

**Grade 10 science learners' behavioural intentions related to good practices
of solid waste management in Vosloorus, Gauteng.**

by

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ABSTRACT

This research explored the behavioural intentions of Grade 10 science learners towards solid waste management. The research relied on the Theory of Planned Behaviour (TPB) to determine such intentions and determine if the intentions affect their behavioural practices regarding solid waste management. Currently, South Africa Environmental Education (EE) is integrated into the CAPS curriculum from Grade R to Grade 12. EE is meant to encourage positive attitudes among learners towards caring for the environment and create environmentally responsible behaviour. With this goal clearly stated, it is expected that learners implement EE knowledge to care for the environment in schools and within the larger community. Studies have shown that school students generally have poor waste management practices worldwide. Several studies have investigated the link between poor waste management practice and personal factors such as awareness, attitude, and knowledge. Previous researchers have discovered that learners show little or no concern about the negative impact of disposing of litter inappropriately; they continue to litter at school and home surroundings. Studies have found that human behaviour is a complex entity; hence, it takes extensive research to understand why school students are reluctant to care for the environment.

The main aim of the research was to determine the nature of behavioural intentions of the grade 10 science learners, identify their behavioural practices, and then determine the extent to which behavioural intentions relate to good practices regarding solid waste management. Purposeful sampling was used to identify learners to be included in the research. The research was designed as a mixed-method inquiry that used both qualitative and quantitative methods of collecting data. Data was collected through questionnaires that the learners completed. These were closed-ended and open-ended questionnaires. By including open-ended questionnaires, the researcher hoped to understand better the high school learners' behavioural intentions towards solid waste management.

The findings of the research reveal that behavioural intentions among learners are positive. Behavioural beliefs were significantly positive among the six TPB constructs used to explore learners' preferences, followed by normative beliefs and perceived behavioural control.

Attitudes towards the behaviour and control beliefs are moderate. The lowest among these are subjective norms. The findings imply that learners are willing to embark on environmentally responsible behaviour. In determining behavioural practices, it was discovered that practices are lower than behavioural intentions. The percentage for behavioural practices is lower than behavioural intentions. The results may imply that although learners have positive behavioural intentions, they are not as committed to behavioural practices as expected. When behavioural intentions are compared to behavioural practices, it emerged that the learner's intentions do affect their behaviour but not to a large extent. The learners have positive behavioural intentions, and their behavioural practices are positive but not as high as their intentions. Their behaviour is affected when they have to go around picking up litter in the school. The results show a need to design behaviour change interventions to help learners adopt positive behavioural practices.

KEY WORDS

Behaviour, solid waste, solid waste management, behavioural intentions, environmentally friendly behaviour, theory of planned behaviour, attitudes, subjective norms, perceived behavioural control, behavioural practices.

DECLARATION

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged using complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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LIST OF ABBREVIATIONS

CAPS	Curriculum and Assessment Policy Statement
DEA	Department of Environmental Education
EEASA	Environmental Education Association of Southern Africa
EEPI	Environmental Education Policy Initiative
IUCN	International Union for Conservation of Nature
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WWF	World Wildlife Fund
IUCN	International Union for Conservation of Nature
UN	United Nations
WCED	World Commission on Environment and Development
RDP	Reconstruction and Development Programme
NCS	National Curriculum Statement
NEEP-GET	National Environmental Education Project for General Education and Training
UNCED	United Nations Conference and Environmental law

CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE RESEARCH

1.1 Introduction

It is stated by Gore 1993 that environmental deterioration has emerged as a serious issue globally, and humans are the largest contributor to many of the environmental problems (as cited in Muderrisoglu and Altanlar 2011, p.160). South Africa is also facing numerous environmental challenges, including climate change, pollution (air, water, waste, littering) and resource depletion (desertification, deforestation, overpopulation and urbanisation Loubser (2014). Loubser (2014) also asserts that humans have a tremendous impact on the environment. This is because the human population has grown, human activities affect the environment, and technological advances have put much strain on the environment. It has been discovered that the ultimate drivers of environmental crisis are rapid population growth, high consumption, pollution, waste disposal, climate change, pressure exerted on natural resources and industrialization, Schudel (2008). The Department of Environmental Affairs (DEA) (2017) publication also confirms that waste generation in South Africa is driven by a growing population, economic growth, rising income levels, and increasing levels of urbanisation.

De Leeuw et al. (2015) stated that to deal effectively with the environmental challenges, humans need to change their behaviour to reduce their detrimental impact on the environment. Human behaviour can both be favourable or unfavourable towards the environment. Krajhanzil (2010) has developed the term “environmental behaviour,” which means such behaviour significantly impacts the environment. He gives examples of unfavourable environmental behaviour such as excessive exploitation of unsustainable mineral resources such as coal or petrol and sustainable (water, soil) resources, litter, distortion of natural monuments, and abuse of countryside. In changing human behaviour, Hungerford and Volk (1999) assert that “societies throughout the world establish educational systems to develop citizens who will behave responsibly towards the environment” (p.257). The systems include formal (schools and universities) and non-formal (companies and different places of work) education. The assertion shows us that people can change their behaviour by learning about the environment. Le Roux (2014) echoes this sentiment when he states, “Environmental Education remains the greatest tool in making a difference in the environment (p.201)” He adds that the undisputed purpose of EE is to educate people to interact with the environment in a responsible way.

DEA (2012) has mentioned that the majority of the South African population is made up of the youth, so there is a greater need to immerse the junior members of the society in an intensive solid waste management practice in schools. In recent years, various sectors and public initiatives have emerged in South Africa to help foster an environmentally conscious society Mnisi (2011). These initiatives include the integration of environmental education into the education system. The incorporation of environmental education into the South African national curriculum begins from the first year of schooling, Grade R up to Grade 12.

A clear definition of EE is important. EE, in simple terms, is education in, about, and for the environment Meyers et al. (2007). They explain this definition further by stating that this description reinforces the different purposes that EE often serves: the programs that provide opportunities to explore nature, information about conservation and environmental issues, and opportunities to gain knowledge and skills that can be used to defend, protect, conserve, or restore the environment. Dreyer and Loubser (2014) confirm that “EE has been developed in a global scale from 1972 during the United Nations Conference” (p. 145). The concept of EE has evolved internationally from a simple people-environment relationship to a complex professional field embracing ecological knowledge and understanding, total people-environmental relationships, ethics, politics, culture, sociology, and public participation in decision making. Irwin and Lotz-Sisitka (2014) trace the development of environmental education prior to the 20th century until after 1994 in the South African context. EE has been viewed as an important system to educate the youth on environmental issues and it is viewed as crucial in preparing environmental literate students who will play an active role in protecting the environment by making informed decisions as far as caring for the environment is concerned Muderrisoglu and Altanlar (2011).

There are examples of countries worldwide that have integrated EE into their school curriculum. Radeiski (2009) reports that formal and non-formal Environmental Education exists in Sweden. EE in Swedish schools is implemented in a comprehensive study and special activity and is carried out for 6 or 7 hours a week. It was also noted that empirical activity such as fieldwork and laboratory work is emphasised in Sweden. EE in Sweden specifies that children learn early environmental awareness; they start from pre-school to compulsory school, making informed decisions about caring for the environment. EE is more than just a prescribed timetable. They continue even after class, and EE intervenes in everyday life. What is described above is formal education. Environmental Education has been included in the German curricula

since the mid-70s. EE is not a subject on its own it is integrated into the subjects and takes 4 hours a week. There is no fixed time window for EE; teachers decide on a method to teach EE, Radeiski (2009). In Benin in West Africa, educational leaders infused EE elements in the Sciences; (physics, chemistry, and technology or SPCT) and Biology and Earth Science (BES) curricula Kelani (2015).

It has been found that EE in Malaysia has been officially integrated across the national curriculum in schools since the 90s. There are environmental aspects in all subjects taught during classroom teaching and learning sessions Mustam and Daniel, (2016). In Namibia, Tshiningayamwe (2017) uses the term ESD (Education for Sustainable Development) which is equivalent to EE. He states ESD is integrated in both the formal and non-formal education programmers. ESD is integrated across the formal school curriculum in all subjects taught in schools. EE has been integrated and infused in an interdisciplinary way across all of Kenya's primary, secondary and tertiary education systems. EE has been integrated rigorously, especially into science and social studies, and environmental values have also been integrated into Mathematics, English, and Creative Arts Mutisya and Barker (2011). Environmental Education is mandatory informal education in Botswana, as reported by Silo and Mswela (2016). Information about these countries shows that EE is integrated into the formal curriculum just like in South Africa.

Researchers internationally and locally have tried to establish if EE is effective in inculcating the necessary knowledge, skills, and attitude to students. Kelani (2015) asserts that despite the compulsory nature of the science and EE curricula, there are many logistical and personal barriers hindering the teaching of science and EE. Logistical barriers include lack of teaching materials, science laboratories and equipment, textbooks, sufficient funding, and access to outdoor learning laboratories. Personal barriers include overcrowded classrooms, a heavy workload for teachers, and an overloaded curriculum which teachers are constantly under pressure to cover. Mustam and Daniel (2016) add that teachers often say that preparing students for examinations is regarded as more important, hence they do not get enough time to delve into EE. Adeolu (2014) reveals that Nigeria still has much ground to cover in environmental education. He believes governors should implement solid waste management policies and sanitation laws in Nigerian schools. There is also a need to increase students' knowledge, attitude, and practice of waste management issues. The study also revealed the need for change

in attitude and behaviour among students, which is essential in effective participation in waste reduction.

Loubser (2008) asserts that EE has been too concerned with problems and issues and not sufficiently concerned about the affective domain, in other words, about exposing learners to the joy and wonder of the environment. The affective domain is the essential component of positive attitudes towards the environment. He states, “We have had EE for more than 28 years, but the environmental crisis continues to get worse” (p3). Even though pupils have a better understanding and awareness of the environment, achieving effective solutions to environmental degradation is still a challenge (Mutisya & Barker, 2011). Buthelezi (2015), in his study on Eco-schools, concluded from the research findings that EE through the Eco-Schools Programme is not effective enough. Msezanes’ (2014) study shows that learners responded negatively to Environmental Education, and consequently, littering continued to prevail in the school. After being taught how to dispose of litter at the school properly, learners continued to litter. Studies including the ones above show that EE has had minimal impact on students’ behaviour to care for the environment. Schudel et al. (2007) believe that sustainable development and education can only succeed if they become students' way of life.

Harold and Trudi (1999) confirm that solving environmental problems can be achieved by altering human behaviour and that to change human behaviour, we need to motivate them to behave desirably. The basic objective in schools is, ‘No littering,’ so learners have to begin at this level to show care of the environment. Therefore, the main purpose of the current study is to investigate learners’ intentions behind the behaviour observed in schools. This will add on information as to why learners behave the way they do. When armed with knowledge, policymakers and leaders in environmental education can employ the right interventions measures to correct learners’ behaviour. The study will explore the nature of behavioural intentions of Grade 10 science learners about how they manage solid waste. As the battle for caring for the environment still wages on, there is a need to explore the human affective domain further to find out why there is a slow response among learners to care for the environment.

1.2 Problem Statement

The South African government has mandated waste management as one of the critical areas it needs to address regarding service delivery and sustainability (Institute of Waste Management

in Southern Africa, 2008). South Africa produces 108 million tons of waste per year (Gauteng being the largest producer with 45%), and 90% of waste ends up in landfills, with only 10% recycled Department of Environmental Affairs (DEA 2012). Many South Africans are prone to littering, resulting in a dirty country and unnecessarily vast sums of money to clean up the mess; funds that could have been used in productive things such as schooling, housing and helping the poor DEA (2012). The DEA stated in an article that littering is a behavioural problem, and all South Africans will need to make a concerted effort to change this mindset and, consequently, their behaviour. Waste disposal is an urgent and critical issue for the community. The ineffective or irresponsible disposal of solid waste pollutes the environment and poses a health risk to the public Desa(2011).

Adeolu (2014) states that inappropriate solid waste management practices in schools in developing countries are major factors leading to worsening environmental conditions. De Leeuw et al. (2015) asserted that young people are critical stakeholders in environmental management; they can be a powerful engine for changing behaviour. Sadly, their research discovered that most young people respond negatively with a lack of interest or denial of environmental issues. They have established that young people are more reluctant to commit to pro-environmental behaviours than older people.

Seemingly there is a gap between knowledge and practice among young people. They have been exposed to EE in schools but they are the ones who are more reluctant to be committed to pro-environmental behaviour. Loubser (2014) argues that the gap between awareness and practice is caused by that Environmental Education that has concentrated on knowing about the environment and neglected education in and for the environment. He states that it is not true that environmental problems will be resolved if people know them. Knowledge about the environment is essential, but it is not sufficient.

The studies of Mudau and Msezane (2014) have focused directly on learners' behaviour after exposure to EE. Their findings were that learners continue to litter even after participating in the EE as an extramural activity. The study by Mbokazi (2016) subjected learners to pre-test and post-test evaluation. In pre-test results, participants lacked environmental knowledge, attitudes, and skills. Participants exhibited significant improvement in saving water, energy, and handling waste in the post-test. Mapotses' (2017) study indicated an improvement in

learners' awareness about litter. Therefore, the authors concluded that action research could raise learners' understanding of littering in environmental education. This suggests that EE should be rigorously done in schools to yield desirable results. The research findings are not conclusive that EE helps to enforce acceptable waste management practice in schools. The main problem is a lack of environmental management knowledge in schools.

With the integration of EE in the school curricula in South Africa and most countries in the world, the goal is to help learners have a thorough understanding of the importance of the environment, to understand the negative impact humans have on the environment, and more so to participate in environment saving initiatives and contribute to finding solutions to care for the environment. De Leeuw et al. (2015) attests that we need to identify individuals' beliefs towards the environment and how they affect their intention and behaviour. Then we can challenge the beliefs that impede the desired behaviour from being adopted. Frankfurt (2018) also confirms that environmental attitudes are not examined sufficiently. That is why the current study will investigate science learners' behavioural intentions related to acceptable solid waste management practices. The aim is to identify the desirable intentions among learners so policymakers, teachers, and all relevant stakeholders in education can nurture them for good solid waste management practices. Unlike previous studies where environmental practice was measured after environmental activities, the current study will delve into attitudes, intentions and beliefs of learners in their day to day lives towards the environment. It will identify their intentions that inform their behaviour. Mutisya and Barker (2011) asserted that sustainable development and education could only be embedded in people's lives if they become a way of life.

As De Leeuw et al. (2015) suggested, future research should be about students in other countries and use qualitative techniques to explore their attitudes and opinions in greater depth. Hence, the study in South Africa will explore the attitudes that shape the behaviour of students. The current research will rely on the theory of planned behaviour (TPB) to explain the relationships between intentions and environmentally responsible behaviour. Hence, the question arises as to what the nature of behavioural intentions of Grade 10 Life Science learners is related to good practice of solid waste management.

1.3 The Research Questions

The research aims at answering the question:

- To what extent do behavioural intentions of Grade 10 Life Science learners relate to good practices of solid waste management in Vosloorus Gauteng?

The main question is broken down into sub-questions which are:

- What is the nature of behavioural intentions of grade 10 Life Science learners in relation to solid waste management?
- What are the behavioural practices of grade 10 Life Science learners in relation to solid waste management?

1.4 Rationale

One of the goals of EE is to encourage positive attitudes towards the environment and create environmentally friendly behaviour among learners and their natural environment Kuhar et al. (2007). Eagles and Demare (2000) state that environmental ethics must be prioritised when looking at environmental issues. Studies need to consider the effects of personal epistemological beliefs. Pan et al., (2018) confirms that environmentally responsible behaviour appears to be influenced by affective and knowledge factors. Gifford and Nilsson (2014) further suggest that we need to identify the subjective beliefs people hold regarding issues of the environment and how these beliefs affect their intention and behaviour. Then measures to positively influence the beliefs can be implemented, especially in a school environment.

Hence the current research will determine affective factors among learners that support environmentally responsible behaviour as far as the environment is concerned. Therefore, the purpose of this research is to identify the behavioural intentions of Grade 10 Life Science learners to see if they lead to good practices of solid waste management. The study used a popular and validated social-cognitive model of human behaviour, the theory of planned behaviour. De Leeuw et al. (2015) states that we need to develop a more thorough understanding of what motivates young people's pro-environmental behaviour (PEB) is an important area of concern. The knowledge acquired in the research will significantly contribute to the body of knowledge on environmental attitudes. Deleew et al. (2015) supports this stance

by stating that developing behavioural intentions knowledge is important for creating sound educational interventions that foster environmentally friendly behaviours.

Pan (2018) states behavioural intentions play the most important role in explaining behaviour. Many researchers agree that behavioural intentions are a significant indication of behaviour Ajzen (1991). The current research aims to understand what motivates responsible environmental behaviour among high school learners. Such analysis can inform the development of behaviour change interventions for young people to adopt environmentally responsible behaviour. Also, we live in times that require people have knowledge issues. The research will add to the body of knowledge on how attitudes influence the learners' behaviour. Van Niekerk (2014) confirms that not many studies have been done on children's environmental awareness in South Africa. A focused approach is needed to turn the philosophy of environmental studies into good practice, which will work towards sustainable development. This approach is also critical for South Africa. However, to enable this focused approach, the significant gap in the lack of research studies will have to be closed. Research should include understanding school students' awareness, knowledge, and waste management practice.

Children need to understand the fundamentals of awareness, knowledge, and practice in waste management. This can contribute to improved waste management, improved education, and a more sustainable future. Leicht et al. (1992) has exerted strong pressure on many governments to develop EE policies and curricula. With such pressure, the current research results may help decision-makers at different levels improve the teaching of EE topics in secondary schools. It may contribute to policy development, especially the policy on education and sustainability. It can help educators and various stakeholders in education plan activities related to developing environmental responsibility towards litter as the main pollutant in schools. It may further help curriculum designers, teachers, parents, and other stakeholders to plan activities that could reduce litter in schools and at home.

1.5 Aims and objectives of the study

The research aims to determine the extent to which behavioural intentions of Grade 10 Life Science learners relate to good practices of solid waste management in Vosloorus, Gauteng.

Objectives

- To determine the nature of behavioural intentions of Grade 10 Life Science learners in relation to solid waste management.
- To identify the behavioural practices of the Grade 10 Life Science learners in relation to solid waste management.

1.6 Introductory Literature Review

Eagles and Delmare (1999) provide background information about attitudes. They explain that attitude structures are well-formed when learners finish high school; significant change occurs most readily in the younger years. Attitude flux occurs throughout youth, up to the early teen years. At this time, the attitudes solidify and become much less amenable to change. Therefore, developers of programs dealing with older high school students face more challenges in changing attitudes. Eagles and Delmare's (2000) findings suggest that media and family influences create an environmental mindset. They took grade 6 learners to a camp for a week and found that their attitudes towards caring for the environment do not show much change. They report that they were surprised when their findings revealed that camping did not affect students' attitudes. They concluded that environmental attitudes are formed due to many factors over a long period. An EE program must be part of holistic EE curricula to influence attitudes effectively; the program and the curricular must be covered over many years. That is why it makes sense for the current study to assess learners' attitudes that have been exposed to EE for about ten years of schooling (Grade 1 to 10). Eagles and Delmare (2000) found that outdoor camping and education experiences can cause lasting gains in environmental knowledge.

By studying environmental attitudes, we can understand beliefs, interests, or rules that influence pro-environmental action Fernandez-Manzanal (as cited in Panth, 2015, p.235). If schools have this kind of understanding, they can inculcate positive values and attitudes towards environmental conservation in children. The children would take an active role in conserving the environment and its resources. In turn, they would preserve the resources for future generations.

Desa et al. (2011) studied students' knowledge, attitudes, awareness status, and behaviour concerning Malaysia's solid waste management (SWM). The findings were that although quite a number of the students (63.8 %) have knowledge about SWM, it is not consistent with their attitude. More than half of the students (65.9%) had negative attitudes towards SWM. De

Leeuw et al. (2015) identified key beliefs underlying pro-environmental behaviours in high school students. The study was done in Canada. They found that descriptive norms had more influence on students. The practice of others to protect the environment is more important than what they say, so the behaviour of parents, family members and some celebrities are important to these high school students. In such situations, the behaviour of people in authority or power can set a good example.

Adeolu (2014) assessed secondary school students' knowledge, attitude, and practice towards waste management in Nigeria. Findings revealed that knowledge, attitude, and waste management practice were relatively moderate in secondary schools in Ibadan. Molapo's (2014) findings in Lesotho suggest that learners have sound theoretical knowledge and awareness of environmental problems but are not action competent about such problems. Therefore, in the context of Molapo's (2014) study, proper understanding does not inform everyday practices. Possible reasons for this may be due to a de-contextualised curriculum and a teaching and learning environment where 'action competence' is not nurtured.

1.7 Introductory research methods

1.7.1 Research Approach

The current research used an explanatory sequential mixed method to collect data. This means both quantitative and qualitative methods of collecting data are used. This is because qualitative research tends to have a problem of biasness so using both methods reaches the research objective. Using this method also allows one to compare and interpret whether the results generated from quantitative and qualitative methods support or contradict each other. For the quantitative method, Grade 10 Science learners completed a questionnaire then analysed responses. **The Science learners some of them did Life sciences and Physical sciences and some combined Life sciences with other subjects like Business Studies.** For the qualitative study, a sample was selected from the study population in the seven schools where they expressed their opinions and feelings about their environmental beliefs and behaviour.

1.7.2 Population and sampling

The current research was conducted in Vosloorus, a township in Ekurhuleni district in Gauteng. Vosloorus covers an area of 32.1 km². According to the 2011 census, the area's total population was 163 216 and has most likely increased. The study included all seven government high

schools in the area. Purposeful sampling was done, which means the researcher specifies the characteristics of a population he is interested in and then locates individuals who have those characteristics Johnson & Christensen, (2014). The researcher already knew the learners with the necessary characteristics; hence purposeful sampling was chosen. **Learners who studied Life Sciences and Physical Sciences were chosen as the sample population.** The age groups of the learners are between 14 and 20 years. The learners are multilingual. They speak English as a first additional language and their different African languages, mostly Zulu then Sotho, Tswana, or Tsonga. The science classes from all seven schools were chosen to participate in the research. The seven schools had a total of 350 science learners.

1.7.3 Data Collection Instrumentation

Questionnaires were used to collect data from the learners. Questionnaires are data collection instruments filled out by research participants. The study used qualitative questionnaires (open-ended) and quantitative questionnaires (close-ended) that have predetermined response categories. Open-ended questions allow participants to respond in their own words. This will be useful since the researcher wants to know the participants' thoughts. Mixing open-ended and close-ended questions helps to obtain rich data about a phenomenon; hence, they were used in the research.

1.7.4 Data collection procedure

Data was collected from the seven high schools, as has been mentioned. Quantitative data was collected first. Questionnaires were administered once, in one session, collected and analysed. The researcher selected 10% of the study population to answer open-ended questions. In open-ended questions, participants are expected to respond in their own words. These are useful since the researcher wants to know the participants' thoughts, feelings, and beliefs.

1.7.5 Data Analysis and interpretation

The research employed a mixed-method study, which means there was qualitative and quantitative data to analyse and interpret. Regarding the quantitative method, solving data was done after all analysis had been completed.

1.7.6 Research ethics

All participants in the current research were informed about ethical issues. The research was approved by the University of South Africa's Ethics Committee on the 14th of November 2018. Participation in the study was not made compulsory, and participants were not forced to participate in the research. Research ethics refers to principles developed to guide and assist researchers in conducting ethical studies. Ethical studies call for the researcher to be always honest, trustworthy and do no harm to others. The researcher needs to respect people's rights, dignity, and diversity. The current researcher obtained prior consent from the respondents, known as informed consent. Informed consent means agreeing to participate in a study after being informed of its purpose, risks, benefits, procedures, and confidentiality issues. Data for the research was collected from learners, so a proper protocol obtained from the school was followed. Individuals were informed of their right to withdraw from the study if they wished, though there was not much risk involved in participating. The respondents were told that the information they provided would be confidential and private. The researcher obtained permission to conduct research, and the ethics certificate number is 2018/11/14/55095429/48/MC attached as Appendix A.

1.8 Planning of the research and chapter outline

The current research comprises five chapters as follows:

Chapter 1: Introduction and background to the research

The introduction gives a contextual background to the research, research problem statement, the research questions, rationale, purpose, aims and objectives of the study. There is a brief introduction to research methods, research approach, population and sampling, data collection instrumentation, data collection procedure, data analysis and interpretation and research ethics.

Chapter 2: Literature Review

The chapter contains a literature review used to locate the research and support discussions and arguments in the research. The theoretical and conceptual framework that underpinned the research is discussed. There will be an introduction, introducing EE worldwide, EE in South Africa, and the gap between EE knowledge and practice. Behaviour will also be addressed, solid waste, behavioural intention, solid waste knowledge, behavioural practices, and Grade 10. The research will be placed in context using the subtopics: the UN and sustainable

development, environmental impact, National Development Plan 2030, CAPS in Grade 10, the study area and challenges of EE in SA. Further discussion will be on factors affecting solid waste management, previous studies about behaviour and solid waste management and the theoretical framework in the research.

Chapter 3: Research Methodology

This chapter focuses on the research methods used in the study and will comprise of an introduction, research approach, population and sampling, data collection instrumentation, data collection procedure, data analysis and data interpretation.

Chapter 4: Data analysis and interpretation

Chapter 4 reports on the research findings. There is an introduction, presentation of results and discussion of conclusions which are the focus of the research.

Chapter 5: Conclusions and recommendations

The research is synthesised in this chapter. The discussion of research findings is the main focus of this chapter. It describes and interprets the significance of the findings. There are also conclusions, recommendations, and implications: implications for theory, limitations and recommendations.

1.9 Conclusion

The current research was undertaken following methodical and systematic procedures. A set of processes was used to obtain useful information about EE in high schools. The researcher followed each step from the research paradigm, data collection, and analysis and write up. Steps are important to control the research process and focus on studying without becoming sidetracked. The problem statement guided the research. The data was analysed to clarify and explain the existing state of EE in schools. The researcher believes that the study will provide a new look to EE through the angle of the reflection.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents literature focusing on main concepts used in the study, such as behaviour, solid waste, behavioural intention, solid waste knowledge, behavioural practices of Grade 10. It will describe the major issues surrounding the current study bringing in the history of EE and sustainable development from the world and scaling it down to what is happening in South Africa. Other significant issues include the UN and sustainable development, environmental impact, national development plan 2030, CAPS in Grade 10 and challenges of EE in SA. It will also discuss factors affecting solid waste management, previous studies about behaviour and solid waste management and the theoretical framework. The current research used research done in South Africa, other African countries and other parts of the world.

2.2 Behaviour

Researchers think about behaviour in different ways. Uher (2016) confirms this by stating, “behaviour is at the heart of many fields in the life sciences, social sciences and psychology but the behaviour is so pervasive and intrinsic to everyday life, researchers often seem to rely more on their intuitive understanding than on scientific definitions” (p.2). Biology disciplines strongly rely on observations and technology-based methods for measuring behaviour. Psychology and social science disciplines, by contrast, largely depend on assessment and self-report methods for studying behaviour, for example, questionnaires and interviews. Uher (2016) has devoted a whole article assessing different meanings of behaviour in different disciplines related to language. He quoted several researchers that have defined behaviour in their field of study. For biology discipline: Levitis et al. (2009), philosopher and historian: Pichot (1999) and others. The most relevant definition to the current research is given by a philosopher and historian Pichot (1999). He defined behaviour as “the organised entirety of the relationships of the living being and its environment” (p.5). A psychologist specialising in behavioural observation Fassnacht (2000), defined behaviour as “those ongoing events of an organism or emanating from an organism that can be externally perceived” (p.6). The current research follows psychology and social science disciplines because these rely on questionnaires and interviews to study behaviour. Hence, the current research also relied on questionnaires and interviews to study behaviour. The definitions from psychologists also resonate with the

current study which focuses on studying observable human behaviour and behaviour about the environment.

The Britannica (2012) also has a relevant definition since it defines behaviour as observable activity in a human, an aggregate of responses to stimuli. Behaviour refers to the array of every physical action and observable emotion in an individual. Uher (2016) says behaviour is influenced by thoughts, feelings, and social norms and reveals attitudes and values. Behaviour results from many factors; therefore, it can be complex to understand. The discussion to follow in the research includes the relationship between all these factors and how they consequently influence behaviour. The current research will look at behaviour as a person's actions and conduct.

Furthermore, environmental and social scientists have developed terminology that describes the environment's behaviour; they coin it "pre-environmental behaviours (PEB)". Taylor and Francis (2013) define PEB as behaviour that consciously seeks to minimise the negative impact of one's actions on the natural and built world, such as reducing resource wastage, disposal of toxic substances, and reducing the daily production of waste. Hines et al. (1987) call such behaviour as environmental responsible behaviour (ERB). Hungerford and Trudi (1999) also refer to such behaviour as Responsible Environmental Behaviour (REB). The word eco-friendly is also used. The following terms can be used as equivalents for pro-environmental behavior: "1, environment-protective behaviour"², "environment-preserving behaviour"³, "environmentally responsible behaviour"⁴ by Kaiser et al., (1999), "ecological behaviour"⁵ by Axelrod & Lehman, (1993); Kaiser et al., (1999), "sustainable behaviour", Clayton & Myers (2009)(as cited in Krajhanzil, 2010,p 253).

PEB stems from environmental concern (EC), assuming that if people are concerned with the environment, they act appropriately; hence, we have PEB. Taylor and Francis (2013) assert that EC is strongly associated with PEB. It is this kind of behaviour that is explored throughout the current research. The term used throughout the study is Environmental Responsible Behaviour (ERB) due to its relevance to the study and ease of understanding.

2.3 Solid Waste

One can start by defining waste in general. The Department of Environmental Affairs (2012) defines waste as any discarded or abandoned material. Waste can be solid, liquid or semi-solid. Solid waste includes the following: waste tyres, scrap metal, latex paints, furniture and toys, garbage, appliances and vehicle parts, oil and anti-freeze empty aerosol cans, paint cans and compressed gas cylinders. There is also construction and demolition debris and asbestos. These are all examples of solid waste. The focus of the research is on solid waste.

Solid waste may be regarded as any rejected material resulting from domestic activity and industrial operations; if these materials can't be used, they are disposed of Sridhar (1998). According to Palabiyik 2001, Sridhar 1998 (both cited in Meydan, 2011, p.73), solid waste can be classified into harmful or dangerous and harmless waste. DEA (2017) also state the two categories, general waste and hazardous waste. Harmless or general waste can become harmful when care is not taken to dispose of it correctly. The authors classify harmless waste as kitchen and food waste, cardboard, paper, ash, metal, glass, plastic, and construction wastes. They explain that the longer solid waste stays in nature, the more harm it causes to nature. Solid waste causes the pollution of water and soil such that living things in water and land suffer as a result. The sources of solid waste include residential, commercial, institutional, and industrial activities Meydan (2011).

The current research will focus on institutional waste identified by Meydan (2011) since high schools are educational institutions. Waste for the present study is defined as discarded or abandoned materials. Solid waste can also be described as litter, especially in schools. Littering in schools degrade the environment. Every school generates waste from routine activities such as classwork, sweeping, serving of food, and grass cutting. The common types of solid wastes found in schools normally include paper, grass, nylon (in pure water bags and biscuits, lollipops, ice cream, and sweet or candy wrappers), sugar cane, maize or corn cobs, and groundnut shells. The Environmental Quarterly Newspaper March (2019) published by the DEA specifies solid waste produced by schools as papers, cardboards, chip bags, magazines, newspapers (mainly distributed by local newspapers), plastics; bags, lolli wrappers, containers and water and juice bottles, metal; food and drink cans, polystyrene; white take away chips and food containers and food scraps from the schools' kitchens. According to Ana et al. (2011),

their study reports that papers and plastics were the most frequently generated wastes around the school campus.

Closely associated with solid waste is solid waste management. Vivek (2013) defines solid waste management as a science that addresses the logistics, environmental impact, social responsibility, and cost of an organisations' waste disposal. He further states that solid Waste Management (SWM) has three basic components: collection, transportation, and disposal. The current research will deal with waste generated in a school setting as Vivek (2013) also asserts that proper management of waste is the most important aspect.

2.4 Behavioural Intention

Behaviour is defined by Ajzen (1991) as an individual's observable response to a given situation concerning a given target. Behavioural intentions (BI) refer to a person's perceived likelihood or subjective probability of engaging in a particular behaviour. Behavioural intentions indicate an individual's readiness to perform a given task. Ajzen (1991) used behavioural intention to explain that behaviour can be predicted and measured. Behavioural intention is guided by behavioural beliefs, normative beliefs, and control beliefs. Behavioural beliefs are a person's beliefs about the likely consequences of performing a behaviour Ajzen (2006). When high-school students believe that adopting environmentally sustainable behaviours mainly produce positive outcomes, their attitude towards these behaviours will be favorable. Conversely, if they associate PEB with mainly negative consequences, their attitude will be unfavorable De Leeuw et al. (2015).

Normative beliefs are an individual's perception of normative social pressures. An example is provided by the Wildlife Society of South Africa (WESSA) that people are likely to litter in areas already full of litter. Littered environments reflect social norms. People see the dirty place and think everyone is doing it, throwing litter on the ground. Generally, positive normative beliefs are formed when people see others taking care of the environment.

Control beliefs mean an individual's belief about the presence of factors that may facilitate or hinder performance. An example is when an individual intends to discard waste but does not find waste bins to throw in the waste, the person may throw it on the ground that means he

exhibited unacceptable behaviour. This means behavioural beliefs can be hindered by constraints. In the current research such beliefs will be investigated to see if learners are hindered by such to neglect the environment.

Normative beliefs, control beliefs, and behavioural beliefs all produce behavioural intentions, which have observable behaviour. The current research will find out how the three types of views discussed above influence the behavioural intention of Grade 10 learners towards solid waste management. Loubser (2008) states that it is inevitable that cultures, values, attitudes, actions, and the environment be correlated in interdependent ways to remedy environmental degradation.

2.5 Solid waste management knowledge

We live in times that require people to be knowledgeable; politicians call this a knowledge society Young, (2008). When people have knowledge, they are empowered to make informed decisions. The main factor for EE to be included in the South African curriculum was that citizens need to have knowledge about the environment to address environmental and sustainability issues faced by the country Sonqwaru (2012).

The definition of knowledge as found in the Oxford dictionary is stated as: “a familiarity with someone or something, which can include facts, information, descriptions, or skills acquired through experience or education.” It can refer to the theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical knowledge of a subject); it can be more or less formal or systematic” Oxford Dictionary (2013).

Muderrisoglu and Altanlar (2011) have confirmed that EE is an important tool to promote awareness and knowledge on various environmental issues. EE changes people’s attitudes, generates critical thinking, and influences actions towards achieving sustainable development Van Niekerk (2014). Knowledge plays a significant role in determining a person’s understanding of environmental issues and environmental awareness that leads to practice.

Irwin and Lotz-Sisitka (2004) trace the development of EE from the mid-1970s up until post-1994 in South Africa. They point out that education, in general, consisted of a curriculum that empowered local people to understand their natural resources to develop skills to adapt to their

natural environment and benefit from it. The Ahmedabad Declaration, drafted in the UN Decade of Education for Sustainable Development in 2007, stated that education systems should use pedagogies that integrate EE and ESD principles. They needed to include transformative learning approaches to enhance progression in environmental learning. As a result, aspects of Environmental Education have been written into the NCS and are included in some learning areas and subjects. For example, Life Orientation subject exposes learners to the work environment and select careers to promote sustainable living. Social Sciences, Geography, Science has most content focused on the environment: Economic and Management Sciences highlights the need for learners to take note of their environment as consumers and the responsibility of business towards the environment in the local and international context.

Irwin and Lotz-Sisitka (2004) add that the National Environmental Education Project for General Education and Training (NEEP-GET) was established in 2001. The project's purpose was to support teachers in developing lesson plans for environmental learning to encourage learners to explore the complexity of environmental issues in their contexts. EE knowledge is important in developing students who are environmentally responsible. EE is an integral part of raising environmental awareness in children. Children should be educated to improve their knowledge to make informed and responsible decisions as adults Littlejohn, (2008).

Palmberg and Kuru (2000) discovered from their research that environmental knowledge and attitudes were important factors for taking environmental responsibility, (as cited by Van Niekerk 2014, p.57). Solid waste has already been defined as a range of garbage arising from human activities discarded as unwanted and useless. The Department of Environmental Affairs (2018) confirms that solid waste must be managed systematically to ensure environmental best practices. Then we need to find out what kind of knowledge high school learners have about managing waste. This suggests that foundational knowledge of key concepts and principles underpinning ecological processes is important. The knowledge helps address environmental issues by developing solutions for the issues, Sonqgwaru (2012). In summary, Sethusha and Lumadi (2013) assert four main knowledge strands students must know in EE i.e., environmental protection, pollution, conservation, and recycling.

2.6 Behavioural Practices

Practice means the actual application or use of an idea, belief, or method instead of theories about such application or use (Oxford Dictionary, 2013). Therefore, environmental responsible behaviour practice can be understood as the application of environmental responsible behavioural ideas and knowledge in real-life circumstances. In an ideal world, all people on earth should demonstrate high levels of good practices and responsibility regarding environmental and waste management. However, it is imperative to translate all knowledge, awareness, and attitude into practice. Without adequate practice, actual results will not solve complex waste management problems, Desa et al. (2011). There are various opinions on the role of school students in sustainable development, but in most cases, students are identified as agents of change, future custodians of the planet, future decision-makers, developers and managers of society's institutions and the environment Percy-Smith and Burns (2010). The development of children into responsible future citizens has recently become a topic of interest, Van Niekerk (2014). This assertion leads to the belief that students or young adults are often instrumental in bringing about change in society.

Studies have shown that school students generally have poor waste management practices worldwide. Several papers have investigated the link between poor waste management practice and personal factors such as awareness, attitude, and knowledge, Desa et al. (2010). The main aim is to turn the philosophy of environmental studies into good waste management practice, which will lead to sustainable development. This is also critical to be done in South Africa. Children's awareness, knowledge and training in waste management can contribute to improved waste management, improved education and evidently to a more sustainable future, Van Nierk (2014).

2.7 Grade 10

Schooling in South Africa starts from Grade 0 (the reception year known as grade R) to Grade 12 (known as matric). Firstly, there is the early childhood development and foundation phase (grades R to 3). Grades 1 to 9 are compulsory and classified as General Education and Training (GET). Grades 10 to 12 are referred to as the Further Education and Training (FET) phase, NCS (2011). Grade 10, in the South Africa school system falls under the secondary education phase known as Further Education and Training. The General Education and Training (GET) programme in South Africa provides Environmental Education (EE) inclusion in the school

curriculum. It is stated, for example, in the learning outcomes in Life Orientation that environmental issues must be covered in teaching and learning. According to the Revised National Curriculum Statement (RNCS), assessment standards in this learning area must cover participatory activities related to problem-solving as far as environmental issues are concerned Department of Education, (2002). Students in this grade have spent at least nine years of schooling, indicating that they may have accumulated considerable knowledge as far as EE is concerned.

In 2006 the National Curriculum Statement (NCS) for Grades 10–12 was implemented, and the science subject name changed from Biology to Life Sciences, Sonqwaru (2012). The NCS focused on developing skills, construction of knowledge and the relationship between science and the environment through the eye of the society. In 2012 the Curriculum and Assessment Policy Statement (CAPS), a content and assessment referenced curriculum, was implemented in Grade 10.

Grade 10 is the entry grade for the FET phase, and that is where learners make subject choices according to the careers they will pursue at the tertiary level. Most schools in the country offer one subject package for sciences which include the core subjects: English, Life Orientation, First additional Language and Mathematics; then the other three subjects can be Life Science, Physical Science, Geography and Agricultural Science. The subject packages contain most topics directly related to environmental education. South Africa makes provision for the inclusion of Environmental Education (EE) in all subjects, but the Life Science group is exposed to more knowledge about the environment. Life Science is the scientific study of living things and their interactions with them and their environments. Goals of Life Sciences include the following: an understanding of how humans have impacted negatively on the environment and organisms living in it; an awareness of what it means to be a responsible citizen in terms of the environment and lifestyle choices they make that impact the environment, CAPS (2012). These expectations indicate a more environmental discourse within the Life Sciences. This is why the current research will focus on this group of learners to assess their behavioural intentions towards the environment.

2.8 Context of the study

The current research about EE has to be put in the relevant context to understand the magnitude of environmental issues in South Africa and the world. This will include the roots of EE, the global intervention in EE through the United Nations, EE in the country and its policy in NDP 2030, CAPS and challenges in the schooling community.

2.8.1 The United Nations and Sustainable Development

Environmental education has its roots in the 19th century when the Industrial Revolution caused an unprecedented alienation of man from nature and the disruption of Western cultural milieu Keith Wheeler, 1975 (as cited in Lotz-sisitka, 2014). The industrial revolution in the production and manufacture of consumable goods increased (from Britain, Europe, the United States, and parts of Asia) and placed a demand for natural resources. The world rapidly became engulfed with mass production, widespread squalor, appalling health conditions, social ills, and environmental destruction, Lotz-sisitka (2014). Critics of the environmental destruction came up, but the prominent one was a Scottish professor (1854-1933) who dedicated himself to improving education and the environment. The decades after the second world-war from 1945, the first international organisations concerned with the environment were established, such as IUCN, World Wildlife Fund (WWF), United Nations Educational, Scientific and Cultural Organisation (UNESCO).

A milestone in the development of EE on a global scale was the 1972 United Nations conference about the Human Environment held in Stockholm to discuss matters of environmental concern (Lotz-sisitka, 2014). This conference led to the establishment of the United Nations Environment Programme (UNEP), the first UN agency to establish “Environmental Education”. UNEP, together with UNESCO, organised the first international workshop on environmental education in Belgrade, Yugoslavia, in 1975. Tbilisi conference followed in 1977 in the USSR, lead to the establishment of the 12 Tbilisi principles of Environmental Education. The principles were reaffirmed in the 1987 International conference held in Moscow. The United Nations Conference on environment and development, also called Rio Earth Summit, was again held in 1992 and re-affirmed that environmental education is concerned with social, political, economic, and ecological matters Lotz-sisitka (2014).

Among the 12 Tbilisi principles, three relate directly to the current research. Examples are:

- EE to be a continuous lifelong process, beginning at the preschool level and continuing through all formal and non-formal stages.
- To enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences.
- To help learners discover the symptoms and real causes of environmental problems.

Embedded in the 1992 conference report is Agenda 21, which focuses on sustainable development. Sustainable development, as described by the Bruntland Report (WCED, 1987) (as cited in Loubser 2014, p. 43), is the development that meets the needs of the present generation without compromising the ability of future generations to meet their needs. Education for sustainability has developed in recent years to provide a sense of reorientation and focus for environmental education, Lotz-sisitka (2014). The term sustainable development has met with much criticism. However, Lotz argues that it does not mean that it is not a useful term; there is a relationship between sustainable development and environmental education. She asserts sustainability is a polysemous concept (has different meanings) and must be celebrated continuously and re-clarified within the various environmental education sites and discourses. Education is at the heart of sustainable development (UN1992: Agenda 21 2000, 2002). Sustainable development has to consider social, environmental, and economic issues.

2.8.2 Environmental Impact

The term environment can mean different things to different people; hence it is necessary to define it. The White paper 1998 defines the word environment as the biosphere where people and other organisms live. The environment consists of renewable and non-renewable natural resources such as air, water (fresh and marine), land and all forms of life, natural ecosystems and habitats and ecosystems, habitats and spatial surroundings modified or constructed by people, including urbanised, agricultural and rural areas. The environment can be classified into different categories. Natural environments are composed of water, air, soil, sunlight, and all life forms. Man-made environments consist of products or materials from human creation such as roads, houses, and factories, among others, Singsewo and Tritip (2016). Cultural and social environments are forms of the environment brought about via human productivity. Each type of environment passes interrelated effects to one another.

- People are part of the environment and are at the center of concerns for its sustainability. Culture, economic considerations, social systems, politics, and value systems determine the following:
- interaction between people and natural ecosystems and habitats, use of natural resources and values and meanings that people attach to life forms, ecological systems, physical and cultural landscapes, and places.

Environmental impact means possible adverse effects caused by development, industrial or infrastructural projects, or the release of a substance into the environment, Handbook 2009. These processes threaten the sustainability of life, Goudie (2005). Humans are the only living beings responsible for destroying the environment. Humans exploit natural resources beyond the limits of safety due to overpopulation, unlimited desire for luxury, and heavy dependence on technology, Goudie (2005). Humans affect the environment by pollution, non-vegetable diet, technology, deforestation, excess use of commodities, and wastage of water, power, petroleum, and others.

The 21st century which also falls under the 3rd millennium is characterised by the serious environmental crisis. . Like all other countries of the world, South Africa is confronted by the same nexus of environmental crisis. The ultimate drivers of this crisis are rapid population growth, high consumption, pollution, waste disposal, climate change, the pressure exerted on natural resources and industrialisation Loubser (2005). Le Roux (2014) also links these crises to social and cultural changes associated with modern way of living and modern world views. The current environmental situation has been worsened by the need for economic growth and job creation, and self-sufficiency. Our population is growing at an alarming rate and exerts greater demand on food, energy, land, and water

2.8.3 National Development Plan 2030

South Africa has non-renewable mineral resources and natural resources, including soil, water, oceans, biodiversity, sunshine, and a long coastline. Since the 19th century, the country has exploited its mineral wealth with little or no regard for the environment (National Development Plan (NDP 2030). However, the country has taken a turn in committing itself to care for the environment through the National Development Plan 2030, Agenda for Sustainable Development. It is further stated in the NDP plan 2030, that South Africa needs to protect the

natural environment in all respects, leaving subsequent generations with at least an endowment of at least equal value. This shows that South Africa is committed to sustainability. Outcome 10 in the plan also states that an absolute reduction in the total waste disposal volume each year is needed. South Africa is a responsible global player as far as caring for the environment is concerned.

The Environmental Newsletter, the News Quarterly captured the launch of the Green Campaign in March 2019 by President Cyril Ramaphosa. This aim of the campaign was to mobilise all South Africans to become environmentally conscious and act together in partnership with government to solve global and national environmental challenges. Various provinces heeded President Ramaphosa's call and engaged in clean-up activities across the country. These provinces included the Eastern Cape, Gauteng, and Kwazulu-Natal. President Ramaphosa unfolded the cleaning puppet named Billy Bin and said it would be a constant reminder to all South Africans that to keep South Africa clean is their responsibility.

2.9 Curriculum and Assessment Policy Statement

It is important to understand how environmental education came to be integrated in the South African national school curriculum. According to Irwin and Lotz-Sisitka (2014), the emergence of EE in South Africa was influenced by the Belgrade Charter of 1975 and the 1977 Tbilisi Principles, as previously mentioned in the research. South African formal curriculum focused on conservation of natural resources and the principles of ecology. South Africa ultimately had its first international conference on environmental education in 1982 in Natal, which resulted in establishing the Environmental Education Association of Southern Africa (EEASA). Subsequently, certain institutions of higher learning in the late 1980s and early 1990s established Environmental Education courses and programmes for teachers in their Education faculties Lotz-Sisitka (2014).

In 1992, during the transition period in South Africa, EEASA coordinated a Policies and Procedures survey in response to a call to develop an education curriculum policy within formal education. This initiative resulted in the establishment of the Environmental Education Policy Initiative (EEPI), which evolved to become the Environmental Education Curriculum Initiative (EECI). In 1994, there was the tabling of a socio-economic policy framework, the Reconstruction and Development Programme (RDP 1996) by the ANC. It was said that the

government must work towards equitable access to natural resources by ensuring that all South African citizens, present and future, have the right to a decent quality of life through sustainable use of resources. This was enshrined in the South African Constitution, in the Bill of Rights (RDP 1996), which states that everyone has the right to an environment that is not harmful to their health or well-being. Everyone has a right to have the environment protected, for the benefit of the present and future generations, through reasonable legislation and other measures that prevent pollution and ecological degradation and promote conservation; secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

In 1995 the White Paper on Education and Training for RSA was released. The Paper presented the framework for transforming the Education and Training system in South Africa. A principle in this White Paper notes that:

Environmental education, involving an interdisciplinary, integrated and active approach to learning, must be a vital element of all levels and programmes of the education and training system to create environmentally literate and engaged citizens and ensure that all South Africans, present and future, enjoy a decent quality of life through the sustainable use of resources (p. 18).

The environmental educators in the EECI board participated in development of the first outcomes-based education, Curriculum 2005 (C2005) and a revised National Curriculum Statement (NCS). This was done to integrate environmental education into the school curriculum. In C2005, the environment was a phase organiser in all the learning areas. Having environmental education as a phase organiser instead of making it a subject in the curriculum meant that all the teachers in the education system would have to engage with it; that is, teachers would have to consider an environmental focus in their teaching Irwin and Lotz-Sisitka (2014).

The integration of environmental education in the South African curriculum was influenced by the need to produce citizens who would have knowledge about the environment and who would be able to address environmental and sustainability issues faced by the country. The Education Minister established a national curriculum project for environmental education with the

revision of C2005 to NCS Irwin and Lotz-Sisitka, (2014). A project called NEEP-GET was established in 2001 to assist teachers with developing lesson plans for environmental education in order to encourage learners to explore the complexity of environmental issues in their own contexts. One of the principles underpinning the NCS curriculum is recognising the relationship among four aspects: social justice, a healthy environment, human rights, and inclusivity. Environmental education is now an integral part of all the South African national curriculum subjects Sonqwaru (2012). In 2012, the Curriculum and Assessment Policy Statement (CAPS), a content and assessment referenced curriculum, was implemented for Grade 10 learners. CAPS was implemented in Grade 10 in 2012 and were examined in the National Senior Certificate for the first time in 2014, Sonqwaru (2012) state that when learners do not have content knowledge, they cannot develop a systematic understanding of ideas. They, therefore, maintain that learners should acquire high-level content knowledge and high-order problem-solving skills.

As mentioned, CAPS was implemented in Grade 10 for the first time in 2012. The subject name changed from Biology to Life Sciences. The NCS focused on developing skills, construction of knowledge and the relationship between science, society, and the environment. Because of the under specification of the content to be taught in NCS, just three years later in 2009, it was rewritten as the New Content Framework (NCF) which provided much more detail on the content that would be covered in 2010 Sonqwaru (2012).

The Life Sciences content framework is organised according to four knowledge areas called strands, South Africa, DoBE, 2011, (p. 9-10). Knowledge strands are expected to be developed progressively over the three years of Further Education and Training band.

These knowledge strands are:

- Knowledge Strand 1: Life at the Molecular, Cellular and Tissue Level.
- Knowledge Strand 2: Life Processes in Plants and Animals.
- Knowledge Strand 3: Environmental Studies.
- Knowledge Strand 4: Diversity, Change and Continuity.

The current research focuses on strand 3, Environmental Studies. The aims of Life Sciences also resonate well with the EE expectations. There are three broad subject-specific aims in Life Sciences which relate to the purposes of learning science. These are:

- Specific Aim 1, which relates to knowing the subject content ('theory').
- Specific Aim 2, which relates to doing science or practical work and investigations;
- Specific Aim 3, which relates to understanding the applications of Life Sciences in everyday life.

Aim 1 and 2 are most relevant to EE, which requires that we acquire knowledge to be applied in our everyday living, South Africa DBE, (2011). EE is indeed an integral part of the Curriculum in Life Sciences, as shown in the policy documents of the country. One, therefore, expects that students should have the necessary knowledge and skills as far as EE is concerned. The expectation applies to my study area, Vosloorus where students do Life Sciences. The improper disposal of solid waste is one of the most significant challenges facing developing countries Kofoworola, 2007 (as cited in Agwu 2012, p. 85). This is a problem recognised by all nations at the 1992 Conference on Environment and Development and is regarded as a significant barrier in the path towards sustainability (UNCED, 1992).

2.10 The study area: Vosloorus

Vosloorus is a large township in the South of Boksburg and just East of Katlehong in the Ekurhuleni region of Gauteng, South Africa. It was established in 1963, when Black Africans were removed from Stirtonville because it was considered by the government to be too close to a white town. Stirtonville was renamed Reiger Park and has become home to Boksburg's coloured community. A local authority was established in 1983 when Vosloorus was given full municipal status. Vosloorus covers an area of 32.1 km². According to the 2011 census, the area's total population is 163 216. Different languages spoken are: Zulu 76 335 people, Sotho 29 339, Xhosa 13 414 and Northern Sotho 11 853. Other languages include Tsonga, Tswana, English, Southern Ndebele, Venda, Sign Language, and Afrikaans.

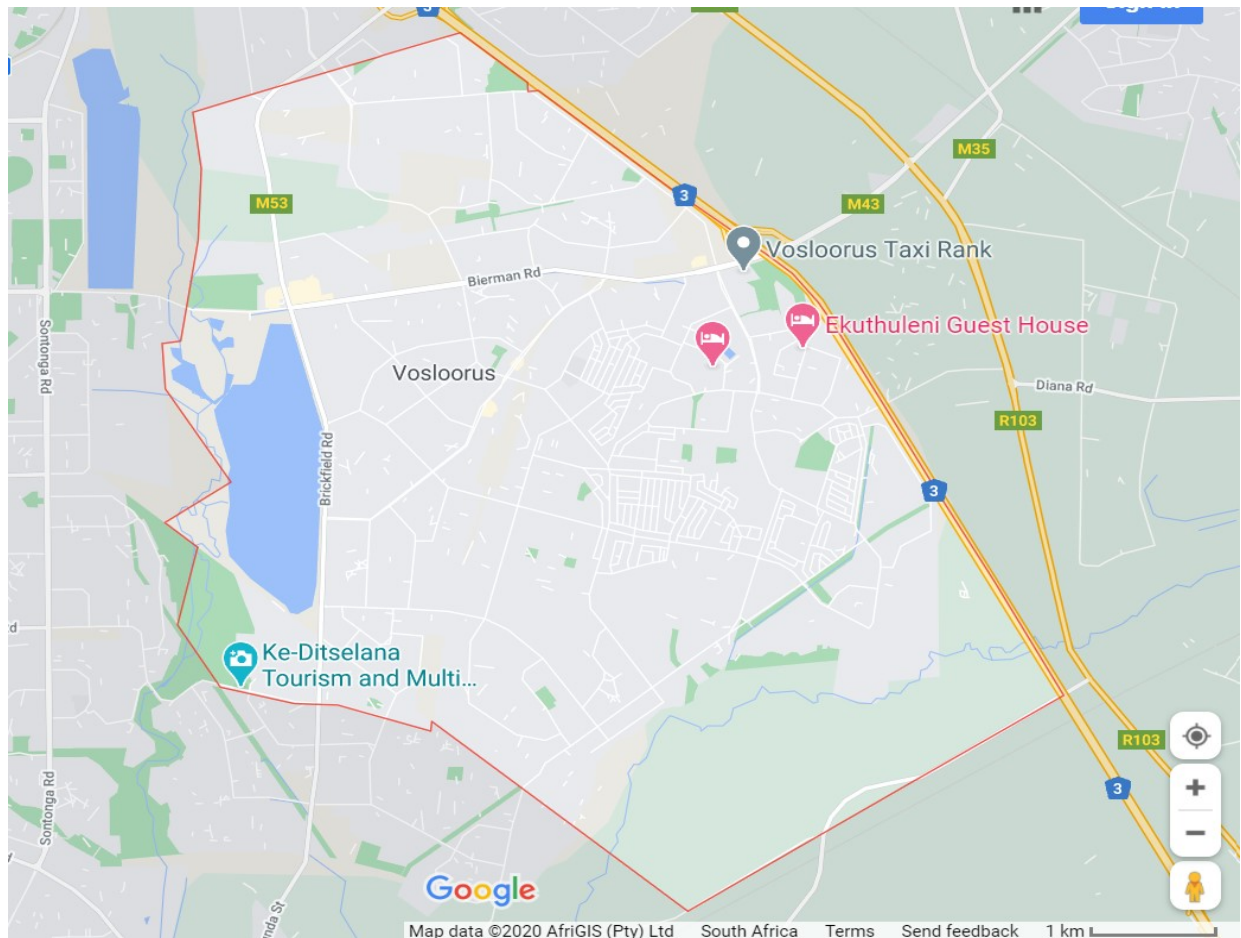


Figure 2.1 Map showing Vosloorus area

The best waste management companies in Vosloorus control the whole waste processing, from waste collection to transportation and garbage disposal. There are different types of waste management being currently carried out in Vosloorus. For example:

Landfills: the waste is buried into the ground but previously treated to avoid odours and dangers. It is one of the most contaminant way of garbage disposal and nowadays there is a lack of space.

Combustion: it helps to reduce the need for landfills. Solid waste materials are burned at high temperatures, becoming gases or heat.

Recycling: People collect bottles, plastic containers to be sold to a company in the area, then the company recycles in another place, except in Vosloorus.

2.11 Challenges of EE in South Africa

Implementing EE has come with its challenges. These include teacher preparedness, EE curriculum and learners themselves. Teacher preparation and improvement are vital issues that should be urgently addressed, Buthelezi (2015). The Norms and Standards of Teachers National Education Policy, 1996: A-47 in Sonqwaru (2012) consider educators to be the mediators of learning, the translators and planners of learning projects and materials, pioneers, chairmen and chiefs, researchers, deep-rooted learners, scientists, individuals from the group, residents and ministers, assessors and learning area specialists.

When teachers are to implement a new curriculum, it has been discovered that they are relegated to ‘once-off’, ‘one size fits all’ workshops that focus on how teachers should follow the official requirements in implementing the new curriculum (Bantwini, 2009). Moreover, Ball and Cohen (1999) add that these workshops fail to engage teachers in conceptual issues like the pedagogy and knowledge that underpins the curriculum reform and new assessment requirements. The workshops are of little value when teachers are not considered, as teachers not only implement a curriculum but also interpret it. Hence, working with teachers and understanding teaching should be a key agenda in education, Sonqwaru (2012).

Literature on professional development criticises the once-off in-service workshops that characterise many teacher training initiatives because they expose teachers to the new curriculum changes without further meaningful support and training. These then have minimal impact on improving teachers’ current practices Bertram (2011), Sonqwaru (2012). Du Toit and Sguazzin (2000) explain that previous studies show that the ‘cascade model’ of transferring curriculum reform in preparing teachers to implement a new curriculum is inadequate to meet the demands of a changing curriculum.

When looking at the EE curriculum, Most EE programmes are still designed to provide knowledge (information) about the environment and increase environmental awareness. There are a few who attempt to promote pro-environmental attitudes and develop or improve the behavioural intentions of learners toward responsible environmental behavior, Hungerford and Trudy (1999). It is imperative that EE programmes move beyond the mere knowledge production and raising awareness and include ways of increasing the intention and desire of learners to act in environmentally responsible ways, and equip them with the necessary skills

and problem-solving abilities to actively engage in environmentally responsible behaviour Hungerford and Trudi, 1999 (as cited in Adams, 2003,p. 13).

Regarding learners, Adams (2003) states that despite the positive environmental perceptions and attitudes experienced by many learners most of them would not necessarily engage in environmentally responsible behaviour. Various reasons are given why an environmentally concerned person won't extend the concern and feelings to actual behaviour. Various studies from different fields reported factors that contribute to littering in schools. Ajaegbo et al. (2012) mention lack of concern and utterance of statements like someone is paid to clean up, insufficient litter bins Malepa (2014). Msezane and Mudau (2014) mention negligence, ignorance, lack of respect, lack of monitoring and proper knowledge about the environment, absence of litter bins, and someone paid to clean up ; lack of punishment and peer influence Doan and Jablonski (2012). Ifegbesan (2010) found that secondary school learners were aware of waste problems in their school compounds but possessed poor waste management practices.

Learners blame other people saying discipline must come from higher authority. Gurevitz (2000) believes that contexts where learners are taught formal knowledge not applicable to everyday life, will not allow them to become citizens who can reflect these values in their personal behaviour. Learners must be action competent as stated by Barker (2011). The researcher's findings differ from one situation to another but what is common among them is that school littering continues to be a problem locally and globally.

In conclusion, Loubser (2008) asserts that the effectiveness of EE depends on the entire school community being aware of and actively contributing to the careful use of the environment. Much of the focus in EE in schools involves developing knowledge about the environment. It is essential that, besides developing understanding, the education process should guide the development of attitudes and values which influence positive behaviour and lifestyles.

2.12 Factors affecting solid waste management

Various studies have indicated that different factors affect how waste is managed worldwide (Vivek et al., 2013); Majed et al., (2012); Singsewo and Tritip, (2016). Singsewo and Tritip (2016) highlighted that students' attitudes affect how they manage waste. Researchers such as Mathe (2014), McAllister (2015), Mutisya and Barker (2011) have attempted to discuss the

factors influencing attitudes towards the environment by focusing on demographic variables such as level of education, age, gender, income, and place of residence. However, these researchers have not established a strong relationship between demographic variables and environmental attitudes. Results have been inconsistent and even are contradictory regarding most of these variables. However, the current study will focus on age in exploring the pro-environmental attitudes among high school students.

One of the factors is the level of education. When we look at education in general, Ferreira et al. (2006) indicate that education is the backbone in the quest for sustainability. He further asserts that we will struggle to transition from wasting resources to sustainability without education. This assertion warrants a deeper look at the factor of education. Furthermore, he echo's that we need to do everything we can to transform our political, economic, and social systems into more sustainable structures. Some studies indicate that individuals with high academic achievement tend to be more environmentally concerned than those with low academic achievement Adams (2003). Also, Adams (2003) found that people with matric or post-matric qualifications showed a more caring attitude towards the environment than people with lower qualifications. A study conducted by Mathe (2014) indicates that those who have completed their tertiary level of education declared that the availability of waste bins is an absolute necessity, which suggests that they care for the environment and have environmentally responsible behaviours.

Some findings also clash with what is previously reported. Mathe (2014) states that the percentage differences between those with tertiary education and those who never went to school are very close regarding littering on the street. The study by Al-Khatib et al. (2007) concurs with the results of the previous research in that education seemed not to influence littering. Those that were illiterate, and who were in elementary or secondary school indicated that they “never litter on streets”, whilst those that completed tertiary institution indicated that they litter “for absolute necessity”, which suggests that they litter if they do not find waste bins. That is why the researchers say results have been inconsistent and even contradictory regarding most of these variables.

The intention behind including environmental and sustainability concepts in the Life Sciences content knowledge is to enable learners to engage in conversations in society relating to

sustainable development issues. These are ‘valid inclusions’ within this knowledge-focused debate; and form part of legitimate societal conversations Lotz-Sisika (2014). From these perspectives, it is evident that education is still necessary to inculcate in students a fundamental and appropriate culture of caring for the environment. Frankfurt (2018) is of the view that environmental knowledge is deemed a basis for environmental behaviour. Sensual experiences alone do not lead to an understanding of ecological contexts. Environmental attitudes alone seem to be a minor predictor for pro-environmental behaviour.

Some researchers have tackled the differences in age in solid waste management. Howell and Laska (1992) found that younger people are more concerned about environmental problems than older people. Mathe (2014) quotes the study conducted by Al-Khatib et al. (2007) and found that those aged 15-20, agreed to litter. These studies prove that other factors could have been involved in promoting an attitude of littering. However, several studies have stressed that age is negatively correlated with the willingness to contribute to additional environmental protection Whitehead (1991); Carlsson and Johansson-Stenman (2000). These studies show that the influence of age on the current research is not generalisable.

The young respondents in Mathe’s study (2014) reported that they only littered if the bins were not available; this means that young people are not committed to caring for the environment. Age strongly influenced littering on the street, suggesting that young adults should be targeted Mathe (2014). It was found that there are serious drawbacks in proper waste management among lower secondary school students compared with high school students. Another significant finding is that 90% of the participants responded that they see garbage on the roadside while coming to school, which highlights the filthy condition of the roads and the severity of improper waste management Vivek (2013). Nevertheless, despite continuous efforts to promote commitment to maintaining a sustainable environment among the youth in Malaysia, their engagement in sustainable practice is below expectation (Ahmad et al., 2012). In a study done by Singsewo and Tritip (2016), gender and age were used as independent variables, while the dependent variables were knowledge, awareness, and participation. It was revealed that after the introduction of the solid waste management curriculum, the students of different genders and ages did not have different levels of knowledge, awareness, or participation in solid waste management processes, meaning that gender and age did not affect the three aspects investigated.

When gender is investigated, females were consistently shown to have higher environmentally conscious attitudes than men. A study conducted by Al-Khatib et al. (2009) explicitly indicated that the percentage of females who claimed to never litter (41%) was almost double that for males (22%). This, therefore, clearly indicates that males litter more than females. Adeolu (2014) asserts that the common reason for gender differences is the different socialisation patterns between boys and girls. Girls are often made to carry out the sweeping and cleaning activities; they are called upon more than their male counterparts to perform maintenance tasks at home or in schools. Also, Agwu (2012) confirms that female residents have positive solid waste management practices than their male counterparts. This is possible as females do most of the cleaning and sweeping activities in many households in developing countries.

Other researchers indicate different findings. A report by Eagle and Demare's (2000) on gender showed that girls scored significantly higher moral attitude scores than boys; there was no significant difference in the ecologic attitude scores of boys and girls. Kellert (1985) found no gender difference in the attitudes for U.S. children in the second grade. Eagles and Muffitt's (1990) study in Agwu (2012) found no attitude differences between the sexes in Canadian students in 6th, 7th, and 8th grade.

Panth (2015) discovered that in India, girls have more environmental awareness than boys. Thus, we can say that based on gender, girls have more environmental awareness than boys. They have more knowledge of social activities and take part in social works. Al-Rabaani and Melkhafi (2009) showed that female students showed more positive attitudes than males.

It was further found that social class, income, and place of residence are somewhat related. Most of the time, people of higher income stay at a similar type of residence, so these will be viewed together. Concerning social class, Lyons and Breakwell's (1994) study shows that the middle and upper classes were more concerned about the environment than the lower classes. Learners from higher socioeconomic backgrounds were more environmentally concerned than learners from lower socio-economic backgrounds (Adams, 2003). They also believe that urban people are more positive in their environment than rural people.

From the study conducted in the Palestinian community by Al-Khatib et al. (2009), low-income earners said they never litter (0–1000 NIS). High-income earners (2001–4000 NIS) said they litter out of necessity. However, this contradicts common knowledge that high earners would litter less because they are the most educated. The finding could be study-specific and should not be generalised. Mathe (2014) found that most high-income earners indicated that they do not litter at all compared to other economic groups, which means that the wealthier you are, the more environmentally conscious you are likely to be. The middle-income earners also indicated that they litter more than other economic groups. Therefore, the respondent's economic status influences littering. However, in some cases, the results are not very conclusive. Gender, monthly income, age, and religious conviction were all significant effects on issues regarding littering.

2.13 Previous studies about behaviour and solid waste management

There is strong evidence from international literature that awareness and attitudes towards the generation of waste and management are critical to support the human race's endeavors to address the current waste management challenge Van Niekerk (2014). The study found that the development of environmental literacy in students in ecology population, pollution, culture, and natural resources should be addressed more pertinently in the school curriculum. Different studies were considered when narrowing down the literature review to look at some studies done on students from primary school to the first year of university to find out if school students' intention informs their behaviour to care for the environment. Most studies focused on the attitudes, knowledge, and behaviour of students. Studies abroad: De Leeuw (2015) in Canada, Frankfurt (2018), Germany, Vivek (2013), Gupta (2015) in India, Ahmad (2015) in Malaysia; in Africa: Adeolu (2014) Nigeria, Molapo (2014), Mutisyia (2011) Kenya, in South Africa: Buthelezi (2015), Msezane (2014), Mapotse, Mashiloane (2017), Matsekolong (2017) and Sethusha and Lumadi (2013). Some of the findings indicated that learners' knowledge and awareness of environmental issues are limited. Schools play a significant role in developing and enhancing such knowledge and concepts in learners Sethusha and Lumadi (2013).

Studies like the current study include Desa et al. (2010). Desa et al. (2011) conducted a study exploring first-year students' knowledge attitude and awareness regarding solid waste management in Malaysia. Results showed that the student's knowledge, attitudes, awareness, and behaviour concerning SWM were moderate. Although quite a number of the students (63.8

%) know SWM, it is not consistent with their attitude. This study showed that more than half of the students (65.9%) negatively affect SWM. Despite the high level of awareness expressed by the students concerning SWM, their behaviour and practice and willingness to act towards the alleviation of those problems varied (high level= 42.8% and low=57.2%). There is a necessity to develop students' attitudes and willingness to reduce problems related to SWM.

Adeolu (2014) assessed high school student's knowledge, attitude, and practice towards SWM in Nigeria. Findings revealed that knowledge, philosophy, and waste management practice were relatively moderate in secondary schools in Ibadan, Nigeria. Though the level of knowledge, attitude and practice of waste management was relatively moderate in secondary schools in Ibadan, the percentage of those who used indiscriminate solid waste disposal methods like open dumping and open burning was higher.

De Leeuw et al. (2015) used the theory of planned behaviour (TPB) to identify the beliefs that influence high school students' pro-environmental behaviour. Results revealed an excellent fit for the TPB model. Attitudes, subjective norms, and perceived behavioural control accounted for a large proportion of variance in intentions to engage in eco-friendly behaviours. On the part of behavioural control, De Leeuw et al. (2015) suggests that it is essential to create conditions to facilitate the performance of eco-friendly behaviours and remove any barriers. These conditions include the presence of waste bins, availability and affordability of eco-friendly products, and guidelines regarding appropriate eco-friendly behaviours among teenagers.

As for subjective norms, De Leeuw et al. (2015) found that descriptive norms significantly affected intentions to engage in eco-friendly behaviours. The behaviour of parents had more influence on the adolescents. The findings demonstrate that among adolescents, what others do to protect the environment is important than what others say. This means for the norm-based intervention to be effective, it should focus on the behaviour of the important others, perhaps by encouraging parents and family members to set good examples. The study revealed that attitudes were already quite positive about engaging in eco-friendly behaviours. Interventions should be made that target perceived behavioural control.

2.14 Theoretical Framework

The current research relied on the theory of planned behaviour (TPB) as a framework in the current study to determine the behavioural intentions of learners towards solid waste management. According to the theory of planned behaviour, human action is guided by three considerations: Firstly, there are beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes (behavioural beliefs) Ajzen, (1991). Behavioural beliefs then affect attitudes which can be positive or negative towards the action. Secondly, there are beliefs about the normative expectations of others (friends, teachers, and parents) and motivation to comply with these expectations (normative beliefs). Closely associated with normative beliefs are subjective norms, which means learners believe that these important others would adopt positive environmental behaviour. Lastly, there are control beliefs about the presence of factors that may facilitate or impede the performance of the behaviour and the perceived power of these factors (control beliefs). Control beliefs give rise to perceived behavioural control, which refers to an individual's ease or difficulty of performing a particular behaviour.

These three conditions, behavioural beliefs, normative beliefs, and control beliefs will result in behavioural intentions. As a general rule, the more favourable the attitude and normative beliefs, and the greater the perceived control, the stronger the person's intention to perform the behaviour in question should be. Finally, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises. The intention is thus suggested to be the immediate antecedent of behaviour. □

The current research focuses on what motivates responsible environmental behaviour among high school students. De Leeuw et al. (2015) assert this is an important area of concern with practical applications for creating a sustainable future. The quest is to find out what informs responsible environmental behaviour in students. The theory assumes that attitude will be favourable if the behaviour produces positive outcomes. If the outcome is negative, the attitude will be unfavourable. Secondly, is it the normative beliefs, that is, the behaviour that is influenced by what other important people say and these people's behaviours also? The assumption is that if the important others approve of the environmentally responsible behaviour or have positive environmental friendly behaviours, the learner's attitude will be positive. Conversely, if they disapprove of the behaviour, the learner's attitude will be negative. Thirdly perceived control can have a direct effect on behaviour. The explanation is the individual's

belief about factors that may facilitate or hinder pro-environmental behaviours. When combined, all three beliefs will result in behavioural intention, inevitably leading to the behaviour itself. There is a direct relationship between these three elements. Suppose both the attitudes and subjective norms are positive and you strongly believe that you can perform a specific behaviour. In that case, it is bound to strengthen your intention and resolve actually to behave in that expected manner.

2.15 Conclusion

In conclusion, based on the available literature, the area of EE has been of interest to many researchers. EE has been in South Africa for more than three decades spanning from the Natal conference in 1982, and thus warrants investigation to find out how much has been achieved. However, results found in schools show that there is still much to be done to practice what they have learned. The next chapter will present the research methodology employed to explore the research objectives.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter contains an outline of the research methodology used in the study, and a justification is presented for using the method. For research information to be integrated into the broader world of scientific knowledge, a specific research methodology needs to be adhered to (Cresswell, 2014). The current research followed specific research methods in collecting and analysing data. The choice of methods solely depends on the nature of the research being conducted. Many research methods exist, so the researcher selected the most relevant methods.

The chapter is organised into three faces whereby the researcher firstly presents the definition of terms and what is in the literature about them. The terms include research approaches, research designs and research methods. Secondly, a discussion of approaches, designs, and methods used in the research follows. The researcher describes in detail what was done. Thirdly, the researcher justifies the preferred design, method, and approach. The justification emanates from the advantages and disadvantages of these and previous studies like the current research. Several issues were considered to ensure the research uses the proper methods, including testing for validity and reliability of the instrument for data collection and analysis.

3.2 Research Methodology

Research is defined by Mcmillan and Schumacher (2014) as the systematic process of collecting and logically analysing data for some purpose. Research is also defined as a systematic investigation into or studying materials and sources to get facts and reach new conclusions Oxford English Dictionary (2013). Both definitions emphasise that research is a systematic inquiry and is purposeful. It is not done haphazardly. The research includes planned procedures to get data on a particular problem. The researcher has a question in mind and collects data to respond to the question. The researcher then analyses the data and answers the question asked.

Since research is done systematically, we have the term methodology. The Concise Oxford dictionary (2013) defines methodology as methods and principles used to perform a particular activity. According to Kothari (2004), methodology is the science of systematically researching to solve the problem under consideration. This shows that a scientific enquiry is made following certain methods and principles. The methods and principles used in the current study will be discussed in the following sections. The theory part of the research methodology includes paradigms, theoretical framework, approaches, designs, and methods.

3.3 Research Paradigms

Research is influenced by philosophical ideas or world views known as paradigms. The researcher needs to consider which research paradigm best suits the research question Le Roux, (2014). Paradigms are patterns of beliefs and practices that regulate enquiry within a discipline by providing lenses, frames, and processes through which investigation is accomplished Olson

(2006). Cresswell's (2014) definition of a paradigm is a basic set of beliefs that guide action. A paradigm thus leads us to ask specific questions and use appropriate approaches to systematic enquiry to provide answers to the question at hand. In summary, paradigms give us the idea that truth can be discovered as a verified and tested entity in research.

There are four main research paradigms stated by Cresswell (2014): Positivism, Constructivism, Transformative or Critical theory and Pragmatism or Realism. The positivism worldview is that we cannot have absolute truth when studying human behaviour and actions; the truth is conjectural. Numeric measures have been developed to study human behaviour. Researchers need to be objective when making their enquiries to find the truth. They believe reality is real and can be understood. The positivism paradigm is a theory verification approach. It relies on empirical observation and measurement. Experiments, surveys, verification of hypotheses are all examples of positivism. The positivism paradigm is also known as a scientific paradigm, and its ideas are primarily used in quantitative research.

Constructivism is seen as an approach that is suitable for qualitative research. The researcher intends to make sense of the meaning's others have about the world. Individuals develop subjective meanings of their experiences. Research relies on participants' views of the situation being studied that is why it is suitable for qualitative research. This paradigm believes that reality is constructed, and there are multiple local and specific realities. Findings are believed to be created. The paradigm is social and historical made—constructivism deals with theory generation Cresswell (2014).

The transformative or critical theory paradigm's worldview is power and justice oriented. Researchers who started this approach are critical theorists Cresswell (2014). It is concerned more with politics and deals mainly with change. Researchers believe reality is shaped by social, economic, ethnic, political, cultural and gender values. There is subjectivity, and they value mediated findings. Transformative worldview is qualitative in nature. The advantage of this worldview is that it places importance on the study of lives and experiences of diverse groups that have been marginalised and offers strategies the people can use to resist, challenge and subvert the constraints in their lives. The paradigm is not used in the current research since it is politically oriented and irrelevant to the recent research question.

The pragmatic or realism worldview is problem-centered and real-world practice-orientated. Researchers in this category use all approaches available to understand the problem; hence, they use mixed study methods. Enquirers draw from quantitative and qualitative methods when researching Cresswell (2014). The pragmatic researchers believe that reality is real and maybe understood, and findings are probably true. Researchers embrace objectivity in their research.

The positivist worldview uses mainly quantitative methods to study entities, so it is not suitable for the current research. The transformative worldview is qualitative, so it is not the most convenient. Constructivism is also not suitable since the researcher should be an active respondent in the world being investigated. Constructivism is useful for theory generation, and the current research is not focused on generating a theory.

The research paradigm followed in the current research is pragmatic because of its advantages, as stated in Cresswell (2014). Firstly, pragmatics focus on real-world practice. They focus attention on the fundamental research problem and then use different approaches available to derive knowledge about the problem. The current research exists but learners are reluctant to commit to pre-environmental behaviours. The study is focused on the problem and follows both qualitative and quantitative methods to get more knowledge about the problem. Secondly, pragmatics use all approaches available to understand the problem at hand. They favour working with both quantitative and qualitative data because it enables them to understand social reality better. In a qualitative study, much of the data required is about views, attitudes, and beliefs; hence real-world problems are attended to. That is why the current research used mixed study methods to understand social reality better. According to Cresswell (2014), mixed method opens the door to multiple methods and different forms of data collection and analysis. Thirdly, researchers embrace objectivity in pragmatic research, hence using the quantitative approach, which ensures a study is done objectively and biasness is reduced. The current research also incorporated the quantitative method in data collection and analysis to enhance objectivity. Lastly, pragmatics concur that research occurs in social, historical, political, and other contexts Cresswell (2014). Hence, the current study uses mixed method to reflect what happens in the social context in which it is conducted.

Sonqwaru (2012) is one of the researchers who used the pragmatic or realism paradigm in her research. The research aimed to reveal structures and mechanisms that might enable teachers

to work effectively with the environment and sustainability content knowledge in their Grade 10 Life Sciences classes. The research echo's the sentiments of the pragmatic world view that reality exists, but it is imperfectly understood. Also, reality influences the events we see. Both quantitative and qualitative methods are used to understand reality. The research findings revealed that Life Science teachers who attended a special training programme lacked confidence in the teaching environment and sustainability content knowledge integrated into the Life Science curriculum.

In conclusion, pragmatics believe that using theory in mixed-method research helps provide a lens reflective of social justice and political aims Cresswell (2014). Theories are tested to find out if they reflect what happens in society. The current research used the theory of planned behaviour, which will be expanded in detail in the next section.

3.4 Theoretical Framework

Studies concerned with responsible environmental behaviours have made use of social-psychological theories of human behaviour such as the model of Environmentally Responsible Behaviour (ERB) by Hines et al. (1987), the theory of Reasonable Person Model (RPM), Kaplan (2000), the Theory of Reasoned Action (TRA) Ajzen and Fishbein (1980) as well as Theory of planned behaviour (TPB) by Ajzen (1991). Akintunde (2017) defines a theory as a well-established principle developed to explain some aspects of the natural world. Therefore, a theory in Social Science can be understood as an explanation of reality. Theories arise from observations and testings, and they incorporate facts, predictions, laws, and widely accepted assumptions. Theories are helpful in research in that they provide a context for examining a problem and serve as a guide to systematically identify logically defined relationships among variables Camp (2001). Theories also present a systematic way of understanding behaviours, events, and situations.

Theories studying human behaviour toward the environment have started as simple linear theories like the behavioural change model. The reasoning in the theories was that if people knew about the environmental problems, they would be motivated to behave in an environmentally responsible manner Akintunde (2017). They linked knowledge to attitudes and attitudes to behaviour. However, research that followed refuted these theories that they were not supported. The newer researchers argued that many variables interact to influence the

embracing of environmentally responsible behaviour. Akitunde (2017) continues to assert that it is worth noting. However, though very simple, the behaviour change model does provide a base for considering the possible relationship between environmental knowledge, environmental awareness, and attitude and how these translate to action or inaction. The behaviour change model was thus not followed in the current research since it does not include other variables that influence human behaviour towards the environment.

The reasonable person model (RPM), as explained by Kaplan (2000), draws on cognitive and affective motives. The theory states that we need to recognise human inclinations and circumstances that support human motivations for people to act more environmentally responsible. Intuitively people resist making changes that they perceive as reducing their quality of life, although they still show concern about the environments future. Also, reasonable individuals can sometimes act unreasonably, which implies that circumstances people find themselves in, to a large extent, determine the outcome of their behaviours. Hence adopting environmentally responsible behaviour does not solely stem from our implicit motivations and intuitions. The RPM model focuses only on circumstances that people find themselves in. Thus, it was not used in the current research.

The ERB model was proposed by Hines et al. (1987). It includes knowledge of action strategies and understanding issues as main elements in personal factors that influence BI. The study directly and intentionally specifies the knowledge issues intended. The current research includes knowledge factors, although general environmental knowledge is not specific knowledge strands. Therefore, this model was not chosen though it is relevant in exploring how knowledge and affective factors influence BIs.

The current research made use of the Theory of Planned Behaviour (TPB) to identify the nature of behavioural intentions of Grade 10 Science learners about solid waste management. The TPB theory extends the Theory of Reasoned Action (TRA). The TRA shows that behavioural intentions drive individual behaviour. In theory, an adopted stance is that people believe that they can execute a particular behaviour whenever they are willing to do so (Ajzen, 2006). This theory does not recognise that behaviour is not always volitional (Hansen et al., 2004). The theory was then complemented by a component named perceived behavioural control. This concept indicates how people believe they can perform the behaviour because they have adequate capabilities or opportunities or lack these. Through such modifications, the TPB then

became the successor of the TRA. The TPB still posits that behavioural intentions determine individual behaviour, as shown in Figure 3.1. Purpose relates to motivational factors that influence behaviour, willingness to try, and the amount of effort people exert (Ajzen, 1991).

The TPB model posits that human behaviour is guided by three kinds of considerations about the likely outcomes of behaviour. These are behavioural beliefs, normative beliefs, and control beliefs. Behavioural beliefs produce favourable or unfavourable attitudes towards that behaviour. Normative beliefs result in perceived social pressure, and control beliefs give rise to perceived behavioural control. As a rule, the more favourable the attitude, normative beliefs, and perceived control, the stronger the person’s intention to perform the behaviour in question. As a result, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises. Hines et al. (1987) add that attitudes do not directly determine behaviour. Instead, they influence behavioural intentions. These three conditions, behavioural beliefs, normative beliefs, and control beliefs will result in behavioural intentions. The intention is the immediate antecedent to behaviour. Gifford (2014) supports the theory in that human behavior is influenced by personal and social factors. Figure 3.1 shows the diagram of the theory of planned behaviour..

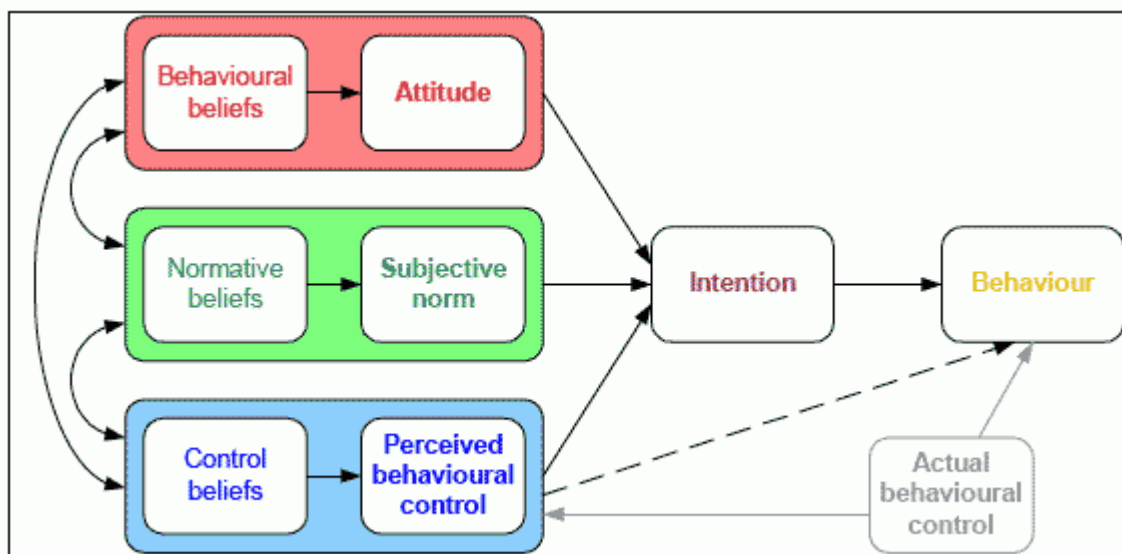


Figure 3.1. The theory of planned behaviour model (Adapted from Ajzen1991).

The TPB model is used in the study to understand high school students’ pro-environmental intentions and behaviour. Since the study uses the data collection and analysis model, it made sense to construct items for the questionnaire. The study investigates the nature of behavioural intentions for Grade 10 learners that inform behaviour, so there are questions on learners’

attitudes, behavioural beliefs, normative beliefs and control beliefs. These are investigated since they lead to the intention, which the actual behaviour will follow as the model prescribes. Under behavioural beliefs, if they are positive, they may lead to a positive attitude, resulting in good intentions. Normative beliefs are about the participant's social pressure; thus, we have questions about friends, parents, and teachers. If these have a positive influence, the participant may have good intentions to exhibit pro-environmental behaviours. Control beliefs lead to questions that capture participants' confidence to perform the behaviour at hand. We need to determine how difficult it is to complete the task or how likely the participant will do it. There is also perceived behavioural control, which means an individual's ease or difficulty performing a particular behaviour. It is assumed that perceived behavioural control is determined by the total set of accessible control beliefs, and it can lead to behaviour or intention to exhibit the desirable behaviour. The theory assisted in data analysis through all its constructs: attitude of students, behavioural beliefs, normative beliefs, and control beliefs. This is done to identify significant predictors of pro-environmental intentions and behaviour.

Though the TPB theory is an excellent tool to explore intentions, it is not without disadvantages. According to Gifford (2014), the TPB, despite its extensive use, is incomplete. Moral norms should be added since they are also a predictor of intentions. It is stated that when dealing with behaviours that have a clear moral dimension, the theory must include moral norms. Some scholars criticise the theory because it ignores one's needs before engaging in a certain action, affecting behaviour regardless of expressed attitudes. Also, participants' emotions are ignored despite being relevant to the model as emotions influence beliefs and the other model constructs. On the other hand, the TPB theory proves to have strengths that offset their limitations and are relevant to the current study. A strong premise of the theory is that, at the conceptual level, links among influences on behaviour and their effects are captured through one of the model's components or relationships. The model also provides further explanations regarding the connection between knowledge, attitude, behavioural intention, and actual behaviour as they influence waste management practices (Akintunde, 2017). It allows for the representation of cognitive elements by their influence on beliefs.

Previous studies such as De Leeuw et al. (2015) used the TPB to identify key beliefs underlying pro-environmental behaviour in high school students. The study confirms that the TPB is a popular and validated social-cognitive model of human behaviour well suited to identify beliefs

that can be used to inform pro-environmental change interventions. Since the TPB model is the extension of the TRA model, it can cover people's non-volitional behaviour, which the TRA theory cannot explain. The TPB model can explain the individual's social behaviour by considering "social norm" as an essential variable.

In conclusion, as the current study aims at identifying the nature of behavioural intentions of Grade 10 Science students about solid waste management, one needed to pick a theory that helps in exploring how intentions are formed and how the intentions influence behaviour. After the theoretical framework, an essential aspect of the methodology is the research approach, discussed in the following paragraphs.

3.5 Research Approaches

The research approach is defined by Cresswell (2014) as the plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. The plan involves a decision on the approach to study a topic. The selection of the research approach is based on the nature of the research problem. The three approaches to research are qualitative, quantitative, and mixed methods. Cresswell (2014) asserts that the three approaches should not be viewed as rigid, distinct categories; instead, they represent different ends on a continuum. Mixed method research resides in the middle of the continuum since it incorporates elements of both qualitative and quantitative approaches.

The importance of research approaches is that it helps researchers to select an approach to a particular study to answer the research question. The nature of the research problem determines the choice of research approaches. The selection of the research approach to be followed in the current study was primarily determined by the nature of the study and the objectives to be answered. The three approaches are described in detail. After the description, the preferred approach in the current research is presented and the justification for choosing the approach.

3.5.1 Qualitative approach

A qualitative approach allows participants' voices, concerns, and practices in a study to be heard. Qualitative researchers are more concerned about uncovering how people feel and think about the circumstances in which they find themselves. Macmillan and Schumacher (2014) confirm that a social situation is from participants' qualitative perspective. Qualitative research

focuses on naturally occurring problems and may use face to face techniques to collect data. This approach relies on narratives and observations to make meaning in a study, and numbers are generally not used. People's behaviours and settings are not controlled or manipulated. The researcher focuses on understanding the phenomenon being studied through open-ended questions and answers.

The features of the qualitative approach are outlined in Hancock (2002) as follows:

- It is concerned with individuals' opinions, experiences, and feelings that produce subjective data.
- It describes social phenomena as they occur naturally.
- Data are used to develop concepts and theories that help us understand the social world.
- Qualitative data are collected through direct encounters with individuals, through one-to-one interviews or group interviews or by observation.
- The intensive and time-consuming nature of data collection necessitates small samples.

Researchers collect data in spoken or written language in qualitative research and analyse data by identifying and categorising themes. In the current research, qualitative approach has been used in the form of semi-structured questionnaires. Learners were required to write their answers to open-ended items, explaining, describing, and stating their opinions concerning caring for the environment. Data are categorised into themes, and learners write their responses to open-ended questions.

The advantages of the qualitative approach include the fact that it allows a problem to be studied in detail. The researcher has some level of versatility when collecting data. A researcher can use interviews, observation to study the same problem. Another plus to the approach is that interpretation is based on the manipulation of raw data and is therefore tied directly to the data source. The researcher can refer to the studied group that these are their opinions.

Furthermore, in the qualitative approach, validity and reliability are established through logical reasoning and consensus. There is no need for statistics. The disadvantage of the qualitative approach is that the sampling technique limits the generalisability of results only to a certain environment or circumstances. The researcher's beliefs may also shape the data interpretation such that the results of a study can be biased. One advantage of using a qualitative approach is that validity and reliability can be established quickly, requiring no intense training. The

researcher can eliminate the influence of personal beliefs when analysing, and results from various individuals or settings can develop a single explanatory model.

3.5.2 Quantitative Approach

The quantitative approach emphasises objective measurements and statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys or by manipulating pre-existing statistical data using computational techniques Babbie (2010). Maree (2007) concurs that the quantitative approach is a process that is systematic and objective in its ways of using numerical data from only a sample of a population to generalise the findings to the population being studied. This approach emphasises numbers, measurements, deductive logic, control, and experiments. A quantitative approach emphasises the size of a particular phenomenon. The four main components of the quantitative system is (1) population: the entire selection of individuals being considered, (2) sample: a subset of a people, (3) hypotheses: tentative predictions of what results will show and (4) variable: an aspect of a testing condition that can change with different needs.

Babbie (2010) outlines the main characteristics of the quantitative approach as:

- Data is usually gathered using structured research instruments.
- Results are based on larger sample sizes that are representative of the population.
- The research study can generally be replicated or repeated, given its high reliability.
- The researcher has a clearly defined research question to which objective answers are sought.
- All aspects of the study are carefully designed before data is collected.
- Data are numbers and statistics, often arranged in tables, charts, figures, or other non-textual forms.
- Research can generalise concepts more widely, predict future results or investigate causal relationships.
- The researcher uses questionnaires or computer software to collect numerical data.

The main aim of quantitative research is to classify features, count them and construct statistical models to explain what is observed Babbie (2010). The quantitative approach has some limitations, as outlined by Babbie (2010).

- It does not allow flexibility as standardised methods constrain the analytical process.

- Due to high controls and standards, the context in which data was collected can be lost during the interpreting stage.
- Establishing validity and reliability is time-consuming.
- Results provide minor detail on behaviour, attitudes, and motivation.
- Results are limited as they provide numerical descriptions rather than detailed narratives and provide less complicated accounts of human perception.
- Preset answers may not necessarily reflect how people feel about a subject and, in some cases, might be the closest match to the preconceived hypothesis

There are important factors to implement when reporting on the quantitative approach results. The researcher needs to explain the data collected and their statistical treatment. The data analysis, procedures took are described, and the specific analysis instruments used to study each research objective.

3.5.3 Mixed method approach

A study that mixes both quantitative and qualitative approaches is termed mixed methods. Denscombe (2008) asserts that mixed methods research emerged from the 1990s and established itself as the third methodology and qualitative and quantitative methods. This method is selected and can be confidently used in research. The mixed-method approach is defined as a study that involves the collection and analysis of both quantitative and qualitative data in a single study in which data is collected concurrently or sequentially and involve the integration of the data at one or more stages in the process of research Creswell et al., (2004). This is done to understand a research problem more thoroughly. The researcher collects quantitative and qualitative data and mixes them concurrently or sequentially, emphasising both equally and unequally. The researcher can use instruments, checklists, and records for the quantitative data. Interviews, observations, documents, and audio-visual materials can be used for qualitative data. When data is analysed, statistical analysis, description, comparing and finding the relationship between variables is done. For qualitative data analysis, text and images are used, coding, theme development and relating themes.

As outlined by Mertens (2005) the strength of using the mixed method is that it can investigate complex problems in instances where a single research method cannot address the phenomenon. The mixed-method approach can bring together diverse researchers and groups

and give them a common language to use in their investigation. Another advantage of using a mixed-method approach is that it allows the researcher to incorporate the strength of qualitative and quantitative approaches to give a more comprehensive picture in answering the research question.

Creswell (2014) posits that mixed methods research provides strengths that offset the weaknesses of both quantitative and qualitative research. The mixed method is chosen for the study since it will best answer the question under investigation. The method also provides a better understanding of the research problem. Johnson and Christensen (2014) state mixed method give more accurate information. Qualitative techniques can only be effective in certain situations but fail to address some situations which can only be addressed through quantitative techniques. Using a mixed-method approach enhances the accuracy of results and helps gain depth of understanding of the problem at hand.

The limitations of the mixed-method approach are that it can be difficult for one researcher to have the skills to carry out both qualitative and quantitative research, especially if the research design is concurrent Denzin (2008). The researcher needs to be competent on each type used, and the process requires extensive data collection and more resources. Furthermore, mixed-method research is expensive to carry out. Denzin (2008) reveals that some researchers believe qualitative and quantitative methods are incompatible; they are based on different paradigms and cannot be easily combined. However, Creswell (2004) argues that many scholars recognise that qualitative and quantitative approaches are not diametrically opposed and divergent.

3.5.4 The approach used in the current research

The current research has used a mixed-method approach, and justification of the chosen approach is presented. The reason the mixed method was chosen for the current research is that it provides a better understanding of the research problem or issue than either research approach alone. The study aims to identify the nature of behavioural intentions of Grade 10 Science learners about solid waste management using the theory of planned behaviour. The learners answered closed-ended questions on caring for the environment. They had an opportunity to explain or elaborate on the open-ended questions why they chose the answers from closed-ended items.

The mixed-method approach works well with the TPB theory in the current research. The theory is flexible enough to be used to collect and analyse data using closed-ended questionnaires and collecting semi-structured questionnaires using the constructs of the same theory whereby students had to explain their opinions in writing. Macmillan and Schumacher (2014) concur that mixed methods enhance the credibility of findings from a single process. It was necessary to use mixed methods to compare and interpret whether the results generated from quantitative and qualitative methods support or contradict each other.

This section outlined the research approaches, giving clear guidance of plans and procedures followed in undertaking research. The process that is tracked has been described and the justification given. The following section provides a detailed explanation of research designs which are also very important in research. There is a connection between research approach and research design since research design also has a quantitative, qualitative and mixed-method design. Study designs further recount how the research will be done. It gives further details from the research approach and answers questions about participants from whom data is collected and different ways of collecting and analysing data.

3.6 Research designs

A research design describes the procedure for conducting a study, including when, from whom, and under what conditions the data will be obtained McMillan and Schumacher (2014). This definition implies that a research design is a detailed plan on how research is set up, the participants and ways of collecting data. Once again, research designs come in quantitative, qualitative, and mixed methods.

3.6.1 Qualitative research design

Qualitative designs are systematic and emphasise gathering data on naturally occurring phenomena. Macmillan and Schumacher (2014) use the data in words rather than numbers. There are two forms of qualitative designs: interactive and non-interactive methods. Interactive methods include ethnography, phenomenological study, case study and grounded theory. Non-interactive methods include concept analysis and historical analysis.

Ethnography is an interactive method that describes a cultural or social group or system. These include learned patterns of action, language, beliefs, rituals, and ways of life, Macmillan and Schumacher (2014). The collection method involves prolonged fieldwork, observation, casual interviews with participants of shared group activity and collecting group artefacts. A documentary-style focuses on details of the group's everyday life under study. Results of ethnography include edited quotations from participants, comprehensive narrative description and interpretation of the complex life of the group Macmillan and Schumacher (2014). The researcher tries to limit being subjective in reporting about outcomes by using many participant's quotations to show it is not the researcher's view. The phenomenological study focuses on the meanings of lived experiences. The researcher collects data on how individuals make sense of a particular experience or situation. The procedure for collecting data is conducting long interviews with informants to understand their lived experiences with the phenomenon.

Under a case study, the researcher examines a system or a case over time, employing multiple data sources found in the setting. The patient may be a programme, an event, an activity, or a set of individuals bounded in time and place. The researcher defines the case and its boundary. A case can be selected because of its uniqueness or illustrate an issue.

Lastly, there is grounded theory in which research goes beyond description and analysis of phenomena but develops detailed concepts and propositional statements that relate to a particular phenomenon Macmillan and Schumacher (2014). Grounded theory is a rigorous set of procedures for producing substantive theory. The researcher collects data using mainly interviews and makes multiple visits to the field. The researcher then selects the central phenomenon, develops a storyline.

The four types of interactive methods were not used in the current research as they require a researcher to spend a long time with the social group under study, which takes much time and is expensive to implement. Multiple data collection methods are used in interactive methods, making them cumbersome to implement. In non-interactive methods, the researcher analyses documents to get the necessary information to respond to the research question. This research is also known as analytical research. Authenticated documents are significant sources of data. In concept analysis, educational concepts are studied, the researcher describes the different

meanings and appropriate use of the concept. Examples of concept analysis include cooperative learning and leadership.

On the other hand, historical analysis involves a systematic collection and criticism of documents that describe past events. It also involves the researchers' study past educational programmes, practices, institutions, persons, policies, and movements. These are interpreted in historical economic, social, military, technological and military trends. In the current research, non-interactive methods were not used, and the researcher needed several more relevant methods.

3.6.2 Quantitative research designs

Quantitative research designs emphasize objectivity in measuring and describing phenomena. Objectivity is maximised using numbers, statistics, structure and control, Macmillan and Schumacher (2014). There are two main classes under quantitative design: experimental and non-experimental designs. There is true experimental design, quasi-experimental design, and single-subject design in experimental design. In non-experimental designs, we have descriptive, comparative, correlational, and ex post facto studies.

As Macmillan and Schumacher (2014) described, the experimental design includes experiments. The researcher will have two groups of participants: one without intervention and one with intervention. The experimental design investigates cause and effect relationships. True experimental design is unique in that there is random assignment of subjects to different groups. This ensures that there are no significant differences between subjects in each group before intervention. This makes the results reliable in that they will not be due to differences in the characteristics of the subjects. Also, accurate experimental designs are compelling for determining the effect of one factor on another.

A quasi-experimental design is the same as true experimental design in terms of purpose and procedure; the only difference is that there is no random assignment of subjects Macmillan and Schumacher (2014). In a single-subject design, one individual is studied, or a few individuals,

not a group. This is done where it is impossible to check the entire group of subjects. Cause and effect relationships are explored; there is intervention but no random assignment.

Non-experimental designs describe phenomena and examine relationships without directly manipulating conditions that are experienced. One of the types is descriptive research, where current needs are assessed. Descriptive research summarises an existing phenomenon using numbers to characterise individuals. Its purpose is to describe something as it is.

In a comparative design, the researcher investigates differences between groups. For example, the groups are compared; a comparative study can compare learners' attitudes in different grades. Correlational research is concerned with assessing relationships between two or more phenomena. The degree of a relationship is measured statistically, and this is called correlation. A positive correlation means a high association of one variable to the other. A negative correlation means high values of the variable is associated with low values of a second variable.

Survey means information collected from groups. The researcher selects a sample of subjects and administers questionnaires or interviews to collect data. Surveys are helpful in educational research to describe attitudes, beliefs, opinions and other types of information Macmillan and Schumacher (2014). Information about many people called population can be inferred from responses obtained from a sample.

Lastly, an ex post facto design explores possible causal relationships among variables that the researcher cannot control. Causes are studied after they have occurred. The researcher focuses on what has happened differently for comparable groups of subjects. Experimental designs were not employed since the current research does not investigate cause and effect relationships. The recent study used a descriptive study, which assesses existing conditions; it characterises something as it is. The purpose of the research is to investigate learner's behavioural intentions as far as caring for the environment is concerned. In terms of design, a survey was used to collect data as Macmillan and Schumacher (2014) stated that surveys help describe attitudes, beliefs, and opinions.

3.6.3 Mixed method research design

Mixed method research design combines quantitative and qualitative methods as it is believed that the use of both can provide a complete investigation. This design also enhances a study with an additional data set. There are four types of mixed method designs: explanatory, exploratory, triangulation and embedded mixed methods. An essential advantage of mixed method design is that they can show the result quantitatively and explain why it was obtained qualitatively Macmillan and Schumacher (2014).

In descriptive design, quantitative data are collected first, and depending on the results; qualitative data are gathered second to elaborate on quantitative findings. Under experimental designs, the qualitative data are gathered first, and the quantitative phase follows. This kind of study aims to identify themes, ideas, perspectives, and beliefs that can be used to design a larger scale quantitative study. The advantage of this study is that validity scores are increased since the results will reflect the subject's ideas, not the ones for researchers.

A triangulation study is whereby both quantitative and qualitative are collected at about the same time. It is used when the strengths of one method offset the weaknesses of the other. The methods together provide a more comprehensive set of data. For the current research, the intention is to identify behavioural intentions that influence pro-environmental behaviours to students. Therefore, the current study used a mixed explanatory methods design to use qualitative findings to clarify the quantitative results. There was quantitative data collection and analysis, followed by qualitative data collection and analysis. This design captures the best of both quantitative and qualitative data. Though such research takes a long time to complete, its main advantage is that two separate phases make it straightforward to implement. It is also easy to describe and give a report. Explanatory research is beneficial in testing theories that explain how and why a phenomenon operates as it does. Thus, the researcher wants to understand what informs the behavioural intentions of the learners using the TPB theory. Explanatory research is relevant since the theory of planned behaviour will be used to understand learners' behavioural purposes about pro-environmental behaviours.

Mbokazi (2016) also used the mixed-method design. The research was conducted to evaluate the role of EE in promoting sustainable living in secondary schools. High schools in the KwaZulu-Natal province were included in the study. The learners' participants were subjected to the pre-test and post-test evaluation. The pre-test results revealed a lack of participants'

knowledge, skills, and attitude towards their environment. In the post-test scores, the participants exhibited significant water savings, energy savings, waste management, garden, and school grounds. The conclusion drawn from the study is that when EE is coupled with hands-on activities, it becomes effective in promoting sustainable living. Mbokazi (2015) research employed the mixed-method approach. The quantitative method was the primary method, and qualitative was used to support the quantitative method. Mbokazi (2015) echoes McMillan and Schumacher (2010) that mixed methods design enhances the credibility of findings from a single method and provides a more comprehensive picture of what is being studied. Furthermore, Kumar (2014) argues that no single approach works well in all situations and can produce accurately valid and reliable findings to all research questions. Similarly, more than one data source in the current research was sufficient to explain and clarify the results. The mixed methods complemented each other in responding to the research questions outlined in this study.

3.7 Research Methods

Research methods include sampling and different types of sampling techniques. It also provides instrument design and development and data collection. These will be discussed in the following sections.

3.7.1 Sampling

In quantitative studies, a population is the entire selection of individuals from which a sample is drawn Macmillan and Schumacher (2014). Sampling, therefore, is the process of drawing a sample from a larger population. An example is a set of elements taken from a larger population to make statistical inferences and estimate the whole population's characteristics Johnson and Christensen (2014). The researcher studies a smaller group and produces accurate generalisations about the larger group. Taking samples in a population eliminates the need to research the entire population, saving time and reducing the cost of research. The two main types of sampling methods are probability and non-probability sampling.

In probability sampling, the researcher selects participants and chooses them randomly. The researcher defines the target population, identifies the sampling frame, determines sample size, determines the sampling method, and sets the sample, Johnson and Christensen (2014). In random selection, each individual has an equal chance to be selected. Bias is also avoided with

random sampling because there is a high probability that the population characteristics will be represented in the sample. Types of random sampling are simply random, systematic, cluster and stratified sampling.

In non-probability sampling, the researcher chooses the participants randomly, but they do not have equal chances to be selected. In the non-probability sampling, participants are selected based on their availability and convenience, Macmillan and Schumacher (2014). The types of non-probability sampling are convenience sampling, purposive and snowball sampling.

The types of non-probability sampling are described as found in Macmillan and Schumacher (2014). In convenience sampling, a sample is obtained in any manner that is convenient or accessible to be included in the sample, such as proximity and affordability. Purposive sampling is selecting participants with a specific purpose in mind. It is mainly used when a difficult to reach population needs to be measured. In quota sampling, the researcher first identifies relevant categories of people, such as male or female, and then decides how many participants to get in each category. Quota sampling provides more representative samples than the other types, and generalisations are possible due to similar subjects. Snowball sampling is whereby selection is made with participants in a network. It begins with a few people and spreads out based on links to the initial people. The researcher asks each participant to suggest others with the same attributes or who fit the profile. It is helpful if the individuals are scattered throughout populations.

The current research employed the non-probability purposeful sampling technique. In purposeful sampling, participants are selected because of some defining characteristics. Information-rich individuals are selected. Purposeful sampling has three categories, namely stratified, criterion and snowball. In the study, purposeful criterion sampling was used since typical characteristics of participants were already specified. Purposeful sampling is when the researcher specifies the characteristics of a population of interest and then locates individuals who have those characteristics Johnson and Christensen (2014). In purposeful sampling, a researcher intentionally selects individuals and sites to learn and understand the central phenomenon, Creswell (2012). The current research will follow purposeful sampling since the researcher has specified the characteristics of the learners to be used (Grade 10 learners who do Life Science and Physical Science) so that information-rich participants will be sampled.

The researcher already knows the learners with the study's necessary characteristics; hence, purposeful sampling was chosen. The area is also purposely selected as it is accessible to the researcher.

Purposeful sampling relies more on the researcher's judgment to select the required sample. The emphasis is on representativeness in quantitative studies. Under qualitative studies, the researchers are more interested in choosing information-rich participants. Some weaknesses of non-probability sampling are that it is difficult to generalise to other subjects, but it is possible to generalise on similar subjects. There is a greater likelihood of error due to experimenter bias Macmillan and Schumacher (2014). That is why the researcher ensures validity and credibility of the study to limit biasness to be discussed in sections to follow. The results are also dependent on the uniqueness of the characteristics of the sample.

Non-probability sampling has many strengths or advantages presented by Macmillan and Schumacher (2014). One of which is that it is less costly and less time consuming to implement. It is easy to administer. It assures a high participation rate of which is necessary for research. The high number of participants results in valid research. Purposeful sampling specifically assures receipt of needed information. There are far more advantages of non-probability sampling than disadvantages.

The sample in the current research was Grade 10, science learners. The research questions informed the selection of the research investigating the behavioural intentions of Grade 10 Science learners related to the good practice of solid waste management in Vosloorus. The learners were sampled from all seven government or public schools, and there are no private high schools in the area. There is a Life Science Grade 10 class in each of these schools, so each of the science classes was used as the sample for the research. The age group of the learners were between fourteen and twenty years. It was a group of both boys and girls. The total sample was 296 learners. Still, 275 learners' responses were used in the study since their questionnaires were filled in correctly and were completed. The learners were multilingual: they spoke English as a first additional language and their African languages, mostly Zulu, then either Sotho, Tswana, or Tsonga. The reason for choosing Life Science learners is that they are more likely to be more informed about EE since they have topics in their science subjects that deal directly with environmental issues as stated, in CAPS. Also, as indicated in CAPS, EE

should be done from Grade R to Grade 12, so the Grade 10 learners have been exposed to EE for many years.

3.7.2 Data Collection

The research paradigm, aims and questions, and data source determine the data collection method. Since the research used a mixed-method approach, both quantitative and qualitative methods of collecting data were employed. To collect quantitative numeric data, a survey questionnaire was designed and administered to seven high school Grade 10 students. To elicit qualitative data, open-ended questions were given to allow participants to substantiate their answers. There were two sets of questionnaires in the current research. One set of questionnaires with closed-ended questions was used for quantitative data, and the other set with open-ended questionnaires was used to collect qualitative data. Both sets of questionnaires were utilised to explore the research objectives, identify the nature of behavioural intentions of Grade 10 students about solid waste management, and determine the students' behavioural practices regarding solid waste management.

An explanatory sequential mixed method was followed in the research in collecting data. The study made use of both quantitative and qualitative processes of collecting data. A survey questionnaire was employed quantitatively, and a qualitatively semi-structured questionnaire was used. Data was collected from the seven high schools, as has been mentioned. Certain procedures were followed before the actual data collection from schools. The researcher sought permission from the Department of Basic Education in Gauteng (GDE). The letter from the GDE is attached as Appendix B. The researcher then sought permission from the principals in the schools (refer to Appendix C). Science teachers in each school were asked to administer questionnaires and distribute consent letters to parents. Much of the communication with the schools was done telephonically to reduce costs. Immediately after the researcher had received clearance to conduct the research, the researcher collected data from the schools. Quantitative questionnaires were administered once, in each school, in one session, then collected and analysed. It was a self-administered survey where participants responded to printed questions and submitted them when done. The advantages of administering a questionnaire are that respondents complete questionnaires quickly, it is easy to help, the response rate is optimal, and it is financially viable Macmillan and Schumacher (2014).

The researcher then did the qualitative research where the set of qualitative questionnaires with open-ended items was given out to learners to fill in. The researcher sampled 10% of the study population from all the science classes in the seven schools. As Johnson and Christensen (2014) assert, taking samples in a population eliminates the need to research the entire population, saving time and reducing the cost of research. The researcher used a sample from science learners to answer open-ended questionnaires. Random sampling was used because the participants have similar characteristics; they are all Grade 10 Science learners with the same curriculum. The learners were registered for Life Science and Physical science as it was previously explained. Random sample was used whereby each Grade 10 science class names were compiled. The names of learners were cut out and were put in a bag. Six characters were drawn out to make up the 10%. The selection resulted in having groups of six learners in each school, and there were 42 learners in all. The qualitative questionnaires aimed to get more insight into information from the responses given in the first questionnaire. The researcher was available to ask questions and clarify if questions were unclear. The respondents wrote their answers next to the open-ended items, and it was one item at a time until the questionnaire was completed. The researcher was also able to rephrase and explain questions during the interview. This was made to increase the validity of the study. Data were analysed, and conclusions were inferred from the data. Table 3.1 shows the data collection process. It includes research, questions, objectives, and different method used to collect data.

Table 3.1: A summary of the research methods adopted in the current research study

Research aim	To determine the extent to which behavioural intentions of Grade 10 science learners relate to good practices of solid waste management in Vosloorus, Gauteng.	
Research Question	To what extent do behavioural intentions of the Grade 10 science learners relate to good practices of solid waste management in Vosloorus, Gauteng?	
Research sub-questions	What is the nature of behavioural intentions of Grade 10 science learners in relation to solid waste management?	What are the behavioural practices of Grade 10 science learners in relation to solid waste management?

Research approach	Explanatory sequential mixed methods	
Research design	Non-experimental research design	Non-experimental research design
Research method	Descriptive survey	Descriptive survey
Data collection instruments	Closed-ended questionnaire	Semi-structured questionnaire
Instrument validation	Pilot study and panel of expert analysis of the instrument	
Data sources	Grade 10 learners (n=275)	Grade 10 learners (n=275)
Sampling method	Non-probability sampling	Non-probability sampling
Data analysis	Descriptive statistical analysis	Inductive data analysis

3.7.3 Instrument design and development

The researcher systematically developed a quantitative questionnaire for data collection. The research aims to investigate the behavioural intentions of Grade 10 learners using the theory of planned behaviour, so it made sense to develop questionnaires using planned behaviour theory as a framework. The researcher adapted questionnaires from the Ajzen (2006), which uses TPB constructs to create items for a questionnaire. The items were then modified to match research objectives to give relevant information to the current research.

The researcher first drafted items that would give demographic information about participants. These include age, gender, and participants had to tick in a list of subjects. Demographic factors were included in the questionnaires because the researcher wanted to understand the population under investigation clearly. Then a list of all the channels through which people learn about waste management was developed, channels such as school books, teachers, internet, radio, friends, family, and other channels. The item about channels is also relevant to the TPB constructs that state that behavior can be influenced by social norms by friends, family, teachers and people in the community.

The next step was to draft items according to the TPB constructs: attitudes, normative beliefs, control beliefs, behavioural beliefs, intention, and perceived behavioural control. The questionnaire was divided into six sections: background information, channels dispensing environmental knowledge, normative opinions, control beliefs, behavioural beliefs, and behavioural intention. From this premise, questions probing the stated factors were incorporated into the questionnaire. According to the theory of planned behaviour, attitudes, subjective norms, perceived behavioural control affect behaviour. The questionnaire is a multiple-choice (Likert scale). It is a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Respondents selected one option between a range of the alternatives. There were 33 questions in total.

The researcher then drafted open-ended questionnaires that were used to collect qualitative data. In open-ended questions, participants respond in their own words. This was useful since the researcher wanted to know the participants' thoughts. Open-ended questions were suitable for qualitative research whose goal is to understand participants' inner world Macmillan and Schumacher (2014). The theory of planned behaviour was also used as a framework to draft the open-ended questions. There were questions on attitude, perceived norm, intention, and perceived behavioural control. There were 12 questions in total.

A panel of experts validated both the qualitative and quantitative questionnaires. The panel consisted of nine people, including the professor supervising the study, an English language specialist, Environmental Science professors and colleagues in Environmental Education. The questionnaires were tested to establish if they do what they ought to and are suitable for the purpose they are designed for.

When the panel was pretty satisfied with the standard of the questionnaires, the questionnaires were then pilot tested. Taylor-Powell (2008) suggests that researchers should ensure that a questionnaire is valid by paying attention to the following:

- The items in the questionnaire measure what they are supposed to measure.
- Respondents understand all words.
- All respondents interpret the thing in the same way.
- All response choices are appropriate.
- The range of response choices is used.
- The respondents correctly follow the instructions
- The questionnaire creates a positive impression that motivates students to respond.
- The length of time available to complete the questionnaire is adequate.

To follow Taylor-Powell's views, the quantitative and qualitative questionnaires were pilot tested on a sample of respondents within the same contexts as the actual research. A group of Grade 10 Life Sciences learners was purposely sampled to pilot the questionnaires described above in a pilot study. They were sampled because their school is in a township next to the study area, and they have the same Life Science curriculum and textbooks.

The data from pilot testing was analysed, and it appeared the questionnaires generally met Taylor-Powell's (2008) stipulations for good questions. The results showed that learners could respond to all items in the questionnaire. The learners generally interpreted the questions the same way; this is demonstrated by the fact that learners gave the same responses. The learners were able to follow instructions. For example, they all used "X" to mark their choices as they were instructed. The only restructuring of the questionnaires was combining items asking about similar concepts.

A statistician was then consulted about questionnaire validation. The statistician evaluated the items to indicate whether, using statistical methods, the researcher would be able to answer the research question. The statistician approved the use of the questionnaire.

The researcher must ensure the validity of the results and conclusions drawn from the research. The validity depends on the research design and data collection methods employed to conduct the investigation. The researcher also ensured that relevant instruments and methods were used

to collect data that would be useful. That is why validity, reliability and trustworthiness will be discussed in the next sections.

3.8 Validity

The study's degree of scientific explanations must match reality. This is achieved through validity which means findings and conclusions for the research are truthful. Validity is the degree to which both the methods employed, and the questionnaire designed to enable the instrument to measure what was intended. Gray (2005) concurs that validity is the ability of the instrument to measure what it was intended to measure. The current research's validity was achieved by using a combination of methods discussed below to help reduce errors. Examples of previous research are given to clarify how they ensured validity in their research. There are different types of validity. There is face and content validity, construct, concurrent and predictive validity.

As defined by Macmillan and Schumacher (2014), content validity is the extent to which a sample of questions in an instrument, such as in a questionnaire, represents the targeted task or domain. The current study achieved content validity by ensuring that questions represent and cover environmental education and sustainable living. Since the study used questionnaires to obtain information from learners, each questionnaire has 32 questions to ensure much information is collected. The researcher ensured that the questions that were asked were relevant. The questionnaires were given to a panel of experts to read and review. The panel comprised nine people, including the professor who is supervising the study, an English language specialist, professors, and colleagues in Environmental Education.

Construct validity deals with entities that cannot be directly observed but which are inferred from empirical evidence Le Roux (2014). Examples are intelligence, attitude. Construct validity is concerned with the meaning of what the instrument is measuring and how and why it operates the way it does de Vos et al. (2006). A pilot test, as explained previously, was done to validate the questions and find out if respondents understood the questions. Construct validity was also determined in the current research. There are items in the quantitative questionnaire that required learners to respond to questions about attitudes. Le Roux (2014) states that pilot-testing the questionnaire enables the researcher to identify ambiguities in the instructions, clarify wording, and alert the researcher to omissions or unanticipated answers.

The questionnaires were distributed to respondents in the current research to establish comprehensibility and ease of response to the instrument. Before launching the questionnaire to the research population, the necessary amendments were then made. The open-ended questions were also pilot-tested to validate them. Immediately following the filling in of the questionnaires, responses were reconstructed to ensure that an accurate record was documented.

Criterion validity refers to the extent to which a measure distinguishes participants based on a particular behavioural criterion Maree (2007). Criterion validity is the extent to which a measure is related to an outcome. The criterion validity is used to predict performance or behaviour in another situation. An example of criterion validity is giving an environmental education test to a learner's expectations of taking care of the environment. Questionnaires are given to learners in the current research to report their behaviour concerning the environment. Still, the researcher will not observe if they do what they say. This type of validity was therefore not used.

Face validity refers to the appearance of a questionnaire or any other instrument for collecting data. It measures what it looks like if it measures the variable, it claims to measure Leedy and Ormrod (2005). To establish face validity in the current research, a direct link was maintained between the questions and the study's objectives. According to Mbokazi (2016), face validity was fulfilled when he structured the questionnaire for the research such that it measured the concepts of environmental education and sustainability.

Sonqwaru (2012) triangulated to increase the validity of her research. Triangulation is the use of two or more data collection methods in the study of some aspect of human behaviour. Cohen (2007) suggests that in the study of human behaviour, two or more methods can reveal the richness and complexity of human behaviour from more than one standpoint. Triangulation is viewed as a form of ensuring validity in research. The current research used a mixed method to ensure validity. Msezane (2014) enhanced the validity of his research by using different methods in collecting data. He used surveys, observations, and focus group interviews.

3.9 Reliability

Research reliability refers to the consistency, stability, or repeatability of the results in a study (Johnson and Christensen (2014)). The definition implies that the results must be repeatable at any given time when the same study is repeated. Maree (2007) concurs with the definition by stating reliability is the extent to which a measuring instrument is repeatable and consistent. There are different reliabilities: internal and external reliability, test-retest, equivalent form and split-half reliability. These will be discussed in the following paragraphs, how they were enhanced in the study, and examples of other similar research.

External reliability refers to the method for contrasting two data collection processes to check the measurement's reliability, Maree (2007). In the current study, participants were chosen fairly; proper sampling methods were employed as discussed previously, and justified strategies and procedures for collecting data.

Internal reliability is the extent to which all items within a single instrument yield similar results (Leedy and Ormrod (2005)). It is essential that instruments used to be reliable in all respects. If the instrument is reliable, then it is valid. The questionnaires used in the study were reliable in all respects; the same results were produced during the pilot study and the actual research. Mbokazi (2016) asserts that the instrument's reliability influences the validity of the instrument. His research also got the same results when conducting the pilot study and the actual survey. Test-retest is determined by administering the instrument to the participants on two occasions (Maree (2007)). The results of the first data collection are compared with the results of the second data collection. This method was not done in the current study because it was not relevant. However, there was pilot testing of questionnaires before the actual data collection.

3.10 Trustworthiness

A study must be trustworthy, and trustworthiness is confirmed using four elements in a study. Firstly, research findings should be credible. This means results findings are accurate of human experience that human experience would recognise the description (Maree (2007)). Secondly, we have applicability or transferability, which refers to how the findings can be generalised to larger populations. Research findings are transferable if they fit into similar contexts outside the study situation. The current research aims to have transferability in that the research findings can be applied in similar contexts. Grade 10 science learners in township schools are likely to have similar feelings and attitudes towards solid waste management. Thirdly, research

findings should be dependable or consistent. The research findings are reliable if the same results are obtained when enquiry is repeated with the same participants or in a similar context. Lastly, neutrality posits that research findings are without bias. This means that the research results could be confirmed by another in similar situations. The researcher tries as much as possible to avoid bias by taking an objective stance in data collection and analysis. That is where quantitative methods play a significant role in minimising biasness in the current study.

Researchers use different ways to enhance trustworthiness. They can use multiple data sources, such as combining interviews with analysis of written material. The current researcher used quantitative questionnaire surveys with closed-ended questions and standardised semi-structured questionnaires for answers as presented in written text. Combining research methods helps strengthen research findings. The researcher can also try to control biasness, and quantitative methods eliminate biasness since it uses structured questions that include numbers. Therefore, objectivity is maintained using numbers, measurements, deductive logic, control, and experiments. The current study has used both quantitative and qualitative methods to eliminate biasness.

Keeping notes of research decisions taken is important. It helps other people to see the decisions you made, how you did the analysis and how you arrived at the conclusions. Another way is to use stakeholder checks, meaning the researcher needs to allow research participants and others with special interest to comment and assess the findings, interpretations, and conclusions. In the current research, a statistician assisted in assessing findings and interpreting findings and explaining implications of these.

Researchers also need to avoid generalisation. The research goal is not to generalise across a population but to seek insight into participants' perspectives, experiences, attitudes, and behaviours Maree (2007). Researchers also need to select quotes carefully. Quotations should not be taken out of context, and the researcher should not force their interpretation on the text. Instead, they need to be clear why each quote is chosen and provide a contextualised understanding. The current researchers enhanced the accuracy of quotations and interpretation by focusing on research objectives and questions.

Researchers also maintain trustworthiness by stating the limitations of the study upfront. Being upfront about the study's limitations help readers understand how conclusions were drawn. It helps to clarify questions that are answered by the study. It also helps to record, analyse, and report discrepant data that are an exception to the pattern or modify patterns found in data Maree (2007). Studies need to maintain confidentiality and anonymity. Researchers can also make use of multiple researchers to increase trustworthiness and have prolonged and persistent fieldwork. It is important to get literal statements of participants and quotations from documents.

In the current research, trustworthiness aspects were covered, as explained in the previous paragraphs. Mbokazi (2016) achieved trustworthiness in his study by comparing his observation with what has emerged from other data gathering strategies. In the current research, data were compared from quantitative and qualitative methods to draw similarities.

3.11 Data analysis

Data analysis may be defined as organising data in ways that allow researchers to see patterns, identify themes, discover relationships, develop explanations, make interpretations, mount critiques, or generate theories Hatch (2002). Data is organised and interrogated to find answers to the research question. The study will employ qualitative and quantitative methods to analyse and interpret data. The collected data will be analysed to answer the study's questions. The goal of data analysis is to summarise the data clearly and generate inductive theories based on the data. Themes will be generated such as the most critical issues that came up in the study, cultural characteristics of the participants, how participants view the topic. In the qualitative procedure, the researcher did the content analysis. In content analysis, the researcher summarises communicated material to ascertain its meaning. The researcher analysed the open-ended answers from questionnaires in the following steps posited by Dawson (2002):

- Research questions adapted from the TPB model were used to identify themes. Descriptive responses given by respondents were analysed to understand the meaning they communicate.
- The researcher then assigned codes to the main themes. The main themes will be organised using the constructs of the TPB model.
- All the responses were classified from open-ended questionnaires under main themes
- Integration of themes and responses into the text of the report.

In analysing quantitative data, the researcher looked for statistical significance and size of effects. The closed-ended questionnaires were categorised into themes according to the TPB model and then analysed and recorded. Diagrams were generated to help interpret the data. The themes varied depending on the research problem. This study collected data from the structured questionnaires were translated into numerical codes, captured into SPSS software of a computer programme, and analysed in terms of mode, median, and percentages.

3.12 Research Ethics

Research ethics refers to principles developed to guide and assist researchers in conducting ethical studies. Ethical studies call for the researcher to always be honest, trustworthy and do no harm to others. Macmillan and Schumacher (2014) posit that ethics are concerned with beliefs about right or wrong from a moral perspective. The researcher needs to respect people's rights, dignity, and diversity. The important principles and guidelines for any educational research are listed below.

- Researchers should be open and honest with participants about all study aspects. The researcher must fully disclose the purpose of the research. In the current study, the researcher has explained the study's purpose and how it will contribute to education in general.
- It is considered unethical to collect data without prior knowledge of the participants and their expressed willingness and informed consent. Informed consent is agreeing to participate in a study after being informed of its purpose, risks, benefits, procedures, and limits of confidentiality. For the current study, consent for the students to participate was sought from the Department of Education, school principal, learners, and their parents. It was explained that they could terminate their participation at any given time.
- Carrying out research should not result in harm or risk to participants. There should be no physical or mental discomfort, harm, or injury to those who participate in the study. Information that may embarrass or endanger home and school performance was not included. Questions seeking information that may cause discomfort, anxiety, harassment, and dehumanisation were avoided.
- The researcher maintained confidentiality, the privacy of participants were always protected. It is unethical to share information about a respondent with others for

purposes other than that of research. In the current study, research participants were assured that their names would not be revealed in any way and that the information provided would be kept anonymous.

This research obtained prior consent from the respondents, known as informed consent, with regards to this. Data for the study was collected from learners, so a proper protocol was followed from the school. Individuals were informed of their right to withdraw from the study if they so wished, though there is not much risk involved in participating. The respondents were told that the information they gave would be confidential and held in privacy. The researcher obtained permission to conduct research from the university, and the ethics certificate number is 2018/11/14/55095429/48/MC. The ethics certificate is attached as Appendix A.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter aims to present the results of the research that emerged from data collection and analysis as described in Chapter 3. These results will provide empirical data to respond to the research questions. The presentation of the results uses non-textual elements such as figures and tables to present the findings. The presented data is critical in answering the main research question, “to what extent do the behavioural intentions of Grade 10 Life Science learners *relate to good practices of solid waste management in Vosloorus, Gauteng?*” The researcher organised the findings under the key themes related to addressing the research problem. The key research objectives are:

- To determine the nature of behavioural intentions of Grade 10 Life Science learners in relation to solid waste management
- To identify the behavioural practices of Grade 10 Life Science learners in relation to solid waste management.

Reliability of data for behavioural intentions (data from questionnaire) was ascertained using Cronbach’s alpha coefficient. The coefficient is 0.926, and it indicates that the data can be considered as reliable since it is above 0.7, as indicated by Creswell (2013). This score is an indication that if similar research is done under similar conditions, the same results are likely to be observed.

The presentation is divided into three sections. Firstly, the demographic profile of the participants will be presented. These include participants’ age, gender, subjects at school, and channels through which they learn about waste management. Then quantitative results will follow, and lastly, qualitative results will be presented.

4.2 Demographic Information of learners

4.2.1 Ages of all learners

The information depicted in Table 4.1 shows the age of all participants. There were 275 in total. The majority of learners were between 15 years (53.5%) and 16 (33.8) years of age, as shown in Table 4.1. The other ages 14, 17, 18, 19 and 20 combined formed the minority (35 participants) (12.8%).

Table 4.1: Ages of all participants

Learner age (years)	Frequency	Proportion
14	4	1.5
15	147	53.5
16	93	33.8
17	19	6.9
18	5	1.8
19	6	2.2
20	1	0.4
Total	275	100

4.2.2 Gender of learners

The information shown in Table 4.2 is about the gender of all participants. 156 learners identified themselves as females, and 119 identified as males. Each learner stated their gender in the questionnaire.

Table 4.2: Gender of learners

Females	Males
156	119

4.2.3 The subjects that learners do at school

Participants were asked to indicate the subjects they do. They were given a list of subjects: Accounting, Business Economics, Economics, Geography, History, Life Orientation, Life Science, Mathematics, English and Physics, and there was a category for others. They were given these subjects because, at the Further Education and Training (FET) phase, learners do four core subjects and choose any three to make seven subjects. So, all the other subjects are the subjects they choose from. Table 4.3 shows the list of the subjects the learners are enrolled in and the number of participants that are enrolled for each subject. The proportion on the third column is in percentages not out of the total number of participants. The list includes English which they all do as a subject, and it is done as a first additional language. Participants indicated African languages as the “other” in the list. Other participants indicated Physical sciences. The South African Curriculum and Assessment Policy Statement (CAPS) advocates integrating Environmental Education (EE) in all grades and subjects.

Table 4.3: The subjects learners do at school

Subjects	Number of Participants	Proportion in Percentages
Accounting	87	31.6
Business Economics	76	27.6
Economics	69	25.0
Geography	82	29.8
History	57	20.7
Life Orientation	275	100
Life Sciences	235	85.4
Mathematics	275	100
Physics	219	79.6

English	275	100
Other	275	100

At the time of the research, all learners were enrolled for Life Orientation. Mathematics in the research includes Maths Literacy and pure Maths, and all participants do either one. The current research is about Mathematics in general; the interest is not on the technical differences between Maths Literacy and pure Maths, that is why they are combined as Mathematics. Mathematics is included in the list since all subjects include environmental education.

4.2.4 Channels through which learners learn about waste management

Besides formal schooling, learners are exposed to other channels to learn about the environment. In the research, participants were asked to indicate all the channels through which they learn about waste management (Table 4.4). **The proportion on the third column is in percentages.** Participants were allowed to select more than one channel because learning from more than one channel is possible. They were to choose among the following options: billboards and notice boards, friends, newspapers/magazines, parents/family, radio, schoolbooks, teachers, TV, and the internet. Environmental information dissemination comes in the form of environmental books, magazines, pamphlets, newspapers, radio, television programmes and bulletin boards. The researcher adopted this list of information and added other categories that high school learners could get information from. Participants had to state any other channel not listed among these, and nobody gave a different option.

Table 4.4: Channels through which learners learn about the waste management

Channel	Number of participants	Proportion in Percentages
a) Billboards and notice boards	80	29.0
b) Friends	61	22.2

c) Newspapers/magazines	89	32.3
d) Parents/family	81	29.4
e) Radio	71	25.8
f) School books	90	32.7
g) Teachers	93	33.8
h) TV	110	40
i) Internet	75	27.3
j) Other (<i>specify</i>)	0	

The number that appears more frequently is TV, probably because most households watch TV. Also, there are channels on TV about nature and animals which teach about waste management, such as National Geographic, People’s Weather and Wild Earth. The schoolbooks category is the second highest. Newspapers and magazines follow this, then the Internet.

4.3 Quantitative results according to TPB constructs

The results presented in the current section attempt to answer the question, “what is the nature of the behavioural intentions of Grade 10 Science learners about solid waste management?” As described in the previous chapter, questionnaires consisting of 33 questions each were used for data collection. The researcher used the Likert scale to capture the responses using a scale ranging from 1 strongly agree to 5 strongly disagree. The theoretical framework informed this scale. The scale was used to measure the six constructs as stated in the theory of planned behaviour. The constructs are behavioural beliefs, normative beliefs, control beliefs, attitude towards the behaviour, subjective norms, and perceived behavioural control. When combined, the constructs predict behavioural intention as indicated by the theoretical framework.

The data collected were ordinal data. Ordinal data is a categorical statistical data type where variables have natural, ordered categories, and the distances between the categories are

unknown Sharpe (2008). In ordinal data, 1 = significantly positive beliefs, 2 = moderately positive beliefs, 3 = neutral beliefs, 4 = moderately negative beliefs, and 5 = significantly negative beliefs. Therefore, all scores less than three can be regarded as affirming agreement on all elements, all scores above three are considered as affirming disagreement, while scores close to 3 are regarded indifferent, (Appendix G: Quantitative questionnaire).

4.3.1 Behavioural beliefs of learners on solid waste management

Behavioural beliefs are a person's beliefs about the likely consequences of performing a behaviour (Ajzen 2006). If learners believe the consequences of acting will be good, they are likely to act. The opposite is true; they are not likely to work if they think the consequences will not be good. Learners who selected numbers strongly agree and believe that the consequences will be good. Learners who selected disagree and strongly disagreed believe that the consequences will not be good. The data presented in Table 4.5 shows each of the learners' responses in each school about their behavioural beliefs on solid waste management.

Table 4.5: Behavioural beliefs of learners on solid waste management

Site	Response	Frequency	Percentage
School 1	Significantly positive beliefs	11	32.4
	Moderately positive beliefs	18	52.9
	Neutral beliefs	4	11.8
	Moderately negative beliefs	1	2.9
School 2	Significantly positive beliefs	12	38.7
	Moderately positive beliefs	17	54.8
	Neutral beliefs	2	6.5

School 3	Significantly positive beliefs	18	40.9
	Moderately positive beliefs	15	34.1
	Neutral beliefs	8	18.2
	Moderately negative beliefs	3	6.8
School 4	Significantly positive beliefs	13	28.9
	Moderately positive beliefs	24	53.3
	Neutral beliefs	8	17.8
School 5	Significantly positive beliefs	22	52.4
	Moderately positive beliefs	16	38.1
	Neutral beliefs	3	7.1
	Moderately negative beliefs	1	2.4
School 6	Significantly positive beliefs	23	53.5
	Moderately positive beliefs	18	41.9
	Neutral beliefs	2	4.7

School 7	Significantly positive beliefs	11	30.6
	Moderately positive beliefs	15	41.7
	Neutral beliefs	6	16.7
	Moderately negative beliefs	4	11.1

Behavioural beliefs of learners on solid waste management are presented in Table 4.5. These beliefs refer to: i) putting waste paper in dustbins, ii) collecting litter around the school and iii) picking up waste material, such as empty cans. As depicted in Table 4.5, the following learners reported positive behavioural beliefs in the following schools: 29 learners (85%) out of 34 (school 1); 29 learners (94%) out of 34 (school 2); 33 learners (75%) out of 44 (school 3); 37 learners (84%) out of 45 (school 4); 38 learners (90%) out of 42 (school 5); 41 learners (96%) out of 43 (school 6) and 26 learners (73%) out of 36 (school 7). In all the seven schools, 233 learners (85 %) had positive behavioural beliefs. They believe that the consequences of their actions will be good. Only 33 learners (12%) out of the 275 learners in seven schools were indifferent. The number of learners who reported negative behavioural beliefs was 9 (3%) out of the 275 learners.

4.3.2 Qualitative results for behavioural beliefs on solid waste management

A qualitative questionnaire was also administered to the learners to express their views about their environmental behaviours. In addition to selecting answers from the categories from agree, disagree and neutral, they had to elaborate on their options. Learners who answered the qualitative questionnaires were 42 in number. This is a sample taken from the total population of 275 learners. As stated in the previous chapter, taking samples from a population eliminates the need to research the entire population, saving time and reducing the cost of research (Johnson & Christensen, 2014). Instead of taking the 275 learners, the researcher used a sample of 42 science learners to answer open-ended questionnaires. Since learners' names were confidential, they were given identifiers, so in the Tables, they will be referred to as numbers from Learner 1 to Learner 42. Table 4.6 summarises the reasons they gave for the answers they

provided. Learners’ positive behavioural beliefs are captured, including information about putting waste in the dustbin and collecting litter around the school.

Table 4.6: Qualitative results for behavioural beliefs on solid waste management

Theme	Sub-theme	Example of verbatim evidence from data
Behavioural belief (person's beliefs about the likely consequences of performing a behaviour)	Positive belief-believe consequences are good.	<p>“It is beneficial to have a clean environment because a clean environment means healthy environment.” Learner 21, School 4</p> <p>“By keeping a clean environment, we are saving also wildlife and marine life.” Learner 2 School1</p> <p>“The environment will be clean, and learners will be protected from diseases.” Learner 7 School 2</p>
	Negative belief-believe consequences are bad.	“It is not beneficial because people continue to litter so they feel it is a never-ending cycle.” Learner 41 school 7
	Indifferent-neither positive nor negative.	No response showed indifference

Table 4.6 gives results on the theme of behavioural beliefs of the learners. It has been stated that behavioural beliefs are a person's beliefs about the likely consequences of performing a

behaviour. The results reveal that some learners have positive beliefs about solid waste management. They stated that it is beneficial to put litter in the dust bins because they will be keeping the classrooms clean, and consequently, the whole school will be clean; a clean environment means a healthy environment. If the school is dirty, they will be vulnerable to diseases, and their health will be affected. Some even said that keeping a clean environment also saves wildlife and marine life because dirt can spread rapidly to land and rivers and ultimately to oceans. By keeping the school clean, they reduce air pollution and water pollution. If the environment is clean and they will be protected from diseases. On the contrary, learners with negative beliefs about solid waste management asserted that they feel it is not beneficial to put litter in the dust bins because people continue to litter, so they think it is a never-ending cycle.

4.3.3 Attitudes of learners on solid waste management

Attitude refers to positive or negative feelings related to achieving an objective (Fishbein and Azjen, 1980). The TPB theory also states that attitudes are formed from behavioural, normative and control beliefs. Attitudes can also be positive, negative, or indifferent. Participants were asked whether it was pleasant to put waste in the dustbin, collect litter around the school, and pick up waste material to extract information about attitudes. Table 4.7 shows the attitudes of learners on solid waste management. Learners' positive attitudes were captured and included the statement: i) putting waste paper in dustbins, ii) collecting litter around the school and iii) picking up waste material such as empty cans around the school.

Table 4.7: Attitudes of learners on solid waste management

Site	Response	Frequency	Percentage
School 1	Significantly positive attitudes	7	20.5
	moderately positive attitudes	20	58.9
	Neutral attitudes	7	20.6

School 2	Significantly positive attitudes	10	32.3
	moderately positive attitudes	14	45.2
	Neutral attitudes	6	19.4
	moderately negative attitudes	1	3.1
School 3	Significantly positive attitudes	12	27.3
	moderately positive attitudes	20	45.4
	Neutral attitudes	9	20.5
	moderately negative attitudes	3	6.8
School 4	Significantly positive attitudes	7	15.5
	moderately positive attitudes	23	51.2
	Neutral attitudes	13	28.9
	moderately negative attitudes	2	4.4
School 5	Significantly positive attitudes	6	14.3
	Moderately positive attitudes	20	47.6

	Neutral attitudes	11	26.2
	Moderately negative attitudes	5	11.9
School 6	Significantly positive attitudes	13	30.2
	Moderately positive attitudes	19	44.2
	Neutral attitudes	7	16.3
	moderately negative attitudes	4	9.3
School 7	Significantly positive attitudes	4	11.1
	moderately positive attitudes	16	44.5
	Neutral attitudes	14	38.8
	moderately negative attitudes	2	5.6

As it is shown on Table 4.7, 27 learners (79%) reported positive attitudes on solid waste management (school 1); 24 learners (76%) were positive, 6 indifferent (19%) and 3% was negative (school 2); 32 (73%) were positive, 9 (21) indifferent and 3 (7%) were negative (school 3); 30 (67%) were positive, 13 (29%) indifferent and 2 (4%) were negative (school 4); 26 (62%) positive participants, 11 (26%) indifferent and 5 (12%) were negative (school 5); 32 (74%) were positive, 7 (16%) indifferent and 5 (9%) were negative (school 6); 20 (56%) were positive, 14 (39%) indifferent and 2 (6%) were negative (school 7). A high number (191) (69%) of learners had positive attitudes, 67 (24%) were indifferent and 25 (9%) had negative attitudes.

4.3.4 Qualitative results for attitudes of learners on solid waste management

The attitudes of participants are captured and displayed in Table 4.8. This is where learners explain why they have different attitudes. Learners reported positive attitudes stating reasons like they feel good collecting litter around the school because it shows that they care for the environment. Some say they feel good because they do not promote pollution in the land, and pollution causes harm to their health. Some confirmed it is good since they want a clean environment. Some reveal it is good because there will be less global warming as a dirty environment contributes to global warming. Some learners had negative attitudes, stating they feel so uncomfortable picking up litter as other learners despise them and they get funny looks. They feel awkward because collecting litter in schools is a rare occurrence. Some stated it is an embarrassment to go around the school collecting litter. Some say it is a waste of time that people won't stop littering around the school.

Table 4.8: Qualitative results of attitudes of participants on solid waste management

Theme	Sub-themes	Example of verbatim evidence from data
Attitude (positive or negative feeling in relation to the achievement of an objective.)	Positive-they like to clean the school.	<p>“I feel good because it shows that I care for the environment.” Learner 1, School1</p> <p>“I feel good because I do not promote pollution in our land.” Learner 4, School 1</p> <p>“It is good, we want our environment to be clean.” Learner 20, School 4</p> <p>“It is good because there will be less global warming.” Learner 19, School 4</p> <p>“Litter can be dangerous to our health.” Learner 11, School 2</p>

	<p>Negative-they do not like to clean the school.</p>	<p>“I feel so uncomfortable picking up litter because other learners will think I’m mad or something, I will get funny looks from other learners.” Learner 2</p> <p>“I feel awkward because it’s very rare to find learners collecting litter around the school.” Learner 27, School 5</p> <p>“I don’t feel good because it’s a waste of time people won’t stop littering around the school.” Learner 28, School 5</p> <p>“I feel shy sometimes because others give you funny looks.” Learner 42, School 7</p>
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4.3.5 Normative beliefs of learners on solid waste management

Normative beliefs are an individual’s perception of normative social pressures. The social pressures can come from friends, families, teachers, and the community. These group’s beliefs and actions can influence the learner’s behaviour towards caring for the environment. The data presented in Table 4.9 shows the information about normative beliefs of learners with regards to questions on i) other learners belief on putting waste paper in dustbins, ii) their friend’s belief on putting waste paper in dustbins and collecting waste material around the school, iii) their families belief on putting waste in dustbins and collecting waste material around the school, iv) their teacher’s beliefs on putting waste in dustbins and collecting waste material around the school. For normative beliefs, most learners (73%) in all the schools reported positive normative beliefs. They believe their friends, other learners, teachers, and parents are happy or think it is good to clean their environment and the schools. The percentage of learners in each school that reported positive normative beliefs are as follows: 30 learners (67%) out of 34 (school 1), 26 (84%) learners out of 31 (school 2), 28 learners(64%) out of 44 (school 3), 27 learners (60%) out of 35 (school 4), 31 learners (74%) out of 42 (school 5), 37 learners (86%)

out of 43 (school 6) and 27 learners (75%) out of 36 (school 7). In these seven schools, indifferent learners are 63(23%). The total number of learners who reported negative normative beliefs is 13 (5%).

Table 4.9: Normative beliefs of learners on solid waste management

Site	Response	Frequency	Percentage
School 1	Significantly positive beliefs	8	23.5
	Moderately positive beliefs	15	44.2
	Neutral beliefs	8	23.5
	Moderately negative beliefs	3	8.8
School 2	Significantly positive beliefs	13	41.9
	Moderately positive beliefs	13	42
	Neutral beliefs	5	9.7
School 3	Significantly positive beliefs	15	35.9
	Moderately positive beliefs	13	29.6
	Neutral beliefs	13	29.6
	Moderately negative beliefs	3	4.9

School 4	Significantly positive beliefs	6	13.3
	Moderately positive beliefs	21	46.6
	Neutral beliefs	17	37.8
	Moderately negative beliefs	1	2.3
School 5	Significantly positive beliefs	11	26.1
	Moderately positive beliefs	20	47.6
	Neutral beliefs	9	21.5
	Moderately negative beliefs	2	4.8
School 6	Significantly positive beliefs	18	41.9
	Moderately positive beliefs	19	44.2
	Neutral beliefs	5	11.6
	Moderately negative beliefs	1	2.3
School 7	Significantly positive beliefs	7	19.5
	Moderately positive beliefs	20	55.5

	Neutral beliefs	6	16.7
	Moderately negative beliefs	3	8.3

Table 4.10: Qualitative results for normative beliefs on solid waste management

Theme	Sub-theme	Example of verbatim evidence from data
Normative beliefs (pattern of behaviour that is usual in a group of people)	Opinions and feelings from friends and other learners on keeping the school environment clean.	<p>“I feel embarrassed because others will laugh at us.” Learner 16, School 3</p> <p>“I feel annoyed when we have to clean the school.” Learner 12, school 2</p> <p>“I say it is not our job to clean around the school.” Learner 13, School 3</p> <p>“I like to be outside the class, not that I like cleaning the school.” Learner 27, School 4</p>
	Opinions and feelings from teachers on keeping the school environment clean	<p>“Teachers feel happy when we pick up litter since they are the ones that always preach to us to pick up litter.” Learner 12, School 2</p>

<p>Opinions and feelings from parents on keeping the school environment clean</p>	<p>“Parents do not care, they are always busy with their jobs.” Learner 1, School 1</p> <p>“Parents say there are cleaners in the school why don’t they pick up litter.” Learner 14, School 3</p> <p>“Some parents are concerned about safety when we pick waste that we might get dirty or may be cut by broken bottles on our hands.” Learner 15, School 3</p> <p>“Parents are happy that we will learn in a clean environment.” Learner 18, School 4</p> <p>“Our parents say we must abide by the school rules.” Learner 5, School 6</p> <p>“Picking up litter helps supplies the recycling companies with materials for recycling.” Learner 2, School 1</p>
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About normative beliefs, there are three themes linked to questions summarised as ‘What do your friends, teachers, and parents feel about collecting waste material in your classrooms and around the school?’. Theme 1 is about opinions and feelings from friends and other learners. Learners answered that they feel bad giving reasons such as feeling embarrassed because others

will laugh at them, they feel annoyed, and they say it is not their job to clean around the school. They also say learners like to be outside the class, not because they like cleaning the school and don't like collecting waste because other learners throw litter on the floor on purpose. Other learners argue that others don't like picking up litter, so they will not collect litter when others do not.

Theme 2 is about opinions and feelings from teachers. Responses about teachers were positive; learners stated teachers feel happy when they pick up litter since they are the ones that always preach to them to pick up litter. Theme 3 is about opinions and feelings from parents. There were varying responses about parents, some stated parents do not care; they are always busy with their jobs, some said parents say there are cleaners in the school who should pick up litter, some say they have sent their children to school to learn not to clean the school. Some parents are concerned about safety e.g., they are concerned that that their children might get dirty or get cut by broken bottles on their hands; they say it's better if they have safety gloves. On the contrary, some learners said their parents are happy to learn in a clean environment. Learners must abide by the school rules and picking up litter helps to supply waste to the recycling companies for recycling.

4.3.6 Subjective Norms of learners on solid waste management

Subjective norm means learners believe that the important others (friends, teachers, and parents) should adopt positive environmental behaviour. The data presented in Table 4.11 shows the information about positive subjective norms of learners with regards to the questions: i) opinions of other learners about collecting litter around the school, ii) opinions of friends about collecting litter around the school, iii) opinions of family members especially parents about collecting litter around the school, and iv) opinions of teachers about collecting litter in the classroom and around the school.

Table 4.11: Subjective Norms of learners on solid waste management

Site	Response	Frequency	Percentage
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School 1	Significantly positive beliefs	5	14.6
	Moderately positive beliefs	14	41.2
	Neutral beliefs	15	44.2
School 2	Significantly positive beliefs	10	32.3
	Moderately positive beliefs	13	41.9
	Neutral beliefs	7	22.6
	Moderately negative beliefs	1	3.2
School 3	Significantly positive beliefs	6	13.7
	Moderately positive beliefs	25	56.8
	Neutral beliefs	11	25
	Moderately negative beliefs	2	4.5
School 4	Significantly positive beliefs	4	8.9
	Moderately positive beliefs	16	35.6
	Neutral beliefs	19	42.2

	Moderately negative beliefs	6	13.3
School 5	Significantly positive beliefs	4	9.6
	Moderately positive beliefs	21	50
	Neutral beliefs	13	30.9
	Moderately negative beliefs	4	9.5
School 6	Significantly positive beliefs	15	34.9
	Moderately positive beliefs	18	41.8
	Neutral beliefs	7	16.3
	Moderately negative beliefs	3	7
School 7	Significantly positive beliefs	7	19.5
	Moderately positive beliefs	14	38.9
	Neutral beliefs	12	33.3
	Moderately negative beliefs	3	8.3

For subjective norms 19 learners (56%) reported positive subjective norms, 15 learners (44%) were indifferent (school 1). 23 learners (74%), 7 (23%) were indifferent and 1 (5 %) were negative (school 2). 31 learners (71%), 11 learners (23%) were indifferent and 2 (5%) were negative (school 3). 20 (45%), 19 learners (42%) were indifferent and 6 (13%) were negative (school 4). 25 learners (60%), 13 learners (30%) and 4 (10%) were negative (school 5). 33 learners (77%), 7 learners (16%) and 3 (7%) reported negative (school 6). 21 (58%), 12 learners (33%) and 3 (8%) were negative (school 7). In all the seven schools, 172 learners, 62% reported positive subjective norms. A high number of learners who were indifferent, 69 (25%) and 19 (7%) learners reported negative subjective norms.

4.3.7 Control beliefs of learners on solid waste management

Control beliefs refer to factors that may facilitate or impede the performance of the behaviour and the perceived power of these factors (Ajzen, 2006). These factors include the presence of bins at home and school to put litter in. Table 4.12 shows responses from the Grade 10 learners about their control beliefs. Positive reactions were captured regarding the questions: i) believing they can put waste material in dustbins, ii) believing they can collect litter around the school, iii) believing they are in control of their actions to protect the environment.

Table 4.12: Control beliefs of learners on solid waste management

Site	Response	Frequency	Percentage
School 1	significantly positive beliefs	6	17.6
	moderately positive beliefs	23	67.6
	Neutral beliefs	5	14.8
School 2	significantly positive beliefs	7	22.6
	moderately positive beliefs	12	38.7
	Neutral beliefs	12	38.7

School 3	significantly positive beliefs	8	18.2
	moderately positive beliefs	25	56.8
	Neutral beliefs	9	20.5
	moderately negative beliefs	2	4.5
School 4	significantly positive beliefs	4	8.9
	moderately positive beliefs	22	48.9
	Neutral beliefs	14	31.1
	moderately negative beliefs	5	11.1
School 5	significantly positive beliefs	10	23.8
	moderately positive beliefs	20	47.6
	Neutral beliefs	11	26.2
	moderately negative beliefs	1	2.4
School 6	significantly positive beliefs	12	27.9
	moderately positive beliefs	21	48.8
	Neutral beliefs	6	14.0
	moderately negative beliefs	4	9.3
School 7	significantly positive beliefs	2	5.6

	moderately positive beliefs	21	58.3
	Neutral beliefs	10	27.8
	moderately negative beliefs	3	8.3

The learners who reported positive control beliefs on their habits to litter are as follows: 29 (85%) (school 1); 19 (61%) (school 2), 33 (75%) (school 3); 26 (58%) (school 4), 30 (74%) (school 5), 33 (77%) (school 6), and 23 (64 %) (school 7). The overall number of learners with positive control beliefs is 187, and the percentage for the seven schools is 68%. The indifferent learners make up 24% (67 learners) and 8% (15 learners) reported negative control beliefs.

4.3.8 Qualitative results for learners for control beliefs on solid waste management

Participants explained their control beliefs on solid waste management as follows: most learners said they would not throw litter on the floor regarding positive control beliefs. They would rather keep it until they get home or find a waste bin. Most mentioned similar reasons stating that if there is no waste bin, they will keep the waste until they get home, find a waste bin, or go around looking for a waste bin to throw the litter. On the negative side, learners said they would throw litter on the floor if there was no waste bin on site.

Table 4.13: Qualitative results for learners for control beliefs on solid waste management

Theme	Sub-theme	Example of verbatim evidence from data
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Control beliefs (the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors)	Positive Control belief-factors that may facilitate positive behaviour.	<p>“I never litter around but I hold on my litter until I see a dustbin and put it in.” Learner 7, School 2</p> <p>“No I will put it in my bag and throw it when I arrive at home.” Learner 16, School 3</p> <p>“I won’t throw litter on the floor, I was taught if I do I will harm the environment.” Learner 38, School 7</p>
	Negative control belief-factors that may impede positive behaviours.	<p>“May be, if I can’t carry the litter around until I find a dust bin.” Learner 28, School 5</p> <p>“I will throw litter on the floor if there is no waste bin on site.” Learner 21, School 4</p>

4.3.9 Perceived behavioural control of learners on solid waste management

Perceived behavioural control refers to an individual’s ease or difficulty of performing a particular behaviour (Ajzen, 2006). It is the extent to which you believe you control the outcome of an event. In the current research, participants were asked if they could collect litter around the school to put waste in the dustbin if collecting and putting waste in the dustbin is up to them. Their responses are depicted in Table 4.14. Positive behavioural control responses are captured with regards to the questions: i) their confidence that they can put waste in the dustbin, ii) putting wastepaper in dustbins is up to them, iii) collecting litter around the school is up to them, iv) they are confident they can pick up waste material, such as empty cans, around the school.

School 1, 29 learners (85%) reported positive perceived behavioural control, and the remaining 15% were indifferent. In school 2, 19 learners (61%) were positive, and 12 learners (39%) were indifferent; in school 3, 33 learners (75%) were positive, 9 (21%) were neutral, and 5% was negative. In school 4, 26 learners (58%) were positive, 14 (31%) were indifferent, and 5 (11%) were negative. In school 5, 30 learners (71%) were positive, 11 (26%) were indifferent, and 2% was negative; in school 6, 33 learners (77%) were positive, 6 (14%) were neutral, and 9% was negative. In school 7, 23 learners (64%) were positive, 10 (28%) were indifferent, and three learners (8%) were negative. The total for positive responses is 193 (70%), those who are indifferent are 65 (24%), and 17 (6%) were negative.

Table 4.14: Perceived Behavioural Control of learners on solid waste management

Site	Response	Frequency	Percentage
School 1	significantly positive beliefs	6	17.6
	moderately positive beliefs	23	67.7
	Neutral beliefs	5	14.7
School 2	significantly positive beliefs	7	22.6
	moderately positive beliefs	12	38.7
	Neutral beliefs	12	38.7
School 3	significantly positive beliefs	8	18.2
	moderately positive beliefs	25	56.9
	Neutral beliefs	9	20.4
	moderately negative beliefs	2	4.5
School 4	significantly positive beliefs	4	8.9
	moderately positive beliefs	22	48.9
	Neutral beliefs	14	31.1

	moderately negative beliefs	5	11.1
School 5	significantly positive beliefs	10	23.8
	moderately positive beliefs	20	47.6
	Neutral beliefs	11	26.2
	moderately negative beliefs	1	2.4
School 6	significantly positive beliefs	12	27.9
	moderately positive beliefs	21	48.8
	Neutral beliefs	6	14.0
	moderately negative beliefs	4	9.3
School 7	significantly positive beliefs	2	5.6
	moderately positive beliefs	21	58.3
	Neutral beliefs	10	27.8
	moderately negative beliefs	3	8.3

School 1, 29 learners (85%) reported positive perceived behavioural control, and the remaining 15% were indifferent. In school 2, 19 learners (61%) were positive, and 12 learners (39%) were indifferent; in school 3, 33 learners (75%) were positive, 9 (21%) were neutral, and 5% was negative. In school 4, 26 learners (58%) were positive, 14 (31%) were indifferent, and 5 (11%) were negative. In school 5, 30 learners (71%) were positive, 11 (26%) were indifferent, and 2% was negative; in school 6, 33 learners (77%) were positive, 6 (14%) were neutral, and 9% was negative. In school 7, 23 learners (64%) were positive, 10 (28%) were indifferent, and three learners (8%) were negative. The totals for positive responses is 193 (70%), those who are indifferent are 65 (24%), and 17 (6%) were negative.

4.3.10 Perceived behavioural control from the qualitative questionnaire

Participants were asked if they believed they were in complete control of their actions to protect the environment. A sample of answers is shown in Table 4.15.

Table 4.15: Perceived Behavioural Control from the qualitative questionnaire

Theme	Sub-theme	Example of verbatim evidence from data
Perceived behavioural control (individual's ease or difficulty of performing a particular behaviour)	Positive participants believe they are in full control to clean their environment with ease.	<p>“Yes, I do believe I’m in full control to protect the environment.” Learner 1, School 1</p> <p>“Yes, I always pick up waste and throw it in the dustbin.” Learner 6, School 1</p> <p>“Yes, I’m in control of what I do whether right or wrong.” Learner 16, School 3</p> <p>“Yes my actions will show I care for the environment.” Learner 7, School 2</p>
	Negative belief-participants do not believe they can clean their environment	<p>“I feel like I’m stupid and I’m wasting my energy.” Learner 12, School 2</p> <p>“No, I can’t do it alone, others should also help.”</p>

		<p>Learner 6, School 1</p> <p>“Sometimes I forget and throw litter on the floor.”</p> <p>Learner 8, School 2</p>
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Regarding perceived behavioural control, most learners stated they believe they are in full control to put litter in the waste bins, but they do not think they are willing to pick up litter around the school. They believe they are in full control to care for the environment, but most learners feel it is a shame to pick up litter in the school. Those who have negative opinions explained that everyone who collects litter must be everyone. They also feel it is a waste of time because other learners continue to litter on the school grounds.

4.4 Behavioural intentions of the learners in all the schools

Table 4.16 shows a comparison of the TPB constructs in all the schools. Firstly, the overall behavioural intentions are quite high, with 0.158 among all learners in all schools. The learners’ attitudes are also more upbeat, with a significance of 0.076. Secondly, control beliefs are moderate with 0.057. Thirdly, what is more noticeable is that social norms are low; perceived norms of 0.003 and normative beliefs of 0.009.

Table 4.16: The results showing the TPB constructs in all the schools

	Intention	Attitude	Perceived Norm	Behavioural Beliefs	Normative Beliefs	Perceived Behavioural Control
Kruskal Wallis H	9,295	11,433	20,078	13,899	17,123	12,244
df	6	6	6	6	6	6
Asymp.Sig	0,158	0,076	0,003	0,031	0,009	0,057

The Mann-Whitney test is used to determine statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable

Ramazan, 2014). You may have more than five groups, determining the differences between the groups. The test allows data to be measured at the ordinal or continuous level. Examples of ordinal variables include the Likert scales. The data in the current research is ordinal data. There are also different participants in each group, with no participant in more than one group. Table 4.17 shows a summary of behavioural intentions in all the schools. The high percentages show positive behavioural intentions.

Table 4.17: Behavioural intentions of all learners in all the schools according to TPB construct

School	Item	Behavioural Intention	Percent
1	Behavioural intentions for learners.	Positive	55.9
		Neutral	35.3
		Negative	8.8
2	Behavioural intentions for learners.	Positive	64.5
		Neutral	29
		Negative	6.5
3	Behavioural intentions for learners.	Positive	52.3
		Neutral	20.5
		Negative	27.3
4	Behavioural intentions for learners.	Positive	53.3
		Neutral	24.4
		Negative	22.2
5	Behavioural intentions for learners.	Positive	52.4
		Neutral	33.3
		Negative	14.3

6	Behavioural intentions for learners.	Positive	58.8
		Neutral	27.9
		Negative	13.3
7	Behavioural intentions for learners.	Positive	57.8
		Neutral	27.8
		Negative	14.4

As discussed earlier, the behavioural intention was used as a waste management practice proxy. Behavioural beliefs, attitudes towards the beliefs, normative beliefs, subjective norms, control beliefs, and perceived behavioural control produce behavioural intentions, producing the observable behaviour in waste management practice. Table 4.17 shows the behavioural intentions of the schools. What emerged is that most learners in all the schools have positive behavioural intentions. When we look closely at each school, the percentage with positive intentions is just above (50%). School 1 has (59%) and school 2 has (65%), school 3 has (52%), school 4 has (53%), school 5 has (53%), school 6 has (59%) and school 7 has (58%).

Also, what is notable about the data is that most learners fall on the neutral and negative categories. Both neutral and negative categories amount to almost half each class, which is a high number of learners. The percentages are as follows; school 1 has (44.1%) and school 2 has (35.5%), school 3 has (47.8%), school 4 has (46.6%), school 5 has (47.6%), school 6 has (41.2%) and school 7 has (42.2%). This means a high number of learners are either negative or neutral, which is cause for concern. School 3 and 4 had the highest percentage of negative intentions, school 3 shows (27%) and school 4 has (22%).

4.5 Behavioural practices of the Grade 10 learners

The second objective of the research is to identify the behavioural practices of the Grade 10 learners about solid waste management in all the schools. Learners had to respond to their environmental practices when asked the three questions. The following data is presented regarding the questions: i) throwing litter on the floor if there is no dustbin, ii) picking up waste material around the school and iii) putting waste material in the dustbins.

Table 4.18 shows responses from learners with regards to behavioural practices. Most responses are negative. The negative responses come from picking up litter around the school. The learners indicated that they do not like walking around the school picking up litter. There is (47.1%) of learners in school 1, one who reported positive behavioural practises and (59.2%) reported negative, from school 2, (51.6%) reported positive practices and (48.4%) reported negative, school 3 had (45.5%) positive and (54.5%) negative, in school 4 (53.3%) reported positive practices and (46.7%) are negative, school 5 had (40.5%) positive and (59.5%) negative, school 6 had (41.8%) positive and (58.2%) negative, school 7 had (41.7%) positive and (58.3%) negative practices.

Table 4.18: Behavioural practices of the Grade 10 learners from the quantitative questionnaire

Site	Response	Frequency	Percentage
School 1	significantly positive practise	5	14.7
	moderately positive practise	11	32.4
	moderately negative practise	15	44.1
	significantly negative practise	3	8.8
School 2	significantly positive practise	6	19.4
	moderately positive practise	10	32.2
	moderately negative practise	15	48.4
School 3	significantly positive practise	9	20.5

	moderately positive practise	11	25.0
	moderately negative practise	15	34.1
	significantly negative practise	9	20.4
School 4	significantly positive practise	5	11.1
	moderately positive practise	19	42.2
	moderately negative practise	12	26.7
	significantly negative practise	9	20
School 5	significantly positive practise	7	16.7
	moderately positive practise	10	23.8
	moderately negative practise	15	35.7
	significantly negative practise	10	23.8
School 6	significantly positive practise	7	16.3
	moderately positive practise	11	25.5
	moderately negative practise	22	51.2

	significantly negative practise	3	7.0
School 7	significantly positive practise	5	13.9
	moderately positive practise	10	27.8
	moderately negative practise	14	38.9
	significantly negative practise	7	19.4

Table 4.19 shows responses from learners with regards to behavioural practices. Most responses are negative. The negative responses come from picking up litter around the school. The learners indicated that they do not like walking around the school picking up litter. There is (47.1%) of learners in school, one who reported positive behavioural practise and (59.2%) reported negative, from school 2, (51.6%) reported positive practices and (48.4%) reported negative, school 3 has (45.5%) positive and (54.5%) negative, in school 4 (53.3%) reported positive practices and (46.7%) are negative, school 5 has (40.5%) positive and (59.5%) negative, school 6 has (41.8%) positive and (58.2%) negative, school 7 has (41.7%) positive and (58.3%) negative practices.

4.5.1 Behavioural practices of Grade 10 learners from qualitative questionnaire

The following data is presented regarding the questions: i) Throwing litter on the floor if there is no dustbin, ii) Picking up waste material around the school and iii) Putting waste material in the dustbins. Behavioural practices reported by learners are described in the qualitative questionnaire.

Table 4.19: Behavioural practices of the grade 10 learners from qualitative questionnaire

Theme	Example of verbatim evidence from data
Throwing litter on the floor	<u>Positive responses</u>

<p>if there is no dustbin</p>	<p>-No, I won't rather keep it in my bag and go look for a dustbin. Learner 2</p> <p>-I will put it in my bag and throw it in the dustbin when I arrive at home. Learner 3</p> <p>-No because I will be promoting dirty environment and polluting my space. Learner 5</p> <p>-I will put it in pocket or bag until I find a dustbin. Learner 11</p> <p>-No, I will keep it until I find a dustbin as I want to keep the environment clean. Learner 14</p> <p>No, I don't throw litter on the floor because I care about my school. Learner 20</p> <p style="text-align: center;"><u>Negative Responses</u></p> <p>Yes Learner 40, Yes, I would. Learner 8 may be. Learner 15 and 32</p>
<p>To clean up waste material around the school</p>	<p style="text-align: center;"><u>Positive responses</u></p> <p>-Yes, starting from today because I need to help keep our school clean. Learner 35</p> <p>-Yes, for our school to be clean and healthy. Learner 33</p> <p style="text-align: center;"><u>Negative Responses</u></p> <p>Not quite because it is more of a difficult process. Learner 32</p> <p>-No, it will make me stupid among other kids. Learner 12</p> <p>No, there are people for that. Learner 30</p>
<p>Putting waste material in the dustbins from then onwards.</p>	<p style="text-align: center;"><u>Positive responses</u></p> <p>-Yes, because I have learnt a lot. Learner 38</p>

	<p>-Yes, because this discussion made me see that it is good to learn in a clean healthy environment. Learner 11</p> <p>-Yes, so that we can stay in a clean and healthy environment. Learner 19</p> <p>-Yes, because I know how waste affects us. Learner 41</p> <p style="text-align: center;"><u>Negative Responses</u></p> <p>-May be when I feel like cleaning. Learner 15</p> <p>-No because there are people employed for that. Learner 8</p> <p>-No because I don't want people to stare at me. Learner 31</p>
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Out of the 42 learners who answered the qualitative questionnaire, only a few said they would throw litter on the floor, and some said that they would possibly throw litter on the floor if there was no dustbin around. The rest reported they would not throw litter on the floor. They would rather keep it until they find a dustbin, or they would put it in a plastic bag and throw it in the dustbin at home. Picking up waste material around the school is a challenge for most learners. There are changes in responses when it comes to this question, even the ones determined to make the school and the whole environment clean answered differently to this question. Some responded that they do not like to pick up litter around the school, though it is beneficial. The stigmatisation of collecting litter around the school came with reasons like learners will look stupid if they pick up litter around the school; some say they feel embarrassed. Some just said they would not go around picking up litter without stating reasons. After filing the questionnaire, most learners responded positively to putting waste material in the dustbins. Some learners said they would not pick up litter since people were employed to clean the school; others were negative without stating any reason.

When behavioural intentions and practices are compared, they are almost at a similar wavelength. The average score for behavioural intentions is 56.4%, while practices are at 53%. This shows that the influence of intentions on practices is almost half. The schools and all stakeholders need to continue naturing the positive intentions so that practices can also improve.

4.6 Conclusion

This chapter presented the findings of the research. The results from background information revealed that learners are engaged in learning about how to care for the environment, formally at school and informally outside school. They agree that in subjects, especially Life Orientation and Life Science they learn about environmental problems and issues. They see notice billboards and notice boards with messages about caring for the environment. It also emerged that they hear about environmental degradation from their families, the media, and the health sector. These sources could shape their intentions about caring for the environment.

The two objectives of the research presented both quantitative and qualitative results. With regards to the first objective, the aim was to reveal the nature of behavioural intentions of learners. The data was presented in line with the TPB constructs, and it shows that most learners reported positive behavioural beliefs in all the six constructs. The qualitative data also revealed that most learners held positive views on solid waste management regarding the first objective. Regarding the second objective, there are differences between the schools. Though some learners reported positive behavioural practices, many reported negative ones. There is a slight difference between behavioural intentions whereby learners reported positive practices, and in behavioural practices, most learners reported negative practices.

CHAPTER 5: DISCUSSION OF RESULTS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

The chapter aims to interpret and describe the significance of the findings in the current research. New understandings and insights are discussed. The researcher explains the underlying meaning of the findings and states why they are significant. The discussion in this chapter draws from the data presented in the previous chapter and the context of the literature reviewed in chapter 2. Both quantitative and qualitative data were presented in the previous chapter 4. The results are also discussed through the lens of the TPB theory that guided the research. Reference back to the research question is important because the question guides the discussion in the current chapter.

Research questions were stated as follows:

1. What is the nature of behavioural intentions of Grade 10 science learners with regards to solid waste management?
2. What are the behavioural practices of Grade 10 science learners about solid waste management?

It is important to regularly reflect on chapters 1 and 2 to find out what already exists in the literature regarding the research question. The main findings of the research are organised according to the questions. Findings and their implications are discussed in detail in the following subsections. In the current chapter, there will also be a discussion of recommendations. The researcher assessed the nature of behavioural intentions of the Grade 10 science learners towards solid waste management. The findings were that the Grade 10 Science learner's behavioural intentions are positive towards solid waste management.

5.2 Research findings that support existing literature

5.2.1 Subjects where EE is taught

The results presented under biographical information revealed that there are discussions in class about EE in different subjects. The General Education and Training (GET) programme in South Africa provides the inclusion of EE in the school curriculum. In the learning outcomes in Life Orientation (LO), it is stated that environmental topics and issues must be covered in teaching and learning. All learners were enrolled for LO in the current research, as indicated in Table 4.3. It emerged that learners have most of the EE talk during teaching and learning of

Life Orientation. This was confirmed in the qualitative questionnaire that learners had completed. Closely following LO is Life Sciences, learners stated that they discussed environmental issues in Life Sciences lessons. One of the goals of Life Sciences is to promote an understanding of how humans have impacted the environment negatively and organisms living in it; an awareness of what it means to be a responsible citizen in terms of the environment and lifestyle choices they make that impact the environment (CAPS, 2012). Also, among the four knowledge areas in Life sciences, strand three is mainly about environmental studies, as stated in chapter 2. These expectations indicate an environmental discourse within the Life Sciences. Some learners in the current research mentioned that they learned about EE in Economics, and lastly, in Physical Science. The other subjects that were mentioned are Geography, English, and Home languages. Hebe (2019) confirmed that Life Orientation contains more topics that could facilitate the teaching and learning of EE. The fact that Languages were mentioned is proof that EE should not be discussed in science subjects only, which is the other reason why all subjects are included in the list of the current research. Muderrisoglu and Altanlar (2011) also confirm that EE is a vital tool to promote awareness and knowledge on various environmental issues.

5.2.2 Other Channels where learners learn about EE

Learners also learn about caring for the environment from other channels outside the school setting. These include billboards and notice boards, newspapers and magazines, hospitals, radios, televisions, and the internet. The current research discovered that electronic media is the leading channel whereby learners get information about environmental issues. Vogelaar and Priante (2021) have confirmed that most people use electronic media, especially social media, to pass information, support environmental campaigns, and discuss major environmental issues. They posit that the importance of EE in determining the value of social media can be done through the interaction between environmental educators and students or common people. This statement is an indication that environmental education can be disseminated through social media.

5.2.3 Learners behavioural intentions

The current research findings indicate that the Grade 10 science learners have positive behavioural intentions towards solid waste management. The findings were revealed from analysing both quantitative and qualitative data. In totality, the six constructs from the TPB theory that guided the research (behavioural beliefs, attitude towards the behaviour, normative

beliefs, subjective norms, control beliefs and perceived behavioural control) provide an aggregate of behavioural intentions. Behavioural beliefs were significantly positive among the six TPB constructs used to explore learners' intentions, followed by normative beliefs and perceived behavioural control.

The research is based on the premise posited by Ajzen (2006) that by measuring beliefs, we can gain insight into the underlying cognitive foundation and explore why people hold certain attitudes, subjective norms, and perceptions of behavioural control. After using all 6 TPB constructs, 57% of the learners had positive behavioural intentions towards caring for the environment. Positive behavioural intentions mean that the learners either had significantly positive or moderately positive beliefs about adopting pro-environmental behaviours. The positive intentions allude to the fact that when all other factors are met example, dustbins provided in the school, learners can commit to environmentally friendly behaviours. De Leeuw et al. (2015) also confirmed that the TPB theory is an excellent fit used as a framework for understanding high school students' pro-environmental intentions. It proved sufficient in their research. Their research reveals that TPB components with major effects are attitudes, subjective norms, and perceived behavioural control. These were found to have a significant effect on the students' intentions. Effendi et al. (2020) also analysed environmentally friendly behaviour among students using the TPB theory as a framework. They found that perceived behavioural control, subjective norms, and attitudes significantly contribute to intentions. The current researcher, like all the other researchers that have used the TPB theory, such as Desa (2011), De Leeuw et al. (2015), explored the specific antecedent beliefs which were significant in influencing individual behavioural intentions.

According to the TPB theory, behavioural beliefs lead to attitudes towards the behaviour, as was previously explained and shown in Figure 3.4. In the current research, the results of behavioural beliefs were the most positive at 85% among the TPB constructs. The results mean most learners believe that the consequences of disposing of litter in waste bins are good. Therefore, it is noteworthy that behavioural beliefs can strongly impact their intentions. Most learners were positive when asked if putting waste in dust bins is good and collecting litter around the school is good. To back this up, learners explained in the qualitative questionnaire that a clean environment means a healthy environment; by keeping a clean environment, they are also saving wildlife and marine life. Also, learners understood that a dirty environment leads to negative consequences like water and food-borne diseases, which heightens the cases

of sicknesses and death. There will also be a destruction of the natural surroundings. They appreciate the fact that a clean environment, on the other hand, means fewer diseases and leads to sustainable lives. As explained in the qualitative questionnaire, learners knew the detrimental effects of not caring for the environment. They also confirmed that they learned about the detrimental effects in subjects like Life Orientation and Life Sciences.

When analysing the learners' attitudes towards caring for the environment, they were found to be positive although not as high as the behavioural beliefs. It was stated in the current research that Fishbein and Ajzen (1980) define attitude as a positive or negative feeling in relation to the achievement of an objective. The TPB theory posits that attitudes are formed from behavioural beliefs. Therefore, through the analysis of the quantitative questionnaire, learners found it a good practice to put litter in the dustbins. Evidence from qualitative data showed that learners had positive attitudes. They declared that they feel good when they throw litter in dustbins because it shows that they care for the environment.

De Leeuw et al.'s (2015) finding in their research was that attitudes were among significant predictors of pro-environmental intentions. Attitudes of the high school students they studied in Luxembourg in Europe were positive. Effendi et al. (2020) also analysed pro-environmental behaviour among students using the TPB theory as a framework. They found that attitudes are significant contributors to intentions. Students showed a positive attitude towards waste management to protect the environment. Van Niekerk (2014) attests that high school students have positive attitudes towards caring for the environment. His research revealed that students had an acute awareness that poor waste management would negatively impact the country and themselves as individuals.

Another strong indicator of intentions in the current research was control beliefs which lead to perceived behavioural control. Control beliefs have questions that capture participants' confidence that they can perform the required behaviour, how difficult it is to perform the task and how likely the participant will do it, and perceived behavioural control reveals individuals ease or difficulty in performing a particular behaviour. The findings indicate that learners have positive control beliefs. Control beliefs are at 70% average of all the seven schools. In this regard, learners stated that they are confident, and they can put waste in the dustbins and collect waste material around the school. Most learners in the qualitative questionnaires responded that they would never throw litter on the ground, they would rather keep it in their bags and dispose of it off at home or when they find a dustbin. Learners were positive that they were in control of disposing of litter correctly. Most learners who completed the qualitative

questionnaire indicated that they would not throw litter on the ground; only a few said they would throw litter on the ground if there were no dust bins around.

The information about perceived behavioural control confirms what is found in the literature. De Leeuw et al. (2015) also found positive perceived control among high school students in Europe. The students were of similar age to the ones in the current research. Their ages ranged from 13-16 years. They found that perceived behavioural control strongly impacts intentions. Effendi et al. (2020) also confirm this finding that perceived behavioural control significantly influences intention. Their research also focused on high school students. Therefore, the current researcher can deduce that schools need to ensure the presence of factors that may facilitate the performance of environmentally friendly behaviour. Schools need to ensure that there are dustbins in and outside classrooms for learners to throw litter inside. The research by Msezane (2015) reported that grade 12 learners confirmed the absence of adequate dustbins inside the classrooms, which was a contributing factor of irresponsibility in disposing of litter. De Leeuw et al. (2015) assert that we facilitate the performance of eco-friendly behaviours and remove any potential barriers to exhibit the correct behaviour. So not having enough dust bins to put in the litter can hinder pro-environmental behaviours. Even the careless learners, as one learner in the current research, stated that they could throw litter on the ground if there is no dustbin (Table 4.13) can be encouraged to throw litter in waste bins if they are available everywhere in the school.

The findings with regards to normative beliefs as well as subjective norms are that both beliefs were positive. However, normative beliefs did not significantly contribute to the prediction of intentions. De Leeuw et al. (2015) also found that normative beliefs did not significantly contribute to the prediction of intentions. Normative beliefs are about social pressure; hence some significant others (friends, other learners, teachers, and parents,) as indicated in the questionnaires, can encourage learners to adopt environmentally friendly behaviour. On the other hand, subjective norms indicate that learners believe that important others (friends, other learners, teachers, and parents) would adopt environmentally friendly behaviours. This suggests significant others can play a role in encouraging learners to adopt environmentally responsible behaviour. Findings in the current research show that encouragement from significant others do not seem to be enough. This is because parents still do not believe their children must do any form of cleaning at school. Some learners explained in the qualitative questionnaire that other parents do not want their children to pick up litter at school. They argued that learners might get hurt, they might get dirty, some people are hired to clean the

schools, and the cleaners are the ones that are supposed to pick up litter. Normative beliefs are still not strong enough to inculcate highly positive behavioural intentions to learners.

It also emerged that the researcher did not expect to find positive behavioural intentions among learners. This was due to the researcher conducting the school visits in the afternoons after school's lunch breaks. Although the school entrances were clean, you could tell the school grounds men tried their best to keep the grounds clean, but when one walked in between the classrooms, there were papers, chips and sweets wrappers thrown on the floor along the corridors, and one could tell they were freshly thrown on the floor. This shows that despite their positive intentions, they were not committed to throwing litter in dustbins. Mbokazi (2016) also reported that litter was the order of the day, especially after breaks in most schools he visited while conducting research. Matsekolong (2017) also confirms that visibility of littered items around the school contributes to litter pollution and provides evidence that learners do not consider environmental risks of littering. De Leeuw et al. (2015) argue that although the high school students had positive behavioural intentions, they failed to act on them. Therefore, the challenge would be to design effective behaviour change interventions, and other litter collection resources need to be provided so that the learners behave accordingly.

Molapo's (2014) findings in Lesotho reveal that learners have sound theoretical knowledge and awareness of environmental problems but are not action competent about such problems. The research by Mudau and Msezane (2014) focused directly on learners' behaviour after being exposed to EE. Their findings were that learners continue to litter even after participating in EE as an extramural activity.

The current research reveals that learners' attitudes towards solid waste management are positive; however, a high number of learners fall in the neutral and negative categories. Both neutral and negative categories amount to above 40% of each class, which is an increased number of learners. This means many learners still need the motivation to adopt environmentally responsible behaviours. Desa et al. (2011) study in Malaysia among first-year university students showed that more than half of the students (65.9%) have negative attitudes towards solid waste management. It means there is still a lot to be done about caring for the environment.

The second question to answer was to determine the behavioural practices of the Grade 10 science learners about solid waste management. It was discussed in chapter 2 that behavioural practices are the actual application of environmental responsible behavioural ideas and

knowledge. The questions about the practices were centred on putting litter in dustbins, throwing litter on the floor if there is no dustbin and collecting litter around the school. The findings were that almost half of the learners had positive behavioural practices, although the percentage for behavioural practices is lower than behavioural intentions. Behavioural practices are at 53% compared to intentions at 56.4%.

The results may imply that although learners have positive behavioural intentions, they are not committed to behavioural practices. The same findings were reported by Ifegbesan (2010) in a knowledge-practice level assessment done in Ogun State, Nigeria. It was revealed that secondary school students from the sampled arrears were aware of waste problems in their school compounds, but they possessed poor waste management practices. Lacruz (2016) research with undergraduate students found that they were aware of the importance of proper solid waste management; they exhibited good attitudes towards the matter; however, relatively few students had exemplary practice levels.

What came up in the research is that learners are willing to engage in environment-saving initiatives and practices; therefore, their knowledge and skills need to be increased. Adeolu (2014) posits that solid waste management policies and enforcement of sanitation laws in Nigerian schools should be more energised until the ideal clean environment becomes a reality. This is true and should apply to all the countries in the world. We need to keep enforcing sanitation rules in schools until we reach the level of cleanliness we desire.

5.3 Findings that to the researcher's knowledge have not been reported

Subjective norms were the weakest indicators of intentions among the TPB constructs measured in the current research. Friends and other learners believe other learners must adopt environmentally responsible behaviours but not them. Learners point at each other that they should dispose of litter responsibly. When the qualitative questionnaires were analysed, the learners lamented being made a laughingstock by other learners for picking up litter around the school. They expressed negative feelings that their friends would laugh at them; they gave them funny looks if they picked up litter, it is so embarrassing to pick up litter in the school, and they look stupid if they pick up litter. What emerged is the stigma around picking up litter around the school. It seems the discouraging factor in subjective norms is friends and other learners at school. What is implied in this is that most learners do not have a problem throwing litter in the dust bins, provided the problem is when they must pick up litter that is already thrown on

the ground. The implication is that waste bins need to be available inside the classroom and outside so that litter can be thrown, then learners will not have to go around the school picking up litter. This also tells us that high school learners will show environmentally friendly behaviour if other learners do the same.

The findings are likely to be novel because other researchers did not explain this stigma as the learners did in the current research. The researcher's state factors affecting solid waste management in schools, and they stated different factors. Ajaegbo et al. (2012), in their study, mention lack of concern from learners and utterance of statements like someone is paid to clean up. Malepa (2014) reported that there were insufficient dustbins. Msezane and Mudau (2014) highlighted negligence and ignorance on the part of learners, lack of respect, lack of monitoring and proper knowledge about the environment, absence of litter bins, and someone paid to clean up, lack of punishment and peer influence. Doan and Jablonski (2012) said that learners blame other people saying discipline must come from higher authority.

The current research also revealed that learners' attitudes towards solid waste management are positive; however, what is noticeable is that many learners fall in the neutral and negative category. Also, for practices, a high percentage of learners still have negative attitudes. Both neutral and negative categories amount to above 40% in each class, which is a high number of learners. This means many learners still need the motivation to adopt environmentally responsible behaviours. Desa et al. (2011) results of their study done in Malaysia among first-year university students showed that more than half of the students (65.9%) have negative attitudes towards solid waste management. It means there is still a lot to be done about caring for the environment.

5.4 Recommendations for future research

Given that the current research reveals that learners have positive behavioural intentions, future research will need to identify pro-environmental behaviour change interventions further. We need to find interventions to encourage environmentally friendly action. De Leeuw et al. (2015) asserts that developing behavioural intentions knowledge is crucial for creating sound educational interventions to foster environmentally friendly behaviours. Gifford and Nilsson (2014) also attest to this fact when they suggest we develop measures to positively influence the beliefs and the measures to be implemented, especially in schools to put the beliefs into action. Since learners expressed discomfort in collecting litter around the school, the intervention should encourage learners to throw litter in the dustbin.

Studies such as Al-Khatib et al. (2007), Ifegbesan (2010) and Adams (2003) have indicated that knowledge about environmental issues does not necessarily lead to the right action as far as the environment is concerned. So, the best way would be to find and implement action-orientated interventions to change learner behaviour. A hands-on approach is needed to encourage environmentally responsible behaviour. The current researcher suggests if schools can celebrate environment days and do some cleaning activities or activities like planting trees during part of a day, to save the environment and teach learners valuable lessons about the environment. These activities can be accompanied by talks from teachers or parents, or other guests on how significant it is to care for the environment. These days can be made compulsory to be celebrated in all schools. Matsekolong (2017) confirms that schools must celebrate environmental days. This gives learners and teachers a chance to engage in environmental matters and offers outdoor learning, discouraging learners from littering.

It was confirmed in the current research that learners hate picking up litter around the school because other learners laugh at them. Learners do not mind throwing litter in the dustbins. The suggestion would be that if teachers and parents would teach learners not to throw litter on the ground in the first place. There will be no need to pick up litter around the school. Future research can develop measures to help schools emphasize “no litter” rules in their schools. The researcher being the teacher herself, had noticed that in schools, the tendency is to highlight all other rules like no late coming, commitment to schoolwork, and so on; one rarely here emphasizes the need to keep the school clean. Schools instead encourage personal cleanliness, not on keeping the environment clean. It is appalling to see food handlers picking up litter after lunch breaks, even in primary schools. Learners throw all sorts of litter after eating and go back to class. There is a loophole here we need to catch them young. An African proverb from *The Minds Journal* goes, “a tree is straightened while it is still young.” This applies to environmentally responsible behaviour; they need to learn to care for the environment while still young.

Environmental care awareness should be an ongoing exercise. Environment days, as it was mentioned, should be celebrated every year. People tend to stop doing an action if they are not reminded regularly. The wider school community should be involved in these initiatives. Another important thing is that one would hardly see a “No litter” banner or poster in all the schools. These small but essential daily reminders can cement responsible environmental behaviours in learners’ minds. If we encourage them to learn, we can encourage them to be

environmentally responsible, and this requires a small but continuous effort that is even not costly.

5.5 Conclusion

When reference is made to the research's main question, the findings are that the learner's intentions do affect their behaviour but not to a large extent. The learners have positive behavioural intentions, and their behavioural practices are positive but not as high as their intentions. The thing that affects their behaviour is when they have to go around picking up litter in the school. Most learners express hate for this practice, and there is a stigma around that. The action that needs to be taken to remedy the situation is to nurture the behavioural intentions that are the highest among learners because they will result in desirable behavioural practices.

Secondly, the behavioural intentions of the learners towards solid waste management were found to be positive. Behavioural beliefs were found to be significantly positive, followed by normative beliefs and then perceived behavioural control. The aim of the research was attained since it emerged that the three constructs mainly influence the learners' behaviours. It was also revealed that subjective norms play a major role in discouraging learners from adopting environmentally friendly behaviours. They fear other learners will laugh at them when they pick up litter.

Thirdly, it was discovered that practices are lower than behavioural intentions in determining behavioural practices. The findings were that the percentage for behavioural practices is lower than behavioural intentions. The results may imply that although learners have positive behavioural intentions, they are not as committed to behavioural practices as expected.

The participants in the research were high school learners, an important population because environmentally friendly habits may be established in early life and because high school learners are often exposed to environmental education as part of their curriculum. The research results support findings of the literature, showing that students in many parts of the world are developing more positive attitudes about responsible environmental behaviour to reduce environmental problems. This is a positive step towards solving environmental concerns; however, it is apparent that our educational system as a country needs to put more effort so that learners transfer their attitudes to behaviour. The learner's willingness to reduce problems related to the solid waste management needs to be developed. The research results also show that learners value cleanliness and want to mitigate the possible occurrences of diseases.

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UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2018/11/14

Ref: **2018/11/14/55095429/48/MC**

Dear Mrs Mavuso

Name: Mrs ZN Mavuso

Student: 55095429

Decision: Ethics Approval from
2018/11/14 to 2021/11/14

Researcher(s): Name: Mrs ZN Mavuso
E-mail address: Nkosikhonaz48@gmail.com
Telephone: +27 72 756 7791

Supervisor(s): Name: Prof LE Mnguni
E-mail address: mngunle@unisa.ac.za
Telephone: +27 12 429 4614

Title of research:

Grade 10 Science learners' behavioural intentions related to good practices of solid waste management in Vosloorus, Gauteng.

Qualification: M. Ed in Science and Technology Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2018/11/14 to 2021/11/14.

*The **negligible risk** application was reviewed by the Ethics Review Committee on 2018/11/14 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.

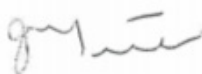


2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures 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.
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.
7. No field work activities may continue after the expiry date **2021/11/14**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

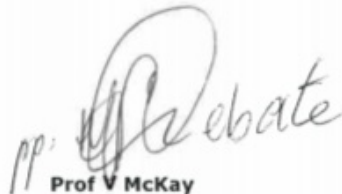
Note:

The reference number **2018/11/14/55095429/47/MC** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,



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



Prof V McKay
EXECUTIVE DEAN
Mckayvi@unisa.ac.za



Approved - decision template – updated 16 Feb 2017

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Appendix B: GDE RESEARCH APPROVAL LETTER



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	06 May 2019
Validity of Research Approval:	04 February 2019 – 30 September 2019 2019/10
Name of Researcher:	Mavuso ZNR
Address of Researcher:	19979 Ugoba street Mfundo Park Vosloorus, 1475
Telephone Number:	011 901 9617/ 072 756 7791
Email address:	55095429@mylife.unisa.ac.za
Research Topic:	Grade 10 science learner's behavioural intentions related to good practices of solid waste management in Vosloorus Gauteng
Type of qualification	Masters
Number and type of schools:	Seven Secondary Schools
District/s/HO	Ekurhuleni South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

Making education a societal priority

Office of the Director: Education Research and Knowledge Management

7th Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 355 0488

Email: Faith.Tshabalala@gauteng.gov.za

Website: www.education.gpg.gov.za

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



Mr Gumani Mukatuni
Acting Director: Education Research and Knowledge Management

DATE: 06 | 05 | 2019

Appendix C: A LETTER REQUESTING CONSENT FROM THE PRINCIPAL

The School Principal

I Request for permission to conduct research at ----- High school.

Title of the research: Grade 10 Science learners' behavioral intentions related to good practices of solid waste management in Vosloorus, Gauteng.

Date

The Principal Department of Education

Contact details of the person (tel and email address)

Dear (title and name),

I, Zanele Mavuso am doing research under supervision of Professor Lindelani Mnguni, a lecturer in the Department of Science Education towards a MED Environmental Education at the University of South Africa. We are inviting you to participate in a study entitled Grade 10 Science learners' behavioural intentions related to good practices of solid waste management in Vosloorus, Gauteng.

The aim of the study is to investigate the relationship between behavioural intentions, and knowledge of solid waste management amongst grade 10 science learners. Your school has been selected because it falls under the area of research. The study will entail learners answering quantitative and qualitative questionnaires.

The benefits of this study are that it will make a contribution in the body of research as far as developing a more thorough understanding of what motivates pro-environmental behaviour among young people since this is an important area of concern. There are no potential risks involved in the study. There will be no reimbursement or any incentives for participation in the research. Feedback procedure will entail the information obtained from this research will be made available to your child's school and can be used by the teacher to help your child during Environmental science lessons.

Yours sincerely

_____ (insert signature of researcher)

_____ (insert name of the above signatory)

_____ (insert above signatory's position)

Appendix D: A LETTER REQUESTING PARENTAL CONSENT

Research title: “Grade 10 Science learners’ behavioral intentions related to good practices of solid waste management in Vosloorus, Gauteng.”

Dear Parent

I would like to request your child to participate in my research project being undertaken at your child’s school. My research topic is “Grade 10 Science learners’ behavioral intentions related to good practices of solid waste management in Vosloorus, Gauteng.”

This research will entail the filling in of a questionnaire by your child. I will be a participant in conducting the survey in the distribution of questionnaires. I would like to promise you that the information obtained from this study will be treated in the strictest confidentiality possible, and it will be used for this research purposes only. Your names and the child’s names will not be revealed instead pseudo names will be used.

If you are willing to allow your child to participate in this study, please sign this letter as a declaration of your consent, i.e. that your child participate in this project with your permission and that you understand that he/she may withdraw from the research project at any time. Under no circumstances will the identity of participants be made known to any parties/organizations that may be involved in the research process.

There are no foreseeable risks to your child by participating in the study. Your child will receive no direct benefit from participating in the study; however, the possible benefits to education are that the study seeks to develop behavioural intentions knowledge as it is crucial for creating sound educational interventions that aim to foster environmentally friendly behaviours.

Your child’s participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly you can agree to allow your child to be in the study now and change your mind later without any penalty.

In addition to your permission, your child must agree to participate in the study and you and your child will also be asked to sign the assent form which accompanies this letter. The information gathered from the study and your child’s participation in the study will be stored securely on a password locked computer in my locked office for five years after the study. Thereafter, records will be erased.

Appendix E: A LETTER REQUESTING ASSENT FROM LEARNERS

Title of study: Grade 10 Science learners' behavioral intentions related to good practices of solid waste management in Vosloorus, Gauteng.

Dear learner

I am doing a study on "Grade 10 Science learners' behavioral intentions related to good practices of solid waste management in Vosloorus, Gauteng as part of my studies at the University of South Africa. Your principal has given me permission to do this study in your school. I would like to invite you to be a very special part of my study. I am doing this study so that I can find ways that your teachers can better the teaching and learning of environmental education. This will help you and many other learners of your age in different schools.

This letter is to explain to you what I would like you to do. There may be some words you do not know in this letter. You may ask me or any other adult to explain any of these words that you do not know or understand. You may take a copy of this letter home to think about my invitation and talk to your parents about this before you decide if you want to be in this study.

I would like you to write answers in a questionnaire with open-ended items, try to be as honest as possible. I will write a report on the study but I will not use your name in the report or say anything that will let other people know who you are. You do not have to be part of this study if you don't want to take part. If you choose to be in the study, you may stop taking part at any time. When I have finished with my study, I shall return to your school to give a short talk about some of the helpful and interesting things I found out in my study. I shall invite you to come and listen to my talk.

If you decide to be part of my study, you will be asked to sign the form on the next page. If you have any other questions about this study, you can talk to me or you can have your parent or another adult call me.

Do not sign the form until you have all your questions answered and understand what I would like you to do.

Researcher: Zanele Mavuso

Phone number: 0727567791

Appendix F: LEARNERS WRITTEN ASSENT

I have read this letter which asks me to be part of a study at my school. I have understood the information about the study, and I know what I will be asked to do. I am willing to be in the study.

Learner's name (print): Learner's signature: Date:

Witness's name (print) Witness's signature Date:

(The witness must be over 18 years old and present when signed.)

Parent/guardian's name (print) Parent/guardian's signature: Date:

Researcher's name (print) Researcher's signature: Date:

Appendix G: The Quantitative Questionnaire to be completed by Grade 10 Science learners

Title of the research: Grade 10 Science learners' behavioural intentions related to good practices of solid waste management in Vosloorus, Gauteng.

Thank you for accepting to participate in my study that seeks to investigate the Grade 10 Science learners' behavioural intentions related to good practices of solid waste management in Vosloorus. At this stage of my study I invite you to respond to the following questions based on environmental knowledge. You are kindly requested to take about 30 minutes. Your responses are not for marks and will be confidential and only used for the purpose of the research.

A What is your age, as at your last birthday?

--

A1	
----	--

B What is your gender?

a) Male

1

B1	
----	--

b) Female

2

C In the following list, mark all the subjects that you are currently taking.

a) Accounting

1

C1	
----	--

b) Business Economics

2

C2	
----	--

c) Economics

3

C3	
----	--

d) Geography

4

C4	
----	--

e) History

5

C5	
----	--

f) Life Orientation

6

C6	
----	--

g) Life Sciences

7

C7	
----	--

h) Mathematics	8	C8	
i) Physics	9	C9	
j) Other	10	C10	

D In the following list, mark all the channels through which you learn about waste management.

a) Billboards and notice boards	1	D1	
b) Church	2	D2	
c) Friends	3	D3	
d) Hospitals/doctors/nurses	4	D4	
e) Newspapers/magazines	5	D5	
f) Parents/family	6	D6	
g) Radio	7	D7	
h) School books	8	D8	
i) Teachers	9	D9	
j) TV	10	D10	
k) Internet	11	D11	
l) Other (<i>specify</i>)	12.....	D12	

For each of the following statements, fill in the questionnaire by indicating your choice by means of crossing (X) the appropriate box.

Attitude						
1. For me putting waste paper in dustbins is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
2. For me putting waste paper in dustbins is pleasant	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
3. For me collecting litter around the school is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
4. For me collecting litter around the school is pleasant	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
5. For me cleaning up waste material, such as empty cans, around the school is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
6. For me cleaning up waste material, such as empty cans, around the school is pleasant	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Perceived norm						
7. Other learners think it is good for me to put waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
8. Other learners approve of me putting waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
9. My friends think it is good for me to collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
10. My friends are happy if I collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
11. My family think it is good for me to clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
12. My family are happy if I clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
13. Teachers are happy if I collect litter in the classroom	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
14. Teachers think it is good for me to collect litter in the classroom	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Perceived behavioral control						
15. I am confident that I can put waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
16. Putting waste paper in dustbins is up to me	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
17. I can collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
18. Collecting litter around the school is up to me	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	

19. I can clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
20. Cleaning up waste material, such as empty cans, around the school is up to me	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Intention						
21. I am going to put waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
22. I am going to collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
23. I am going to clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Behavioral Beliefs						
24. I believe that putting waste paper in dustbins is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
25. I believe that collecting litter around the school is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
26. I believe that cleaning up waste material, such as empty cans, around the school is good	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Normative beliefs						
27. Other learners believe that it is good to put waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
28. My friends believe that it is good to collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
29. My family believes that is good to clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
30. Teachers believe that learners must collect litter in the classroom	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
Perceived behavioural control						
31. I believe that I can put waste paper in dustbins	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
32. I believe that I can collect litter around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	
33. I believe that I can clean up waste material, such as empty cans, around the school	Strongly agree 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree 5	

Appendix H: Qualitative questionnaire

Open ended Questions to be completed by grade 10 learners

Introduction

Answer all questions about environmental education. You are encouraged to feel free to express yourself and write your own views. Your privacy will be protected. You are not required to divulge any information that you have given to any person outside the group. This will help to maintain confidentiality.

Answer the following questions as genuinely as you can:

Knowledge

1. Do you talk about caring for the environment in your lessons in class?

2. Which subjects have topics that cover caring for the environment?

Attitude

3. How do you feel about putting litter in the dustbins?

e.g., pleasant, embarrassed, good, support your

answer _____

4. Do you feel it is beneficial to put litter in the dust bins? Elaborate

5. How do you feel about collecting waste material such as papers around the school?

Perceived norm

6. What do your friends feel about collecting waste material around the school?

7. What do your teachers feel about collecting waste material around the school?

8. Are your families happy if you clean up waste material, such as empty cans, around the school? Elaborate

Perceived behavioural control

9. Will you throw litter on the floor if there is no dustbin?

10. Do you believe you are in full control of your actions to protect the environment? Elaborate

Intention

11. Are you going to clean up waste material, such as empty cans, around the school after this exercise?

Elaborate

12. Are you going to put waste material in the dustbins after this exercise? Elaborate

Appendix I: Language Editing Certificate

26 January 2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam

Re: Editorial Certificate

This letter serves to prove that the thesis listed below was language edited for proper English, grammar, punctuation, spelling, as well as overall layout and style by myself, proprietor of Dr. Thesis (Pty) Ltd.

Thesis Title: The Grade 10 Science learners' behavioural intentions related to good practices of solid waste management in Vosloorus, Gauteng.

Degree: Master of Education

Author: Zanele Nkosikhona Roster Mavuso

The research content or the author's intentions were not altered in any way during the editing process. However, the author has the authority to accept or reject my suggestions and changes. I, the editor can guarantee the quality of my editing and mentorship abilities, however I cannot guarantee that the examination board will accept the thesis with a pass. This will depend on the hard-work, persistence and amount of effort put in by the mentee.

Should you have any questions or concerns about the edited document, I can be contacted at the listed telephone numbers or email addresses.

Yours truly,
Dr. Eden Padayachee
(Proprietor/ PhD. Medicinal Biochemistry)



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