

**THE DEVELOPMENT OF A TEACHING AND LEARNING
PROGRAMME TOWARDS SUSTAINABLE LIVING THROUGH
PROPER WASTE MANAGEMENT IN SCHOOLS IN GIYANI
AREA, LIMPOPO PROVINCE**

by

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(i)

DECLARATION

I declare that **the development of a teaching and learning programme towards sustainable living through proper waste management in schools in Giyani area, Limpopo Province** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Date

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DEDICATION

This work is dedicated to the three members of my study team Rachel Chabalala, John Golele and to the memory of Fredrick Matjokane, you will remain forever in our hearts.

ABSTRACT

The study is about how the development of a teaching and learning programme may lead proper waste management in Limpopo. It is a case study and ten schools were identified. The questionnaire was handed out to learners and educators who participated as respondents. From the analysis of the views expressed on the questionnaire completed by the learners and educators, they indicated that there is no waste management programmes. Literature review in this study indicated how teaching and learning programmes have been developed globally and in South Africa with reference to industries, communities and schools. The questionnaire revealed that many schools did not have waste management programmes therefore it was confirmed that the development of a teaching and learning programme could lead to proper waste management

KEY TERMS

Development, teaching, learning, waste, waste management, programme, teaching and learning programme

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CHAPTER 1

1. *ORIENTATION*

1.1 Introduction

1.1.1 Global environmental waste

Waste generation is a global problem, which threatens sustainability in the world. Technological advancement, industrialization and the high population growth in many countries around the world directly or indirectly increase the exploitation of some natural resources such as water, land and air (Jenman 2000:2). The by-products are dumped as waste in water resources and on land, and the incineration of other by-products causes air pollution (Jenman 2000:2). In England and Wales the combination of industrial, commercial and household waste amounts to over 100 million tonnes annually (www.defra.gov.uk, accessed on 26 March 2006).

In 2003/04, paper and cardboard accounted for almost a third of all household waste collected for recycling, with almost 1, 3 million tonnes being collected in England. This means, however, that there is still a considerable amount that is not recycled and ends up in landfill or is incinerated (www.wasteonline.org.uk accessed on 16 June 2006).

The British Government set out its vision for sustainable waste management in *Waste Strategy 2000*. Provisional figures show that in 2004/05 English households recycled more than a fifth of their waste (approaching 23%) – one of the lowest rates in Europe (www.defra.gov.uk, accessed on 26 March 2006).

According to Stallworthy and Kharbanda (1990:215) cooperation between countries is needed for an effective waste management programme to be implemented throughout the world. Concern for waste management throughout the world led to the formation of a number of international agencies such as the International Labour Organisation (ILO), the United Nations Environmental Programme (UNEP), the European Commission (EC) and the World Health Organisation (WHO) focussing, among other things, on environmental waste management (Stallworthy & Kharbanda 1990:215–216). Because of high levels of waste generation around the world, more countries are gradually engaging in waste management programmes in order to reduce waste. For example, in England the government made a public commitment in 1990 to raise levels of household recycling to 25 percent by the year 2000. That was part of a new environmental management strategy set in the British government's White Paper: *This common inheritance* (Gandy 1993:1).

What should be done with the waste we produce is a world-wide problem, although the solutions should be provided locally. Many organizations in the UK – governmental and independent, local and national – are trying to move Britain

forward towards a sustainable society (www.wastewatch.org.uk, accessed on 16 June 2006).

In California, USA, schools dispose large amounts of waste (approximately 764 tonnes per year) (<http://ciwmb.ca.gov/publications>, accessed on 6 June 2006). The waste generated by the schools pose a threat to the health of students and staff, and also to the environment, therefore, schools should review processes and operations, and even curriculum choices. Schools should also learn about successful waste prevention, composting and recycling waste programmes throughout the state (<http://ciwmb.ca.gov/publications>, accessed on 6 June 2006).

1.1.2 National environmental waste

Waste management has been badly neglected for some time in South Africa. New approaches are required to handle rapid urbanisation, recycling and industrial waste through legislation for proper waste management in various regions and provinces in South Africa. As part of executing its responsibility the National Department of Environmental Affairs and Tourism (DEAT), the Department of Water Affairs and Forestry (DWAFF) together with the Danish Cooperation for the Environment and Denmark (DANCED), initiated a project for the development of a National Waste Management Strategy to promote sustainable living (Enviro-Tour 1999:3). The purpose of this project was to focus on capacitating communities on how to manage

waste, as provision of basic waste management services to all South Africans was identified as one of the country's needs.

Furthermore, in the *White Paper on Environmental Management Policy in South Africa* (Department of Environmental Affairs and Tourism 1999:47), the Department of Environmental Affairs and Tourism (DEAT) was identified, among others, to take overall responsibility for waste management as part of its commitments in South Africa. The DEAT had to ensure that the Government encouraged waste recycling, separation of waste at the source and safe disposal of unavoidable waste in order to promote sustainable living amongst South African citizens (Department of Environmental Affairs and Tourism 2000:54).

The South African National Waste Management Strategy was developed in 1997 to ensure adequate waste planning and minimization (Jenman 2000:41). That document was entered into legislation on environmental management but many people did not consider it to be adequate. Just as in the rest of the country, South African schools also produce large amounts of environmental waste.

1.1.3 Formal school environmental waste

Through observations, the researcher realised that many schools in the Greater Giyani Municipality produce a variety of wastes, which often take the form of

either solids, liquids or gasses. According to Fuggle (1992:509) local authorities in South Africa have found that it costs up to three times as much to collect and dispose litter as it does to handle waste that is placed in a formal waste stream. Litter is a problem in many schools. For example, many schools produce waste such as plastic bags which some learners use to carry their school books. Sales in schools also produce a lot of waste as drinks are sold in disposable cups and tins. Photocopying more than necessary handouts in schools, learners not writing on both sides of the sheet and learners not throwing waste in the designated containers are other ways in which schools produce waste (www.ci.fort-collins.co.us accessed on 16-06-2006). Schools can avoid producing too much waste by organising separate collections of waste in each classroom and for learners to buy returnable, re-usable and recyclable packages. Learners should also create posters, leaflets and stickers on the avoidance of waste (www.ci.fort-collins.co.us accessed on 16-06-2006).

On 31 October 1998, the National Department of Environmental Affairs and Tourism (DEAT) launched a national waste management campaign, Enviro-tour (1999). The aim of the campaign was to inculcate the culture of responsibility with regard to waste management upon South African communities (schools included) to enable them to innovate projects designed to abate the waste and pollution problem. It is the duty of the schools to design projects, which will help them to keep their school buildings and grounds free from waste (Enviro-tour 1993:3).

Having observed the state of the environment in our schools, the researcher has realized that there is a need to develop teaching and learning programmes for proper waste management in schools.

1. 2 The need to develop teaching and learning programmes for waste management in schools

There is a need to develop teaching and learning programmes, because teachers have an important role to play in introducing learners to the concept of waste management and to assist them to better understand how to develop more sustainable living practices in schools (Enviro-Teach 1997:10). Activities such as collection, sorting, storing and recycling of waste will be helpful for learners to learn at school.

According to Frick (EE Bulletin 2000:18) sustainable living begins with education because through education schools and the society at large can be reached and taught to live in a sustainable way. Therefore there is a need to develop teaching and learning programmes in schools to empower learners and educators to take initiatives to manage waste properly. It is important for schools to engage in waste management activities such as sorting litter, waste recycling projects and waste audits because these can result in visible improvements to the surrounding environment (EE Bulletin 2000:3).

The development of teaching and learning programmes will reinforce what the former minister of Education, Dr Kader Asmal said in the foreword of the booklet *enviro Days 2000* (EE Bulletin 2000:3). He stated that the environment continues to be a key priority of the Department of National Education. This became more evident when Dr Razeena Wagiet, a long standing member of Environmental Education Association of South Africa (EEASA) was appointed as the environmental education advisor to the former minister of National Education, Dr Kader Asmal, in September 1999 (EE Bulletin 2000:3). Schools can play an important role in the reduction of waste by reducing, reusing and recycling waste.

1.2.1 Reduce

To reduce is to use less in order to save natural resources and to produce less waste, for example, by buying in bulk (www.airdefenders.org/docs/glossary.htm, accessed on 4 December 2007). Waste management plans in schools should always be to reduce the amount of potential waste generated by learners (Jenman 2000:16). Reducing waste is not the responsibility of schools only – industries, businesses and individuals all have a role to play in reducing waste (Jenman 2000:16).

1.2.2 Reuse

To reuse is to collect and reprocess manufactured materials for reuse either in the same form or as part of a different product (www.earthdaymc.org accessed on 4

December 2007). Another definition of the term "reuse" is using a product or component of municipal solid waste in its original form more than once for example, refilling a glass bottle that has been returned (www.nsc.org/ehc/glossar.2.htm, accessed on 4 December 2007). People tend to discard some items such as plastic shopping bags after they have been used once. By using the same shopping bags when going shopping again is another way of reusing plastic bags (Gerrans 1994:34). Learners can also reuse plastic bags by using them to carry books or other items to school. Reusing is an even more environmentally friendly method of reducing pollution and using less energy than recycling (Frohlich: 2000).

1.2.3 Recycle

Recycling means reutilization of a material in an environmentally sound manner that will not result in hazards to human health or the environment (www.epa.state.oh.us/opp/guide/p2pch3.html, accessed on 4 December 2007). According to Jenman (2000:19) recycling can be useful to youth groups and schools as a way of raising funds by turning waste into useful objects, for example turning plastic bags into mats or hats and by turning cans into toys or tin flowers. Learners should be exposed to recycling activities at an early age so that they grow up with the knowledge of managing waste through recycling. Learners should be

encouraged to choose recyclable packaging and to ensure that they recycle as much waste as possible (Jenman 2000:102).

1.3 Statement of the problem

1.3.1 Some factors leading to the problem of the study

In schools a lot of waste is generated through littering. Litter that is evident in many school grounds around the Greater Giyani municipal area takes the form of paper, cans, fruit peels and plastic. Litter continues to degrade the school environments despite some attempts made by environmental clubs, such as community groups and some schools, in organizing clean-up campaigns. These campaigns are not sustained as the responsibility of cleaning up diminishes as soon as the campaign ends and many people who participated in the campaign tend fall back to their old habits of littering.

Another factor is that there are no teaching and learning programmes for waste management in schools and there are only a few teachers who are qualified to teach in an environmentally directed way (Lebeloane 1998:14). Waste cannot be properly managed in schools if only few teachers are qualified to teach in this way. The success of waste management teaching and learning depends on how well teachers are trained. The above mentioned and other reasons necessitate the development of

teaching and learning programmes for proper waste management in primary schools in Limpopo.

1.3.2 Problem of the study

The main problem of this study is that there are no teaching and learning programmes for proper waste management in schools in Limpopo. This necessitates the development of a teaching and learning programme for teachers and learners to follow in order to promote sustainability through proper waste management.

1.4 Aim of the study

The aim of this study is to develop a teaching and learning programme towards sustainable living through proper waste management in schools in Limpopo.

1.5 Hypothesis

Waste can be properly managed in primary schools in Limpopo through the development of a teaching and learning programme for proper waste management.

1.6. Definition of terms

The key terms which will be defined in this study include teaching, learning, programmes, waste management, development and Limpopo.

1.6.1 Teaching

According to Heinlich and Norland (1994:24), "teaching is guiding and directing the learning process in such a way that learners acquire new knowledge, skills or attitudes, increase their enthusiasm for learning and develop their skills as learners even further". The Oxford Advanced Learners' Dictionary (1995:1014) defines "teaching as the work or a profession of a teacher." In (<http://www.wordreference.com>, accessed on 12 September 2006), "teaching is referred to as the activities of educating, instructing and imparting knowledge or skill." For the purpose of this study, teaching implies guiding the learners to participate in waste management projects such as recycling of different waste products which include paper, cans, plastic and food waste to create useful products as a way of reducing waste.

1.6.2 Learning

According to the Oxford Advanced Learner's Dictionary (1995:547) "learning is knowledge gained through study." Le Roux (2000:341) defines "learning as a form of 'meaning making' to create an experience in which the student can arrive at creative encounters, be drawn out and make meaning." "Learning also refers to concerted activity that increases the capacity and willingness of individuals, groups, organizations and communities to acquire and productively apply new knowledge

and skills, to grow and to mature and to adapt successfully to changes and challenges”(www.mwls.co.uk, accessed on 16 June 2006). An organism is said to have learnt when it has increased its options for applying new or different behaviour to a specific set of circumstances which the organism believes will be to its benefit (www.mwls.co.uk, accessed on 16 June 2006).In this study learning refers to a process of acquiring knowledge through participation of learners in waste management activities and projects such as recycling of cans, plastic, papers and food waste.

1.6.3 Waste management

There are many definitions of the terms "waste", "management" and "waste management" respectively. Some examples thereof will be cited below, followed by the definition of waste management for the study. According to the White Paper on Integrated Pollution and Waste Management for South Africa (Department of Environmental Affairs and Tourism 2000:59), "waste is an undesirable or superfluous by-product, emission or residue of any process or activity which has been discarded, accumulated or been stored for the purpose of discarding or processing." It may be gaseous, liquid or solid or any combination thereof and may originate from a residential, commercial or industrial area.

According to the First Report on the situation for waste management and pollution control in South Africa (CSIR 1991:6), "waste is any substance having no perceived use for the organism or system that produces it." According to the Oxford Advanced Learners' Dictionary (1995:712) "management is the practice of controlling a business or other activity." Van der Bank (1994:2) defines "management as a specific type of work, which is goal-oriented and consists of a process which involves people." This process consists of a managerial function of planning, organizing, leading and controlling.

According to the First Report on the situation for waste management and pollution control in South Africa (CSIR 1991:6), waste management includes any activity which affects the quality, quantity or effects of waste produced. Furthermore waste management is defined as "the reduction, reuse and recycling of wastes, with disposal being the last resort (www.uwa.edu.au/ accessed on 16 June 2006). Another definition of waste management is that "it is the collection, transportation, processing or disposal of waste materials, usually ones produced by human activity, in an effort to reduce their effect on human health or local aesthetics or amenity (www.uwa.edu.au/ accessed on 16 June 2006).

In this study, waste management "refers to all the projects and activities designed by the teachers to engage learners in the proper managing of waste." Waste management involves waste prevention, minimization, resource recovery, treatment

and disposal of waste. The waste management process may take any of the following forms:

- **Waste prevention:** the prevention and avoidance of the production of waste
- **Waste minimization:** the reduction of the volume of waste during production
- **Resource recovery:** recycling of waste or the recovery of energy through incineration and biodegradation
- **Treatment:** the treatment of waste to reduce the volume or the hazardousness thereof
- **Disposal:** the safe disposal of waste so that it will not pollute the environment or cause health hazards (Department of Water Affairs and Forestry 1998:v)

1.6.4 Programme

According to the *Oxford Advanced Learners' Dictionary* (1995:767), "a programme is a series of events that has been planned or that has to be done." Le Roux (2000:132) refers to "a programme as a plan of work, which guides the activities, assessment and achievement." A programme is also defined as "a series of planned projects to be undertaken" (www.crystalreference.com, accessed on 12 April 2006). In this study, a programme refers to a series of activities and projects designed to manage waste.

1.6.5 Development

According to the *Oxford Advanced Learners' Dictionary* (1995:253), "development is the work done on studying and improving on previous or basic models, designs or techniques." In this study development refers to the establishment of teaching and learning programmes for proper waste management in primary schools.

1.6.6. Limpopo

The Limpopo Province is the "northernmost province of South Africa" (www.enwiki.org/wiki/LimpopoProvince accessed on 4 December 2007).

Another definition is that the Limpopo Province in South Africa "is the northernmost part of the country."

(<http://ca.encyclopedia.msn.com.encyclopedia/features/dictionary.aspx?> accessed on 31 March 2006). In this study Limpopo refers to the northernmost province of South Africa.

1.7. Research method

The *Oxford Advanced Learners' Dictionary* (1995:996) defines "research as a careful study or investigation of phenomena which is done with the objective of discovering new facts." The *Longman Dictionary of Contemporary English* (1995:1205), on the other hand, defines "research as the activity of finding

information about something that you are interested in or need to know about."

Furthermore, research is defined in the following ways:

- As a human activity based on intellectual application in the investigation of matter. (www.en.wikipedia.org/wiki/Research_Methods accessed on the 13th November 2008)
- As a systematic approaches to gathering information that rely on established processes and procedures drawn from scientific research techniques, particularly those developed in the social and behavioural sciences. Examples include surveys, focus groups, interviews and observation. (www.utexas.edu/academic/diia/assessment/iar/glossary.php accessed on the 13th November 2008)
- As an organized and systematic way of finding answers to questions (www.linguistics.byu.edu/fuculty/henrichsenl/researchmethods/RM-0-031.html accessed on the 13th November 2008)
- As a scientific or critical investigation aimed at discovering and interpreting facts (www.wikimediafoundation.org/ accessed on the 13th November 2008)

For the purpose of this study, research refers to a scientific inquiry of which the aim is to investigate ways in which the development of waste management teaching and learning programmes can help to reduce littering and bring about sustainability in schools. There are two basic types of research, namely, qualitative and quantitative

research. Qualitative research describes or analysis a phenomenon without specifically measuring variables. This is useful in the categories for understanding human phenomena, and for investigation and interpretation of meaning which people give to events (Schumacher & McMillan 1993:372).

Qualitative research will be employed in this study. Qualitative research is a naturalistic inquiry, which uses non-interfering data collection strategies to discover the natural flow of events and processes and how participants interpret these (Schumacher & McMillan 1993:372). Qualitative research also describes and analyzes peoples' individual and collective social actions, beliefs, thoughts and perceptions (Schumacher & McMillan 1993:372). This method of research is appropriate for this study because there will be a collection of data through interviewing and observing respondents in their environment or social setting. This method can also be used to uncover and understand what lies behind any phenomenon about which not much is known, for example waste management (Schumacher & McMillan 1993:372).

1.8. Demarcation of the study

There are 88 schools in the Greater Giyani Municipality in Limpopo. Out of these, 27 are high schools and 61 are primary schools. Ten primary schools will be used to

gather data. That is a reasonable sample for the study. Those which are in the proximity of the researcher will be identified and used in this study.

1.9. Research programme

In chapter 2 literature will be reviewed to show how teaching and learning programmes have been developed globally, and in South Africa, with reference to communities, industries and schools. Chapter 3 focuses on empirical research about the development of teaching and learning programmes for proper waste management in primary schools. Qualitative analysis and interpretation of the development of teaching and learning programmes for proper waste management in primary schools will be made. Chapter 4 focuses on the summary of findings, testing the hypothesis with the use of the instrument developed in chapter three and includes recommendations.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

This chapter focuses on reviewing the literature on the development of teaching and learning programmes for waste management in primary schools. Firstly, the global development of teaching and learning programmes will be discussed. Thereafter the focus will be on the development of teaching and learning programmes in industries, communities and schools in South Africa.

2.2 How teaching and learning programmes have been developed globally

Waste is a global problem. Many countries around the world have developed different waste management programmes in order to deal with the problem of waste (Kimball 1992, Hudson 1992, Mayet 1994, United States, Environmental Protection Agency, Office of Solid Waste and Emergency Response, Prufer 1995, Mears 1998, Solo 1999, Khumalo 2000, <http://ciwmb.ca.gov>, www.ladpw.org, accessed on 6 June 2006). The programmes discussed below have been developed by different countries as way of teaching their citizens about proper waste management, as well as affording them the opportunity to learn by participating in these teaching and learning programmes.

According to (Kimball 1992:140) one of the institutions that used recycling as a way of minimizing waste is the Alaska Department of Environmental Conservation (ADEC), which actively promoted the waste management practices of source reduction and recycling. It created a Pollution Prevention Programme that subsequently researched recycling and solid waste management in Alaska. The Arkansas Department of Pollution Control and Ecology (PEC) has three divisions that have programmes related to recycling and solid waste management. PEC hired a person to oversee the development of a comprehensive recycling and solid waste education programme (Kimball 1992:145).

Kimball (1992:139) further states that many states in America, like Alabama and California, use recycling programmes as a way of minimizing their waste. For example, the Solid Waste Branch of the Alabama Department of Environmental Management (ADEM) offers a number of recycling services and programmes to the public. These included educational presentations to the general population and schools students, recycling market assistance and information on recycled product procurement. The development of these programmes is not only peculiar to other countries but also to South Africa.

Hudson (1992:15) indicates that in Canada, for example, the Alberta Provincial Government established a number of programmes under the Environment Act 26 to deal with waste management problems. Waste minimization and recycling

programmes were developed with the aim of helping to achieve a 50 percent reduction in municipal solid waste by the year 2000. The programme included two initiatives namely, the Municipal Funding Initiative and the Resource Reclamation Initiative.

Under the Municipal Funding Initiative, funding and support are available to municipalities for the development of recycling and waste reduction projects in Alberta with the aim of helping to achieve a 50 percent reduction in municipal solid waste (Hudson 1992:15). The Resource Reclamation Initiative assists municipalities in finding solutions to problems caused by specific waste products. The Resource Recovery Grant Program provides grants to local Governments and non-profit organizations to cover capital cost involved in establishing community recycling and waste reduction projects. The third support programme is the Pesticide Container Collection Program, which encourages the collection of used pesticide containers at 108 permanent locations throughout the province. The fourth support programme was the Help Eliminate Landfill Pollution Program, which identified abandoned dumps and landfills in order to see to their reclamation (Hudson 1992:15–16).

To endorse that waste is a global problem, Mayet (1994:23) indicates that the global concern of waste management was evident when the Basel Convention, which enhanced the control of the transfrontier movement of toxic wastes in order to

encourage safe management and the reduction in volume of the transboundary waste shipments, was signed by 34 countries and endorsed by 113 countries. It was intended to be the most far-reaching and comprehensive international agreement concerning the management of international waste (Mayet 1994:23).

As a way of managing waste, the European Union (Prufer 1995:84–85) has put in place various action programmes. For example:

- ◆ The first action programme emphasized a remedial approach to problems of waste disposal.
- ◆ The second and third action programmes outlined a policy containing aspects such as waste prevention, waste recycling and re-use, and safe disposal of non-recoverable residues. This required action by the European Union to combat waste and to safeguard natural resources while managing them properly.
- ◆ The fourth action programme emphasizes the need for "clean technology" and "clean product" measures (Prufer 1995:84–85).

The three aspects outlined in the second and third action programmes are aimed at the reduction of waste before it is disposed of in landfill sites.

According to United States, Environmental Protection Agency, Office of Solid Waste and Emergency Response (1995:6) the Environmental Protection Agency (EPA) provided a basic framework for regulating waste generators, waste

transporters and waste management facilities in the United States by putting in place three comprehensive waste management programmes with the aim of reducing waste. These programmes are the following:

- The Subtitle C program, which establishes a system for controlling hazardous waste from its generation to its ultimate disposal.
- The Subtitle D program, which establishes a system for controlling waste such as household waste.
- The Subtitle I program, which regulates toxic substances and petroleum products stored in underground tanks. (United States, Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1995:5).

Mears (1998:263) says that recycling programmes in America benefited greatly when President Clinton signed an executive order requiring that all paper procured by the government contain 20 percent post-consumer waste. This created local jobs, income and tax revenue (Mears 1998:263). The Delaware Department of Natural Resources and Environmental Control (DNREC) works to encourage a pollution prevention or waste minimization programme entitled the "three Rs for the Gos". The teaching and learning programme defines a state-wide comprehensive pollution programme designed not only to maximize the re-use and recycling of waste but also to reduce the actual production of waste products in the first place (<http://ciwmb.ca.gov/publications> accessed on 26 March 2006).

According to Solo (1999:237), the Waste Management Act of 1998 in Botswana provides for drawing up a local and national waste management plan, waste recycling plan and a litter plan as a way of managing waste. The new legislation gave local authorities the power to collect, recycle and dispose of waste in licensed and controlled sites. Under the new regime in Botswana unlicensed waste management facilities were prohibited and the general penalty for illegal disposal of waste was P14, 000 or 10 years imprisonment or both, (Solo 1999:237).

Although waste is a problem in many countries around the world, Khumalo (2000:30) indicated that Japan is an environmentally friendly society because there is no evidence of litter along the roadside. In Japanese schools for example, after lunch students sort waste in well prepared refuse bags. The sorting of waste seems to be the Japanese tradition as it was also observed in university cafeterias at Hiroshima and Naruto.

As a way of minimizing waste by engaging learners and educators in the City of Los Angeles, the Department of Public Works in partnership with the *Los Angeles Times* have sponsored a Plan-It Earth programme. This programme, a resource for teachers in Los Angeles County, is a teaching and learning programme that provides teachers with exercises, assignments and lessons which focus on the environment and also allows learners to research environmental issues (www.ladpw.org, accessed on 6 June 2006).

The Plan-It Earth programme gives teachers the opportunity to nurture environmentally sound habits. The programme also supplements teachers' existing curriculum with assignments and lessons which focus on the environment – particularly pollution prevention and solid waste management (www.ladpw.org accessed on 6 June 2006). The lessons are designed to give students the chance to research environmental issues related to preventing water pollution, recycling to preserve natural resources, and handling toxic and other solid wastes in a responsible way that protects the environment (www.ladpw.org, accessed on 6 June 2006).

The California Education Code encourages each school district to establish and maintain a paper recycling programme in all classrooms, administrative offices, and other areas owned or leased by the school district (www.ci.fort-collins.co.us accessed on 4 December 2007). Teaching and learning programmes have not only been developed globally but have also been developed in South Africa in industries, communities and schools. The following section elaborates on this development by the various institutions.

2.3 How teaching and learning programmes have been developed in South Africa

It is imperative for communities, industry and the government to work together to solve South Africa's waste management problems (Enviro-Spotlight 1994:28). In

South Africa the amount of waste being produced by industries and communities is on the increase as more people attain higher standards of living and have more disposable income (that is money available to people after having paid their bills and taxes (Enviro-Teach 1997:22). In order to improve the quality of life in South Africa, the Department of Environmental Affairs and Tourism launched a national waste management campaign on 31 October 1998.

One of the aims of the campaign was to mobilize support and assistance for waste and pollution management programmes and public facilities maintenance from all levels of government, the private sectors and civil society in order to improve practical delivery of public environmental services (Enviro-Tour 1999:3). A waste management programme has to relate to the school it serves (Enviro-Tour 1999:3). Industries and communities in South Africa have taken initiatives by developing teaching and learning programmes for waste management as outlined below.

2.3.1 Industries or organisations

Different organisations and industries in South Africa have developed waste management programmes. For example Waste-Tech, one of the largest private sector waste management organisation in South Africa, believes that to solve the country's waste management problem, re-use, recycling and waste minimization at the source should be encouraged (Enviro-Spotlight 1994:28).

As one of the leading waste management companies in South Africa, Waste-Tech has published a 32-page booklet called *Guidelines for the Transport and Disposal of Hazardous Waste* with the aim of assisting waste producers, the public, authorities and waste managers to assess themselves to see if they are handling waste correctly. In 1993 Waste-Tech organized and presented a household Hazardous Waste Collection Day in Ottery close to Cape Town in order to educate the public about waste disposal (Gerrans 1994:35). Apart from the public, 20 schools were also involved.

Steinhobel Keller Chamtler Inc. (SKC) Engineers has developed a software program for the modelling and analysis of solid waste management scenarios (Local Government Digest 1998:39). By applying the *Waste Model* software, consultants could perform various analyses much faster, accurately and easily (Local Government Digest 1998:39). The waste model allows engineers to compare modes of transport used for the collection of waste within an area, predict the annual cost of transport of waste for twenty years into the future, thus allowing councils to plan waste flow and cash flow well in advance. This software program enabled SKC to maintain its competitive edge in the field of solid waste disposal. It further consulted and presented clients with a superior product and thereby optimized all facets of regional waste management (Local Government Digest 1998:39).

According to Enviro-Tour (1999:10), Toyota South Africa Manufacturing in Durban is eliminating waste by recycling about 60 percent of all waste generated at that plant. The aim thereof is to reach a point of a no waste philosophy in which the causes of waste are eliminated. Since Toyota SA Manufacturing launched its waste minimization program, it initiated the recycling of 150 tonnes of cardboard and 13 tonnes of plastic every month. It also introduced international manufacturing techniques which focus on the elimination of waste at its point of creation (Enviro-Tour 1999:10). Toyota SA also co-sponsored the coastal clean-up campaign organized by the KwaZulu-Natal Nature Conservation Service. Local communities and schools participated and 27 tonnes of litter was cleared (Enviro-Tour 1999:10).

BMW SA implemented a plastic recycling programme and further sponsored the so-called Green Cages (<http://partnershipscentral.org/mainpages/country/sa/index>, accessed on 31March 2006). These cages were set up in public spaces, allowing environmentally conscious people to dispose of their household plastic waste. It also started a school project in 1998 with only ten schools. The number of schools has increased to 50 in the Soshanguve area close to the BMW SA plant in Rosslyn. The learners from these schools concentrate on different projects such as waste management (separation, collection and recycling), water management (saving and re-using of water) and the cultivation of vegetables in the schools' so-called food gardens (<http://partnershipscentral.org/mainpages/country/sa/index>, accessed on 31March 2006).

Recycling companies like Consol Glass, Enviro-Glass and Tsoga Environmental Resources Centre, agree with the Western Cape Education Department that the only way of ensuring sustainable waste management in communities is by encouraging and supporting schools to use the Teacher's Guides for the development of teaching and learning programmes to integrate recycling and waste management into the school curriculum (www.environment.gov.za, accessed on 12 April 2006).

Delta Environmental Centre, a non-government organization in Victory Park in Johannesburg maintains and manages the Recycling Centre in Delta Park, which is supported by the National Recycling Forum and their contractors. It is a programme used by the local communities, Delta Environmental Centre and its staff and it provides more information about the need for and benefits of recycling (www.deltaenviro.org.za, accessed on 12 April 2006). Not only industries and organisations develop teaching and learning programmes to reduce waste, but communities as well.

2.3.2 Communities

A non-profit organization called Keep South Africa Beautiful was launched in 1971 (Enviro-Spotlight 1994:13). Its aim was to encourage, educate and empower communities in South Africa to participate in the effective handling of waste. To carry through this belief, Keep South Africa Beautiful identified and mentioned five

national programmes, which provided for community participation, education, waste reduction, job creation and environmental awareness (Enviro-Spotlight 1994:13).

The teaching and learning programmes are:

□ **Waste-Wise programme**

It strives specifically to make everyone wise about waste and tells people how to handle waste correctly as they go about their daily tasks of living, studying and playing.

□ **Adopt-A-Highway**

In this programme, private companies take ownership of a tract of highway and undertake as a public service to maintain this section of a highway on a regular basis. The highways are kept spotlessly clean.

□ **Tidy Town Programme**

In this programme the community is brought together in a formal committee structure that is fully representative of the local sectors such as educational institutions, youth groups, business and industry. This programme is managed by Keep South Africa Beautiful and provides ongoing training, education

programmes and community projects for the local Tidy Town Committee. Local authorities and their communities have the opportunity to tackle the problem of waste in a maintainable and sustainable community participation programme.

□ **Zibi**

Zibi is a programme that promotes recycling ethics and also provides a recycling directory, which includes more than 400 recycling agents.

□ **One man contract system**

In this programme, the local authority divides its municipal district into zones. In each zone one unemployed local resident is contracted to collect all the domestic waste to a specific collection point. The local authority collects each load and pays the resident accordingly (Enviro-Spotlight 1994:13).

According to Clacherty (1998:12) people at Botshabelo have set up a waste recycling programme that is linked to a feeding scheme. Food waste from the feeding scheme project is used to make compost, which is used as fertilizers in the vegetable garden. Amandla Waste Creations based in Chiawelo, Soweto, was established in 1990. It is a recycling centre aimed at minimizing, recycling and re-using domestic waste. To date it has offered training in waste minimization to about

150 unemployed youths and women. The programme entails manufacturing valuable arts and crafts of waste materials (Enviro-Tour 1999:7).

In 2001 the Department of Environmental Affairs and Tourism (DEAT) launched the Cleanest Town Competition, which was well received across South Africa. All Provinces of South Africa and interested municipalities began in earnest to ensure that they participate in the campaign. The DEAT believes that the campaign has some positive impact in the communities; this is evident from attitudes of different municipalities towards waste management – especially in the previously black areas where waste collection and management has significantly improved. The main objective of this campaign is to change the attitudes of people towards waste management and environmental management in general, and to highlight the socio-economic benefits of a clean environment (www.environment.gov.za, accessed on 12 April 2006).

The Community Adoption and Monitoring Programme for Schools (CAMPS) completed the project and aimed to bring together students, communities, and the government for improving Delhi's environment in 2001. Ten nodal schools were selected for this project. Each school adopted a locality and worked hand in hand with the community to identify problems related to air pollution, water supply, sewerage, sanitation, and solid waste management (www.teri.res.in/teriin/camps/index.htm, accessed on 12 April 2006). During this

research, it became evident that various members of the school community were unable to distinguish between waste and litter. To most the two concepts were synonymous. One of the outcomes of the investigation was that it raised the community's awareness of the reality of the waste situation and their contribution to it, for example the mismanagement of water and organic waste generated on the school premises as well as the poor waste disposal methods which were followed, for example failure to separate waste, to utilize that which could be recycled and the failure to properly dispose that which was not biodegradable (www.teri.res.in/teriin/camps/index.htm, accessed on 12 April 2006).

The above information indicates how the industries and communities have developed teaching and learning programmes for proper waste management in their institutions. All the different programmes that have been cited above have been designed to teach the people in those institutions to manage waste properly. Teaching and learning programmes have also been developed in South African schools as cited below.

2.4 How teaching and learning programmes have been developed in schools

At local level waste management teaching and learning programmes should be developed to address the problems of a specific school and should not be

generalized. At a school level, teaching and learning programmes should be contextualized to cater for the learners' needs, available resources and the local environment (Lotz, Tselane & Wagiet 1998:5). The teaching and learning programmes do not and are not contextualized to cater for waste management in schools. However, many schools usually participate in programmes sponsored by industries and presented by community environmental centres. For example, Coca-Cola, South African Breweries, Nampak and Woolworths sponsored an EE waste management teaching and learning programme for schools. This programme, Collect-a-Can, teaches learners the practical experience of recycling. Schools collect as many cans as they can and sell them to Collect-a-Can for cash. At the end of the year the schools with the most points win prizes such as computers, fax machines, et cetera (Local Government Digest 1998:38).

The Lydenburg Environmental Centre also presented a teaching and learning programme to learners of the Lydenburg Primary School (Enviro-Tour 1999:16).

The school was given time to collect as many empty cans as possible for their recycling project. On D-day learners had 60 minutes to design and build an anaconda on the rugby field. The class with the longest snake won the *We can* trophy and a free milkshake at the Wimpy restaurant (Enviro-Tour 1999:16).

There are, among others, four different kinds of identified school recycling programmes. Apart from participating in programmes like the ones mentioned

earlier, schools can participate in any or all the programmes mentioned below as a way of managing their waste.

These programmes include the following:

- ◆ An occasional or once-off recycling drive where students collect recyclables such as cans, plastics and newspapers. The waste is either collected by, or delivered to a recycling company.
- ◆ An ongoing in-school recycling programme. In this programme, a permanent collection centre for recyclables is established at school.
- ◆ An ongoing account with a local buy-back recycling centre. In this instance students take recyclables directly to the centre and payment for waste is credited to the school's account.
- ◆ Community collection points at school. The school serves as a drop-off point used by the entire community (Jenman 2000:42).

The students in Ramotswa Secondary school in Botswana investigated the issue of waste management with the aim of creating awareness among the community about the economic opportunities that are to be found in proper waste management. The specific objectives were to enable students to identify the various types of waste generated at the school and to realize the economic potential of the waste by

participating in simple waste management strategies such as recycling, re-using and reducing waste (www.unisa.ac.za, accessed on 12 April 2006).

Nkadimeng Primary School in Moteti, Mpumalanga, experienced a littering problem. Because of a lack of litter disposal points, litter was scattered all over the school grounds and in the classrooms. The littering problem was attributed to a lack of an environmental consciousness among the school community and a lack of knowledge of how to recycle and reuse accumulated waste products that became litter. Educators discussed the issue with the learners and sensitized them to the potential hazards of litter. This was followed by arranging an inter-class debate on the issue. The debate was a school function held during assembly. A next phase in the process was that learners were given the opportunity to propose ways of using litter creatively (Le Roux 2003:22).

Brakpan Primary School was awarded a green flag in 2004 and retained their status in 2005. This was after the entire staff, management included, attended all the workshops offered by the Delta Environmental Centre. They identified waste as one of their key focus areas after doing an audit at their school and discovered that waste management needed attention. Trash Truck was one of the organizations that worked with the school in addressing waste. The school adopted the principle of reduce, recycle and reuse and also embarked on the project of recycling glass,

plastic, paper, and making compost for the vegetable garden (www.deltaenviro.org.za, accessed on 12 April 2006).

As mentioned earlier, teaching and learning programmes at school level should be contextualized to cater for the learners' needs, available resources and the local environment (Lotz et al 1998:5). The existing teaching and learning programmes in schools do not and are not contextualized to cater for waste management hence schools only participate in teaching and learning programmes sponsored by industries and presented by community environmental centres. The schools in Limpopo are no exception. This was confirmed in the latter province's Giyani area by the outcomes following a workshop which was facilitated by a Unisa Environmental Education academic. It is for this reason that the researcher developed the teaching and learning programme below, which is now contextualized to cater for proper waste management in schools.

2.5 The development of a teaching and learning programme for proper waste management in primary schools

LEARNING AREA : Natural science

LEARNING PROGRAMME : Waste management

LEARNING EXPERIENCE : Waste and recycling

LO : Learning outcomes

NS : Natural science

CO : Critical outcomes

TECH : Technology

SS : Social sciences

EMS : Economics and Management Sciences

Learning outcomes

LO 1: Act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

LO 2: Interpret and apply scientific, technological and environmental knowledge.

LO3: Demonstrate an understanding of the interrelationships between science and ..
Technology, society and the environment.

Mathematics 1:

Recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.

TECH 1: Demonstrate an understanding of the interrelationships between science, Technology, society and the environment.

Apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

EMS: Demonstrate entrepreneurial knowledge, skills and attitudes.

ACTIVITY (Teaching process)	ACTIVITY OUTCOMES	ASSESSMENT STANDARDS	ASSESSMENT STRATEGY
	(Learning process) What the learner should be able to do	(What evidence will be collected)	(How assessment will be done)

1. INTRODUCTION			
<ul style="list-style-type: none"> The teacher should ask the learners to look around the school yard and identify the types of waste that they see. 	<ul style="list-style-type: none"> The learner will be able to mention the types of waste found in their school yard. 	<ul style="list-style-type: none"> This will be evident when learners can name the types of waste found in their school yard. 	<ul style="list-style-type: none"> Assess what learners already know about the different types of waste around their school yard.
2. FINDING OUT	The learners will be able to ...	This will be evident when the learners ...	Evidence of learning/skills in outcomes ...
<ul style="list-style-type: none"> The teacher will ask the learners to go outside in groups and to each pick up a waste object and bring it back to the class. The teacher should also ask the learners to classify the types of waste they collected. The teacher should 	<ul style="list-style-type: none"> Pick different types of waste and bring them back into the class Classify different types of waste they collected in their group Mention the types of 	<ul style="list-style-type: none"> Can pick different types of waste objects and bring them to the class. Can classify different types of waste they collected in their groups. Can mention the 	<ul style="list-style-type: none"> By checking if all learners in all groups have managed to pick a waste object. Observing if learners have classified the types of waste correctly. Check if groups have

<p>give the groups time to mention the number of the types of waste they collected, for example, 15 cans, 20 papers, 50 fruit peels, etc.</p>	<p>waste they collected, for example, 15 cans, 20 papers, 50 fruit peels, etc.</p>	<p>number of the types of waste they collected, for example; 15 cans, 20 papers, 50 fruit peels, etc.</p>	<p>given the correct number of waste they collected in their groups.</p>
<ul style="list-style-type: none"> • The total number of different types of waste from different groups should be recorded. 	<ul style="list-style-type: none"> • Record the total number of different types of waste from different groups. 	<ul style="list-style-type: none"> • Can record the total number of different types of waste from different groups. 	<ul style="list-style-type: none"> • Check if recording of waste collected has been done correctly.
<ul style="list-style-type: none"> • Ask learners to identify the type of waste with the highest number of objects. 	<ul style="list-style-type: none"> • Identify the type of waste with the highest number of objects. 	<ul style="list-style-type: none"> • Can identify the type of waste of which there is the most. 	<ul style="list-style-type: none"> • Check if the type of waste with the highest number of objects had been identified correctly.
<ul style="list-style-type: none"> • For recycling paper: The educator should contact any of the paper recycling organizations such as SAPPI, War on 	<ul style="list-style-type: none"> • Sort waste and separate paper from the rest of the waste. Sort the paper according to the 	<ul style="list-style-type: none"> • Are able to sort paper according to the specifications of the recycling organization. Can 	<ul style="list-style-type: none"> • Check if paper has been sorted and objects like bricks and paper pots have been made.

<p>waste, NAMPAK recycling; Two oceans (paper) Recycling and Mondi Recycling. She or he should get information about collecting and sorting papers and the amount of money the recycling company will pay per kilogram. When an agreement has been reached, the school and the recycling organization can agree on a date on which the paper will be collected from the school on a monthly basis.</p> <ul style="list-style-type: none"> • Ask the whole class to start the recycling project by recycling 	<p>specifications of the paper recycling organization. Alternatively learners can recycle paper themselves by making paper bricks and paper pots for plants and selling these to the community.</p> <ul style="list-style-type: none"> • Start the recycling project by recycling the 	<p>also participate in practical activities of recycling paper by making paper bricks and paper pots for plants.</p> <ul style="list-style-type: none"> • Can start the recycling project by recycling the 	<ul style="list-style-type: none"> • Check if the class is ready to start the recycling project.
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<p>the type of waste that was identified. For example, if paper was identified as the type of waste with the most objects, paper recycling should follow.</p> <ul style="list-style-type: none"> • If plastic bags were identified as the most waste, the educator should initiate plastic recycling by encouraging learners to make usable objects out of plastic bags such as hats, mats, and bags. • For recycling of cans the educator can contact Collect-a-Can to get relevant information like which cans should be collected, how the 	<p>type of waste of which there was the most.</p> <ul style="list-style-type: none"> • Start recycling of plastic bags by making hats, mats and bags. • Start collecting and sorting cans. Make useful objects like wheeled toys, paintbrush holders, crayon 	<p>type of waste of which there was the most.</p> <ul style="list-style-type: none"> • Are able to make hats, mats and bags out of plastic bags. • Are able to collect and sort cans and make useful toys from the cans. 	<ul style="list-style-type: none"> • Check whether hats, mats and bags have been made. • Check if cans have been collected, sorted and toys have been made.
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<p>cans should be sorted, the price per kilogram and how the company will collect the cans. Alternatively the educator can encourage learners to create useful objects from the cans.</p> <ul style="list-style-type: none"> Learners can be encouraged to recycle food waste like fruit peels by making compost in the schoolyard. <p>3. EVALUATION</p> <ul style="list-style-type: none"> The educator asks learners to display their work for evaluation. 	<p>holders and baby rattles.</p> <ul style="list-style-type: none"> Start collecting food waste and fruit peels and start making compost. Should display their work for evaluation. 	<ul style="list-style-type: none"> Are able to collect food waste and fruit peels and to start digging to make compost. Are able to display the expected work such as hats and mats. 	<ul style="list-style-type: none"> Check the measurement of the compost and the way it is being prepared. Evaluate the objects made by learners – for example objects such as hats, mats, and bags from recycled plastic should be evaluated.
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<p>4. CONCLUSION</p> <ul style="list-style-type: none"> • The teacher asks the learners to decorate their work 	<ul style="list-style-type: none"> • The learners decorate their work. 	<ul style="list-style-type: none"> • Are able to decorate their work. 	<ul style="list-style-type: none"> • Check if learners have decorated their work
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The programme has been developed to help educators to teach in an environmentally directed way by engaging learners in doing activities that will lead to proper waste management in schools. It has also been developed to help the learners to identify the type of waste that is generated most in their schools so that they can initiate different recycling projects in order to manage waste. The teaching and learning programme will also help both educators and learners to know that waste is a resource which can be turned into useful objects. Having developed the above programme, it is important to note that it will be tested in the empirical study.

2.6 Conclusion

Many countries internationally have developed various waste management programmes which teach their citizens on how waste can be properly managed in their communities. South Africa is no exception as industries, organisations and communities have also taken the initiative to develop programmes which will help the citizens to manage waste properly. Schools also participate in waste

management programmes presented by industries as a way of managing waste, but as mentioned earlier, the teaching and learning programmes do not and are not contextualized to cater for waste management in schools. From the developed teaching and learning programme one can thus conclude that each school can manage its waste by initiating recycling projects that will help to eliminate waste that is most generated at that particular school. Equipping learners with the necessary recycling skills will help schools to manage waste in a proper way.

CHAPTER 3

3. EMPIRICAL RESEARCH ON THE DEVELOPMENT OF A TEACHING AND LEARNING PROGRAMME FOR PROPER WASTE MANAGEMENT IN PRIMARY SCHOOLS

3.1 Introduction

In chapter 2 literature on the development of a teaching and learning programme for proper waste management was reviewed. Focus was on an international and South African perspective. In this chapter, focus will be on conducting empirical research. In developing a research design for the study, a questionnaire will be developed and used to collect data from the respondents. Thereafter, data will be analysed and interpreted. An overview of the respondents' views will be compiled and conclusions drawn.

3.2 Qualitative research

3.2.1 The purpose of qualitative research

The purpose of qualitative research is to understand the social phenomenon from the participants' perspective (Schumacher & McMillan 1993:14). Qualitative research seeks to establish relationships and explain causes of changes in measured

social facts (Schumacher & McMillan 1993:14). In qualitative research, unlike quantitative research, there is greater flexibility in both methods and the research process (Schumacher & McMillan 1993:14). There are four main qualitative research approaches. They are ethnography, phenomenology, case study and grounded theory (Johnson & Larry 2004:363). This notion endorses the view expressed by Schumacher and McMillan (1993:372) that qualitative research also describes and analyses people's individual and collective social actions, beliefs, thoughts and perceptions.

In this study, phenomenology, as one of the four main approaches of qualitative research, will be employed. The aim thereof is to describe individual's experiences of a teaching and learning programme for proper waste management in primary schools (Johnson & Larry 2004:363).

3.2.2 Method of gathering data

There is no standardized method of gathering data. There are basically six identified ways to collect data: observations, questionnaires, interviews, documents, tests and unobtrusive measures (Schumacher & McMillan 1993:40). All research uses a variation of one or more of these, depending on the strength and limitations of each, and other considerations (Schumacher & McMillan 1993:40). Experienced researchers can and do combine both qualitative and quantitative research methods

in a single study in order to investigate a particular research problem (Schumacher & McMillan 1993:14).

For the purpose of this study, qualitative research will be employed and a questionnaire will be used. Qualitative techniques collect data in the form of words rather than numbers and there is an in-depth verbal description of phenomena (Schumacher & McMillan 1993:42). Questionnaires, as one of the qualitative techniques, encompass written questions. It is used to elicit reactions, beliefs and attitudes from the respondents (Schumacher & McMillan 1993:40). A set of appropriate questions has been constructed and the answers will be given using a rating scale of 1-3.

3.2.3 Importance of qualitative research for this study

Qualitative research allows researchers to study an aspect of educational life (Bogdan & Biklen 1992:29). The researcher in this study employed qualitative research to collect data for the following reason:

- It is descriptive, that is, the data collected is in the form of words and pictures rather than numbers.
- It has the natural setting as the direct source of data and the researcher is the key instrument.

- Qualitative researchers are concerned about the process rather than simply outcomes or products.
- Qualitative researchers analyze their data inductively, that is, abstractions are built as the particulars that have been gathered are grouped together.
- Qualitative researchers are concerned with so-called participant perspectives (Bogdan & Biklen 1992:33).
- It is a naturalistic inquiry, that is, studying real-world situations as they unfold naturally; nonmanipulative and noncontrolling; openness to whatever emerges.
- It captures and discovers meaning once the researcher becomes immersed in the data.
- It allows personal experience and engagement, that is, the researcher has direct contact with and gets close to the people, situation and phenomena studied.
- In qualitative research, the researcher focuses on the one phenomenon which is selected for an in-depth understanding (Schumacher & McMillan 1993:372–375).

3.3 Research design

Research design refers to a plan and structure of the investigation used to obtain evidence to answer research questions (Schumacher & McMillan 1993:31). It indicates how the research is set up, what happens to the subjects and what methods of data collection are used. The purpose of the research design is to provide the

most valid, accurate answers possible to research questions (Schumacher & McMillan 1993:31). In this section, the researcher will give details on how the respondents were selected, reached, the questionnaire applied to collect information about the programme and also to analyze and interpret data.

3.3.1 Selection of respondents

Ten primary schools were identified for the purpose of this study because of their proximity to the researcher. Thirty respondents (learners and educators) were identified and selected from the ten primary schools for the purpose of completing the questionnaires. Ten of the respondents were educators and twenty of the respondents were learners in the intermediate phase. The respondents were provided with a questionnaire as well as the teaching and learning programme. All respondents, learners and educators, responded to the same set of questions. Educators teaching Natural Sciences, Technology, Languages, Economic and Management Sciences, Life Orientation, Social Sciences and Mathematics were randomly selected because a teaching and learning programme for proper waste management can be developed in any of the above mentioned learning areas.

The following points were taken into consideration in selecting educators and learners:

- Educators teaching Natural Science and Technology, Languages, Economic and Management Sciences, Life Orientation, Social Sciences and Mathematics were eligible for selection because all learning areas are related to Environmental Education.
- Educators who participate in Environmental Education activities were preferred as they are familiar with Environmental Education issues, therefore, they are in a better position to answer the questions of the study as compared to those who were not involved.
- Learners who participated actively during the teaching and learning programme implementation were selected to complete the questionnaire.
- Only educators and learners were selected as respondents because the questionnaire reflected the teaching and learning programme which was developed for proper waste management in primary schools.

The researcher reached the respondents by first requesting permission from the Regional Director of the Limpopo Department of Education to conduct the research in the ten schools mentioned earlier (appendix A), and the permission was granted (appendix B). The researcher visited the identified schools in order to request prospective respondents to participate in the study and to supply them with a questionnaire and a teaching and learning programme. In each school the researcher first introduced herself to the principal and supplied him/her with the letter of

QUESTIONS	ALWAYS	%	SOMETIMES	%	NEVER	%	TOTAL	%
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permission from the Regional Director of the Limpopo Department of Education (appendix B). The researcher also supplied the respondents with a letter (appendix C) requesting them to participate in the study and also explained the purpose of the study to them. The principal and the respondents (educators) were requested to sign the researcher's register which indicated that they had seen and received the questionnaire and a teaching and learning programme (appendix D). A questionnaire was used to collect data (appendix E) from the respondents.

Lastly, questionnaires were handed out together with a teaching and learning programme to the respondents (learners and educators) and were collected on an agreed date.

3.4 Data analysis and interpretation

All respondents received and responded to the questionnaires. Data collected by means of the questionnaire were analyzed and interpreted in this section. The analysis and interpretation of the data follows below. The analysis and interpretation of data will be given in a tabular form.

Does your school have a teaching and a learning programme on waste management?	0	0	0	0	30	100	30	100
Is there any evidence of waste in your school?	22	73	8	27	0	0	30	100
Is the waste in your school picked up?	24	79	6	21	0	0	30	100
Is the waste sorted into paper, plastic, cans, peels, and bottles?	0	0	0	0	30	100	30	100
Is the waste quantified?	0	0	0	0	30	100	30	100
Is waste identified?	0	0	0	0	30	100	30	100
Is the waste recycled?	0	0	0	0	30	100	30	100
Is the waste sent to recycling organizations?	0	0	0	0	30	100	30	100
Do you display objects made from waste for evaluation?	0	0	0	0	30	100	30	100
Do you decorate objects made from waste?	0	0	0	0	30	100	30	100

From the preceding table it was clear that all the schools do not have waste management programmes. 73% of the respondents said that there was always evidence of waste in schools while 27% indicated that waste was evident sometimes. 79% agreed that waste is always picked up in their schools while 21% said that waste was sometimes picked up in their schools. No respondents indicated that waste from their schools was classified, quantified, identified, recycled or sent to recycling organizations and they all agreed that they never displayed or decorated objects made from waste for evaluation.

3.5 Overview of the respondents

From the respondents' views it could be stated that in all the schools that the researcher visited, there were no teaching and learning programmes on waste management. No recycling activities were done in any of the schools.

3.6 Conclusions

In this chapter, an outline of empirical research on the development of a teaching and learning programme for waste management in primary schools was presented. That included a description of the method of data collection and how the respondents were reached and selected. An analysis and interpretation of data collected was also made. The development of a teaching and learning programme

could contribute towards proper waste management in primary schools because currently no recycling activities on proper management of waste are being conducted.

A summary of findings and recommendations regarding this study is presented in chapter 4.

CHAPTER 4

4. SUMMARY, TESTING THE HYPOTHESIS AND RECOMMENDATIONS

4.1 Introduction

This chapter summarizes the literature review discussed in chapter 2. It further analyses and interprets the collected data on the development of a teaching and learning programme in primary schools in the Greater Giyani Municipality discussed in chapter 3. The process of testing the hypothesis of the study (see 1.5) and recommendations based on the findings are also dealt with in this chapter.

4.2 Summary of findings

4.2.1 Literature review on the development of a teaching and learning programme for proper waste management in primary schools

The literature review indicates that teaching and learning programmes for proper waste management have been developed globally, and in some schools in South Africa. The literature review has to some extent addressed the problem of the study, namely to determine whether the development of teaching and learning programme

will lead to proper waste management in schools. A deduction was made that the development of a teaching and learning programme may lead to proper waste management in Limpopo.

4.2.2 Factors supporting the notion of how the development of a teaching and learning programme can lead to proper waste management in schools

All the respondents indicated that their schools did not have a teaching and learning programmes on waste management. All activities that lead to proper waste management such as picking up waste, quantifying, recycling and classifying waste into paper, plastic, cans, peels, and bottles were not practiced in their schools.

4.3 Validity and reliability

Consistency of the data provided by the respondents was found to be high and reliable, for the sample group as a whole, and for the specific schools. All respondents from the various schools found the teaching and learning programme to be good as they all indicated that no waste management activities took place in their schools. Criteria validity and reliability were assessed by comparing the answers provided by all respondents from the primary schools. Assessment was

also done by observing the products such as hats, doormats, and ornaments that were created by the learners during the implementation of the programme (www.springerlink.com/feedback).

4.4 Testing the hypothesis of the study

The hypothesis (see 1.5) that the development of a teaching and learning programme will lead to proper waste management in Limpopo has been confirmed. All respondents from the ten identified schools confirmed that the teaching and learning programme supplied to them brought change in their schools when it comes to waste management. Recommendations emanating from this study were made on the basis of the summary of the findings cited above.

4.5 Recommendations

In order to address the problem of littering and to promote proper waste management in schools, the following recommendations are made.

- Educators should start engaging learners by developing teaching and learning programmes that will lead to proper waste management in schools.

- Both educators and learners should further ensure that there is no waste around the schoolyard by always reducing the production of waste and also to pick up waste as soon as it is generated.
- They should learn to classify waste into plastic, paper, cans, peels and bottles.
- Waste should always be quantified to assess the type of waste generated most in the school.
- Waste should be recycled as much as possible and waste that cannot be recycled in schools should be sent to recycling organizations.
- After recycling waste, objects that have been created should be displayed for evaluation.

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5. APPENDIXES

Appendix A – Request for permission to conduct a research

Appendix B – Permission to conduct research

Appendix C – Questionnaire covering letter

Appendix D – Sampled schools from Giyani area

Appendix E – Questionnaire sample