementing effective waste reduction and recycling strategies. Community assistance was increased, and behavioural changes in learners and community members were promoted.”	Attitude (A): Personal beliefs and views about solid waste management	• Personal benefit. • Technology	
I1	“Sustainable waste management...managing waste in such a manner that it does not harm the environment...save natural resources...important in school as it protects the schooling environment...ensures learners are being educated about the environment and that		• Protecting the environment • Conserving natural resources • Promoting healthy habits	

	they start practising healthier habits...”			
B2	“...collected bottles and paper to be recycled...taken learners to a landfill so that they are educated in the processes involved in waste management...personally use recycled paper in art and drawing paper...used recyclables to make containers, boxes at the projects.”	Behaviour (B) Actual actions taken; current practice related to solid waste management	• Education • Role model	Solid Waste Management Practices Currently in Use Solid Waste Management Practices Currently in Use
H2	H2: “...reducing the use of paper when giving notes and reducing paper waste by printing on both sides...encouraging learners to share books and equipment...online resources...I follow EPA’s sustainable waste management programme, ‘Think Green’, it offers educational materials and activities for learners.”		• Circular economy • Promoting learner activities	

Appendix E: The KwaZulu-Natal Department of Education Approval



KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X 9137, PIETERMARITZBURG, 3200

Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201

Enquiries: Ms Phindile Duma

Email: phindile.duma@kzndoe.gov.za

Ref: 2/4/8/383

Tel: 033 392 1063

Mr Kalin Nolan Naidoo
11 Ronald Place
WESTVILLE NORTH
3629

Dear Mr Naidoo

PERMISSION TO CONDUCT RESEARCH IN THE KZN DOE INSTITUTIONS

Your application to conduct research entitled: **"EXPLORING THE LEVEL OF KNOWLEDGE OF SUSTAINABLE SOLID WASTE MANAGEMENT AMONGST SCHOOL PERSONNEL IN SELECTED CHATSWORTH PRIMARY SCHOOL"**, 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 02 December 2024 to 31 October 2027.
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: 04 December 2024

GROWING KWAZULU-NATAL TOGETHER

Appendix F: Ethical Clearance Certificate



College of Agriculture and Environmental Sciences_Health REC

Date: 16/01/2025

Dear: Mr Kalin Nolan Naidoo

NHREC Registration # : REC-170616-051
Ref #: 2024/CAES_HREC/6231
Name: Mr Kalin Nolan Naidoo
Student #: 25036068

**Decision: Ethics Approval from
16/01/2025 to 31/12/2027**

Researcher: Mr Kalin Nolan Naidoo
25036068@mylife.unisa.ac.za 0658784783

Supervisor: Dr Unine Van den Berg vdberu@unisa.ac.za

EXPLORING THE LEVEL OF KNOWLEDGE OF SUSTAINABLE SOLID WASTE MANAGEMENT AMONGST SCHOOL PERSONNEL IN SELECTED CHATSWORTH PRIMARY SCHOOLS, KZN

Qualification: MSc Environmental Management

Thank you for the application for research ethics clearance by the College of Agriculture and Environmental Sciences_Health REC for the above mentioned research study. Ethics approval is granted for three years, **subject to submission of yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report is submitted.**

Due date for progress report: 31 December 2025

The **low risk application** was **reviewed** by College of Agriculture and Environmental Sciences_Health REC on 15 January 2025 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(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. 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 College of Agriculture and Environmental Sciences_Health REC.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. 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, accompanied by a progress report.
5. 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.
6. 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.

Appendix G: Turnitin Receipt

Similarity Report	
PAPER NAME	AUTHOR
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94 Pages	1.0MB
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