

**How can school gardens be used for teaching environmental activities  
in the Technology Learning Area at Senior Phase?**

**Dissertation**

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by

**Bongani Eric Mazingisa**

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Supervisors:

Professor Heila Lotz-Sisitka and Professor Rob O'Donoghue

## **ABSTRACT**

This study was conducted as a case study at the rural Ethridge Junior Secondary School which is located in the Eastern Cape Province of South Africa. The aim of the study was to investigate how school gardens could be used to teach environmental activities in the Technology Learning Area at senior phase. The study examined how environmental activities in the school garden can be used to develop technological concepts and knowledge and for developing technological problem-solving abilities. Furthermore, it examined the relationship between technology, society and environment, and how structural and socio-cultural factors influence the use of environmental activities in the school garden.

The overall approach was a case study. The data was generated using qualitative methods such as interviews, observation, workshops and document analysis of learners' work. Of all the research tools used, the interviews and observations were the most fascinating and informative methods.

The study focused on various activities undertaken by Grade 8 learners in their Technology Learning Area. These activities were compost making, planting and irrigating. The study showed how learners from poor rural homes can use available resources and suitable technology processes to plant vegetables. In terms of resources, virtually all resources used in the study were free, sourced locally and/or borrowed. This indicated that even in poor, rural areas materials are available to make structures and complete activities. In terms of available suitable technology, learners in the study explored the use of old car tyres for planting containers that can be easily transported. They also, using easily available resources such as tin cans, explored how to design and construct an effective, low-water consumption, low cost irrigation devise.

The study explored the achievement of Learning Outcomes (LO) using the school garden. This study uses the school garden as a teaching aid to achieve the three main LO's in the Technology Learning Area (LA). This study has also indicated that LO's are sometimes intertwined, that is to say that more than one can be achieved at the same time. The three activities (compost making, planting and irrigation) were used to attain the required LO's. The study indicates that LO 1 (related to applying technological processes and skills ethically and responsibly) can easily be achieved by designing a compost box and a compost heap, making them and evaluating the process. LO 2 (related

to understanding and applying relevant technological knowledge) could easily be achieved in the irrigation activity, and LO 3 (related to demonstrating interrelations between science, technology, society and environment) could easily be attained in both compost making and planting. The study also showed that curriculum activities, such as those used in this study, are influenced by socio-cultural and structural factors that influence the curriculum contextualizing process.

The main findings of the study are captured in five analytical statements. These form the basis for a set of recommendations to inform the use of school gardens as a resource for technology teaching in Ethridge Junior Secondary School, and possibly for other rural schools.

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## LIST OF ACRONYMS

- AIDS** – Acquired Immune Disease Syndrome
- AMI** – Analytic Memo Interview
- AMLW** – Analytic Memo Learners Work
- AMO** – Analytic Memo Observation
- AMW** – Analytic Memo Workshop
- ANC** – African National Congress
- AS** – Assessment Standard
- BDT** – Bizana Development Trust
- C2005** – Curriculum 2005
- DoE** – Department of Education
- ECD** – Early Childhood Development
- EE** - Environmental Education
- EPC** – Education Policy Consortium
- FET** – Further Education and Training
- GET** – General Education and Training
- HIV** – Human Immuno deficiency Virus
- HSRC** – Human Science Research Council
- ID**– Interview Data
- J.S.S.**- Junior Secondary School
- LA** - Learning Area
- LED** – Local Economic Development
- LGI** – Learner Group Interview
- LO** -Learning Outcome
- NCS** – National Curriculum Statement
- NEEP-GET** – National Environmental Education Policy – General Education and Training
- NEPA** – National Education Policy Act
- NMF** – Nelson Mandela Foundation
- NQF** – National Qualifications Act
- OD** – Observation Data
- PI-1** – Parent Interview 1
- PI-2** – Parent Interview 2

**RNCS** – Revised National Curriculum Statement

**SACE** – South African Council of Educators

**SANBI** – South African Biodiversity Institute

**SASA** – South African Schools Act

**SDI** – Spatial Development Initiative

**TI-1** – Teacher Interview 1

**TI-2** – Teacher Interview 2

**UNEP** – United Nations Environmental Programme

**WD** – Workshop Data

**WG** – Workshop Group

**ZPD** – Zone of Proximal Development

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# **CHAPTER 1**

## **INTRODUCING THE STUDY**

### **1.1 INTRODUCTION**

This study shows how activities in school gardens can be used to teach Learning Outcomes (LO) of the Technology Learning Area (LA). This study is carried out in three phases. The first being the composting activity, the second is the planting activity and finally the irrigation activity. The activities are aimed at supporting teachers to teach the environmental focus in the Technology Learning Area, and to encourage learners to become engaged in vegetable gardening at their homes in easy ways like planting vegetables in motor car tyres. This study was conducted with Grade 8 learners which fall into the Senior Phase in the National Education Policy Act (NEPA). The Technology Learning Area has three Learning Outcomes (LO) and each LO has a set of Assessment Standards (AS). In the study, I examine each activity in the light of the LO's and AS's to identify how the curriculum can be contextualized through these activities.

### **1.2 ABOUT MYSELF**

I am a teacher in a remote rural village of the Eastern Cape, in OR Tambo District Municipality (ORTDM). I hold the position of a Deputy Principal and I am involved in teaching, just like any other teacher in the school. I have a commitment to environmental concerns and my goal is to contribute to the protection of the environment. I am able to teach learners to understand the importance of environmental sustainability, and through this, learners can teach the community in their area, including their relatives.

In my district I serve the community and the local municipality as an executive councillor. The executive committee is made up of fulltime councillors and the chairpersons of the portfolio committees. The mayor is the chairperson of the executive committee.

As a member of this committee, I therefore serve under the chairmanship of the mayor. I am the chairperson of a portfolio committee called Local Economic Development (LED). This committee is responsible for issues related to economic benefit of the local population and I have to balance these benefits by ensuring that all the communities that are citizens in the area benefit directly from municipal resources, either individually or in groups.

The committee faces huge challenges. Firstly, there is a large backlog of service delivery in the municipality. Secondly, the budget for the municipality from the National Treasury is small. Thirdly, almost 80% of the population of 350 000 are unproductive in the sense that they have few skills and have no or little formal education, and are inactive in the formal and informal economy. Their lack of employment and employability, places a strain on the municipality. Fourthly, according to the OR Tambo Municipality Spatial Development Framework (SDF) of 2005, 76% of all the population in the municipality are young people (below 35years) and 51% of the youth has an education level of less than Std 5 (Grade 7).

For this study, it is important to mention that I am also responsible for the conservation of the environment in this district municipality. In 2007/08 the local municipality budgeted only R100 000 for all environmental activities. By all standards, this is very little and there is not much one can do to reduce the environmental impact using such a small amount. As a municipality we have one officer in charge of the environmental division.

Among other things, the environmental officer and I must use this amount to raise awareness about the dangers of veld fires, protection and preservation of fauna and flora, proper monitoring of the 40km coastline (between Umtamvuna river and Mtentu river) and the responsible management of forested areas. Combined, these are complex functions which need to be done effectively and efficiently. I was therefore motivated to register and complete a Masters in Education (Environmental Education) so that I could cope with these challenges through having a greater knowledge about the environment.

I was also interested in finding out how environmental education in schools could contribute to community environment and development issues.

I have involved myself in this study through the use of school gardens with the purpose of integrating environmental education into the school curriculum. As a teacher and as a councillor, I have a commitment to the environment, and through this research I hope to show how school gardens can be used to teach Technology in the senior phase (Grade 7 to 9). Using school gardens in this way has not only the potential to strengthen the teaching of environmental issues in Technology, but also to contribute to food production. Through this process, learners can also implement what they learn in the school garden back at home, and this could potentially contribute to household food security. My interest in working in school gardens was also motivated by our school's involvement in the Greening the Nation project.

### **1.3 THE GREENING OF SCHOOL'S PROJECT (GREENING THE NATION PROJECT)**

This Greening of School's Project came about as a result of the South African National Biodiversity Institute's (SANBI) commitment to maintaining and providing protection of biodiversity. This institute is based in Pretoria and is involved in maintaining some of the country's National Botanical gardens. As a parastatal agency it has a mandate to conserve and sustain the country's biodiversity, as well as to re-establish and increase numbers of wild plants that have become locally extinct.

In Bizana, a cultural village was developed by the Greening the Nation Project in 2005. It was started with the municipality and with the Department of Education (DoE) in the district. The DoE allowed its schools to be greened by SANBI, and it permitted its staff to be trained in courses that involved the Greening of the Nation Project.

My school, Ethridge Junior Secondary School, was one of the 31 schools that were greened.

The greening activity was completed in March 2005 by a service provider called Mbizana Indigenous, which was a small company business enterprise employed by SANBI to continue greening of schools and the town on its behalf. All plants that were used were indigenous to Bizana and its surrounding areas. To complete the greening project successfully, it became necessary for the school to be fenced properly first. This was done by a small company that was funded by the Bizana Development Trust (BDT). BDT was formed in Bizana to administer the development funding that was issued to the local communities by the Wild Coast Sun. Its work became valuable to schools such as Ethridge which was declared as a no-fee paying school by the Provincial Department of Education. Since the Provincial government is not paying its dues as scheduled in respect of the National no-fee paying schools agreements, small schools such as Ethridge are battling, and there are no funds for school development.

In 2005, SANBI enrolled two education specialists from Bizana district and one SANBI worker for an Environmental Education Masters degree at Rhodes University in Grahamstown. This demonstrated SANBI's commitment to promoting environmental education in the district. These individuals were chosen from among many applicants and this was a way of ensuring quality candidates. All candidates were to research school-based activities that relate to curriculum development and environmental education through the use of school gardens. Ultimately, there is an expectation that these individuals will promote the culture of greening the schools when SANBI pulls out, thereby supporting the sustainability of the project. There was also a hope that these individuals would play a role in spreading the project to other districts.

By 2007, the school greening project was greening schools in Mt Ayliff and Cradock districts, thus extending its influence in the Eastern Cape. After the successful greening of schools in 2006, SANBI enrolled a further five principals from the district schools into the Rhodes University Masters Degree Environmental education programme, of which I was one. Through my work on greening and with my specialization area being Technology, I decided to research the use of school gardens in teaching Technology.

## 1.4 RESEARCH QUESTION AND GOALS

The aim of this study is to investigate how school gardens can be used to teach environmental activities in the Technology Learning Area at senior phase. The following goals were then developed for this study:

- To examine how environmental activities in the school garden can be used for technological problem-solving through the application of the technology process.
- To examine how environmental activities in the school garden can be used to consider the relationship between technology, society and environment (through considering issues of impact, bias and culture in technology) LO. 3.
- To examine how environmental activities in the school garden can be used to develop technological concepts and knowledge.
- To examine the structural and socio-cultural factors that influence the use of environmental activities in the school garden for Technology education (factors affecting the contextualization of Learning Outcomes).

As stated above, this study examines and attempts to explain some of the activities that can be used to teach Technology using the available resources.

In this case I use school gardens as the most relevant environmental teaching tool at a school level. It is my belief that each and every school, poor or rich, rural or urban, has a space for a school garden. If the school garden does not exist, the community has the potential to make a school garden when needed. This way, school gardens can be seen as an immediately available and valuable teaching tool for the Technology Learning Area.

This research study identified three garden activities as relevant activities that can be done to achieve the research goals.

These activities are: composting, planting and irrigation. It is important to note that in this study, all the material used in the Technology learning activities were locally sourced and environmentally friendly. I also took care to ensure that environmental education was not an “add on” or something extra, but rather ensured that environment was viewed as being integral to the Technology Learning Area, and the environmental activities therefore allowed me to implement the requirements of the Technology Learning Outcomes, using available garden materials. This is consistent with the approach to environmental education in South Africa’s National Curriculum Statement (NEEP-GET, 2004; DoE, 2002).

## **1.5 OVERVIEW OF THE STUDY**

Chapter 1 introduces the study to the reader. The chapter spells out the context of the research and the research aim and goals. This chapter also describes the role I played in the research and why I undertook this study. It also provides insight into the technical and structural setting of the research process.

Chapter 2 provides the context and history of Ethridge Junior secondary School (JSS). It explains in detail the school policy as contained in the National Education Policy Act (NEPA) 2006. The chapter also introduces the theoretical basis of the research of Cornbleth’s (2000) theory of curriculum contextualization.

This provides the conceptual tools for probing the Technology Learning activities in more depth in the study. Cornbleth (2000) discusses curriculum development as a contextualized social process, with teachers as curriculum contextualisers. She sees curriculum as a process influenced by structural factors, and as a socio-cultural activity that seeks to harness the cultural values of learners for Technology learning to be understood better. This chapter also examines the state of the environmental education in relation to formal school education.

Chapter 3 introduces the approach (case study) and methods that were used to collect data on the technology education activities in the school garden. It describes how the research was orientated to address the research question and to achieve the research goals. It emphasizes the importance of practical and technology design research activities that the students were engaged in so that data could be gathered to answer the research question. The chapter outlines how data is generated and analysed. Research ethics, trustworthiness and validity is also discussed.

Chapter 4 reports on the analysis of related data which forms the basis of findings. It provides a detailed description of the three technological activities and what the learners learned in the school garden, as well as insight into the context of learning (the structural and socio-cultural factors).

Chapter 5 discusses the findings in Chapter 4 in more detail using a set of analytical statements. These analytical statements are drawn up through a review of the data presented in Chapter 4. The chapter argues that school gardens facilitate contextualization of curriculum, and enables the attainment of Learning Outcomes. This chapter addresses the research goals. It also argues that this process is influenced by structural and socio-cultural factors, and indicates that neither teachers nor learners are familiar with using school gardens in the teaching and learning process.

Chapter 6 provides a concluding summary of the case study research. It puts forward recommendations based on the findings of the research as articulated in Chapter 5. There are four recommendations that have been put forward for the school based on this study.

## **1.6 CLARIFICATION OF KEY CONCEPTS**

In this study, I use a range of concepts, which I briefly introduce here to facilitate reading of the study.

**South African Biodiversity Institute (SANBI)** - It is an institution that seeks to maintain and preserve the biodiversity (including wild natural forests, plants and indigenous flowers) in South Africa.

**Biodiversity** – This is a collective term meaning diversity of plants, insects and all animals including habitats in the ecosystem.

**Outcomes Based Education (OBE)** - The South African System of education that was introduced by the new government after 1994. All schools in South Africa are implementing Outcomes Based Education as the basis of the national curriculum in their teaching and learning practices. Outcomes Based Education, according to the DoE (2002) NCS document, refers to the contextually demonstrated end products of the learning process.

**Contextualisation** - This concept, according to Cornbleth (2000) refers to the use of context and contextually available materials in carrying out teaching and learning in schools. In this study contextualisation is used to refer to the use of locally available materials by teachers in order to facilitate learning. It also refers to the socio-cultural and structural factors that influence the curriculum contextualisation process.

**Decontextualisation** - The opposite of “contextualisation”. The school context and its locally available materials are treated as if they do not exist during teaching and learning. No relationship is established between the context and the lesson plan during teaching.

**Conceptual decontextualisation-** According to Cornbleth (2000) this occurs when curriculum is treated as a product, e.g. when curriculum is treated as a syllabus document, a course of study or as a package of materials that is accompanied by directions for its use.

**Operational decontextualisation-** Cornbleth (2000) says this occurs when curriculum is treated apart from its structural setting and out of its socio-cultural contexts as if it were independent of its location in the educational system, society and history.

**Technocratic curriculum** – A conception that views curriculum as a tangible product, usually a document or plan for instruction in a particular subject. The specificity and detail of the curriculum product can range from a brief outline of topics to be taught and learned, such as a syllabus or course of study, to an elaborate outline accompanied by teacher and student materials like readings, worksheets and transparencies, and a teacher guide including directions for teaching and assessing (Cornbleth, 2000).

## **1.7 CONCLUSION**

In this chapter I have introduced the research context through providing detail on the research orientation, the research question and the research goals. The discussions contained in this chapter show how I became involved in this project and the cause of my motivation for the study through my role as a teacher and as a councillor. I have explained the background to the Greening of Schools Project and its impact on the school and curriculum development. In the next chapter, I discuss the policy context and the theoretical framing of the study in more depth.

## **CHAPTER 2**

### **CONTEXTUAL FRAMEWORK OF STUDY**

#### **2.1 Introduction**

This chapter reviews the relevant literature and outlines the context of the school and educational system. It examines the relationships between the research context, the school garden, the school curriculum and the history of the area. I tried to write this chapter with the requirements of the school vision and mission statement in mind. I do this to avoid a situation where I may find that research and its activities do not address the order of action in the school. There is a relationship that exists between the school, learners and the community around the school. Throughout this chapter I have kept this relationship visible and interconnected. There is also a relationship and interconnectedness between the context and the school curriculum. This relationship is ever present and needs to be investigated and be analysed by professional teachers to assist with the teaching and learning process.

#### **2.2 Rural schools in South Africa**

The condition of schooling in rural areas has come under scrutiny in recent years. Most schools in rural areas in the Eastern Cape have a teacher to learner ratio of 1 : 39 (HSRC, 2005). The South African Schools Act 84/1996 puts certain powers of a public school on the shoulders of a School Governing Body (SGB), for this reason it becomes necessary for the SGB to understand how to support schools to manage themselves. (South African Schools Act, Act 84 of 1996). The unfortunate part is that, in rural areas and in rural schools there is a great illiteracy, poverty, unemployment and other social ills, the parents of learners do not have enough time to look after the education of their children through SGBs (HSRC, 2005).

#### **2.3 Ethridge Junior Secondary School**

In this section I look at the school as an educational structure and as an open organization with its teachers, parents and learners, through a contextual profile of Ethridge J.S.S. where I am researching the teaching of Technology.

Technology is one of the subjects that was not taught in rural schools during the apartheid era in South Africa, and is therefore a new learning area with new challenges for teachers.

Ethridge Junior Secondary School, (J.S.S) is a rural school, 20 km from the town of Bizana along the R61 provincial road towards the Umthamvuna River mouth. The school is named after the founder of the school, the right Reverend Ethridge of the Presbyterian church of England who was stationed at Imizizi location in the early 1800s. The school was originally built by Rev. Ethridge to educate members of his congregation so that they could read the Bible together with their children. From its humble beginnings, the school grew into a mission school and is now a public school under the Eastern Cape Department of Education (ECDoE).

Ethridge Junior Secondary School was called Imizizi Junior Secondary School until the early eighties. In the nearby Imizizi location the houses are mud rondavels (izindlu zodaka) and this is not necessary a sign of poverty, people are using what is naturally available in their surrounding to build their houses. The area is under the jurisdiction of chief Mditshwa. There is less than 1% employment rate of men and all citizens are poor. Therefore most of the people survive through old age pension money and child support grants from the government.

In the 1980s School Committees were not statutory and were only elected by the Principals to assist their daily school activities. These structures had little power and were supporters of the Principal in doing his/her management functions. These committees mainly functioned to organize their communities to build the school with mud, wood or stone. In the early eighties there was only one brick classroom that had been built by the Anglican Bishop in the 1800. All other classrooms were made of mud and stone. In this way communities were using what is at their disposal to construct their houses.

The South African Schools Act (SASA) 84/1996 states that all public schools should elect a School Governing Body (SGB). These bodies are elected once every three years and are expected to run the school according to the rules laid down in the SASA document. Some of the issues and powers that are given to the SGB are:

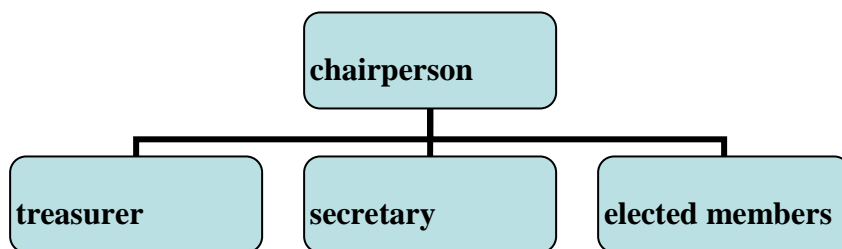
- They need to ensure that schools are to be free from violence and vandalism.

- They must ensure schools are centers of learning and so teaching must take place accordingly.

These are only a few of the rules that must be taken care of by the SGB in any public school. The law stipulates that these bodies can only be elected from the parents of the learners who are learning at the school during the time of election. This rule further says the SGB can co-opt parents who could be a resource to the school even if the above rule is in force.

The Chairperson, the Secretary and the Treasurer of the SGB form the school Secretariat (see Figure 2.1) and no school funds could be used by anybody without the full knowledge of the Secretariat of the school. The Principal of the school becomes an un-elected member of the School Governing Body.

**Figure 2.1: The structure of an SGB**



## **2.4 Teachers and Learners**

In any public school, teachers are employed by the Provincial DoE using the Employment of Educators Act, 76/1998. This act defined qualifications for all educators and determines the number of teachers that can be employed as a result of the school's staff establishment.

All teachers need to enroll with their professional body, South African Council for Educators (SACE), Act 31/2000 prior to their employment. At Ethridge J.S.S. there are 22 staff members, 21 of which are teachers and the Principal, who runs management and administration of the school, is a non-teaching staff member (Table 2.1).

There are 753 learners at Ethridge J.S.S. for 2007 (Table 2.1), 324 boys and 429 girls. Most of these learners come from very poor backgrounds due to different reasons. Most parents have no work due to their lack of skills, some parents have HIV/AIDS, which is prevalent in the area of Imizizi and some kids are born to single young mothers who cannot support themselves. A number of boys smoke dagga at an early age while many girls give sexual favors to men in return for money (own opinion).

**Table 2.1: Summary of teachers and learners at Ethridge J.S.S 2007**

	<b>LEARNERS</b>	<b>TEACHERS</b>
FOUNDATION PHASE	213	5
INTERMEDIATE PHASE	276	6
SENIOR PHASE	264	10
TOTAL	753	21

## **2.5 School and Community Issues**

There are parts of the school premises that are used by the learners alone. There are, however, other areas such as the soccer and netball fields that are shared with the community by teams and clubs. Sometimes these fields are used by the community for their mass meetings.

There are a number of issues that have a big impact on the school, negatively affecting the teaching and learning. These are issues around HIV/AIDS, crime and drug abuse.

Another issue that is a problem is that of local migration towards the R61 road. Over recent years considerable number of people in Mbizana Municipality as a whole have crowded in some areas into dormitory settlements or villages along the R61 road and the other arterial commuter

routes in search of better services. This has resulted in uncontrolled use of valuable agricultural land which is contributing to the erosion of the remaining resources available for the people to sustain their rural livelihood. This is causing reduced life expectancy, it reduces human values (due to struggles for limited opportunities), unemployment and criminality in the area.

A further issue is that of transport. Just like in most rural areas in South Africa, roads are a major problem as they are mostly gravel and bumpy. In poor weather, public transport for those deep in rural settlements is non-existent. For these reasons it becomes imperative for the working rural people to move towards the tarred R61, thereby causing a chisel settlement distribution. This concentration causes many accidents, often with animals as most of the people who move towards the only tarred road like the R61 are farmers of goats, pigs and cattle etc. The most common available transport are taxis and buses. Taxi wars are common, and careless driving by young taxi drivers is proving to be dangerous to the lives of commuters (own opinion).

Buses are very old, resulting in the common loss of braking system while running, causing unparalleled deaths in this region. By their design, vans are not for loading humans, but in these rural areas they are used extensively by commuters, as there are no other suitable transport mechanisms for these communities.

These are some of the issues that affect the school and local community. However, it is not possible to fully understand the context of Ethridge J.S.S. without a broader understanding of the education change process and the new dynamics of the South African Education System, which I now discuss in more detail.

## **2.6 The Education System of South Africa**

### **2.6.1 The need for educational transformation**

South Africa has a National Department of Education (DoE) that acts as an anchor department which levels and rationalizes policies in all provinces to be the same and equal. There are nine provinces in this country, each province runs its Department of Education and has a budget for this function.

For a long time South Africa was characterized by an apartheid government which deprived black people of a good education. The process of teaching for black people was designed to be inferior with the result that black people received education of a lower quality. This led to the disempowerment of the young generation, and when they became parents they had no resources for sending their children to higher education. This resulted in an ever continuing self validating cycle that ultimately bred poverty and illiteracy among many of the black people in the country.

After 1994, the new government had a great task of normalizing these separate development schools into equitable schools for all children of South Africa. There was a need to develop black people from all walks of life: technical, primary and secondary education and higher education. For this reason, the black community has come to be referred to as the 'disadvantaged community'. After 1994, the Department of Education started the educational reconstruction process by amalgamating 17 racially divided departments into a national and provincial education structure, with national bodies responsible for policy and provincial bodies became responsible for implementing far-reaching policy changes, including new aims for education in a democratic state.

### **2.6.2 Aims of the South African education system**

The goals and aims of the education system in South Africa are contained in the White Paper on Education and Training (March 1995) which became the guidelines for the National Education Policy Act. Aspects relevant to this study are:

- Education and training are basic human rights and the state has the obligation to protect these rights.
- Parents and guardians have the primary responsibility for the education of their children.
- Education policy should enable all individuals to value, have access to and succeed in lifelong education and training of good quality.
- All historical inequalities should be redressed.

- Communities must accept ownership for their schools and legitimate representative governance bodies should be instituted etc.

The following sections are aspects of the legislation that are relevant to this study. The general aim of all the acts is to promote education from its separatist formula of pre- 1994 elections, to a more inclusive education approach.

#### **2.6.2.1 The Constitution of the Republic of South Africa, Act 108/1996**

The Constitution of South Africa contains the Bill of Human Rights (section 29) which reads: everyone has the right to basic education including adult basic education, and further education and the state should provide every measure to open further education to everyone. This enshrines the right to basic education for all South African.

#### **2.6.2.2 National Education Policy Act, (Act 27 of 1996), (NEPA).**

This Act determines national education policy by the minister in accordance with certain principles. It provides for the monitoring and evaluation of education policy. This Act outlines the responsibilities of the National Department of Education.

#### **2.6.2.3 South African Schools Act, (Act 84 of 1996), (SASA).**

This Act establishes minimum and uniform norms and standards for the provision of education at schools. It provides the guidelines for the organization, governance and funding of schools, which includes the issue of parental involvement in school governance. This Act introduces a focus on quality into the policy discourse, concentrating on the provision of quality education across the school system.

#### **2.6.2.4 The Employment of Educators Act, (Act, 76 Of 1998).**

This Act confirms the Minister of Education as employer of an educator for purposes of determining salaries and other conditions of service. The Act formally established the South African Council for Educators, (SACE). It provided for the establishment and governance of public FET institutions and a system of programme-based funding.

It also provided for the establishment of quality education. As the name indicates, this Act provided for the employment and conditions of service for educators.

## **2.7 Curriculum Transformation**

When the new ANC government took over the running of the country, there was hope that the syllabus would change. Not only has the entire structure of the education system changed, but in the past 10 years, a new curriculum has been designed, revised, streamlined and strengthened. The first change was the introduction of an Outcomes Based Education (OBE) curriculum.

OBE relates to teaching and assessing whether learners have achieved certain outcomes. In OBE, the learning process is learner centered and learner participation is regarded as a primary condition for success of the OBE lesson. Learners were to learn by doing or be very active in what they were doing, and were to discover by themselves. A system of grouping learners around a table became the center stage of OBE teaching. The teacher was seen to be a facilitator, and he/she was to help facilitate learning and not to lead it.

The new curriculum came to be known as Curriculum 2005. In the new curriculum eight Learning Areas (LA) were identified for the General Education and Training (GET) band (Grades R – 9). “Subjects” was no longer used in schools, and was replaced by the word, Learning Areas. The specified Learning Areas were Language, Literacy and Communication, History and Geography, Economic and Management Sciences Mathematics, Mathematics Literacy, Life Orientation, Natural Sciences and Technology (including aspects of agriculture). Environmental Education was not a considered as a separate learning area, but was instead included through a system of phase organizers, and an environmental focus was built into a number of the specific outcomes in the new Learning Areas.

The first few years of implementing C2005 were problematic for a number of reasons, and in 2000 the Minister of Education commissioned a curriculum review. The review committee recommended that:

- Human rights education and education for civic responsibility throughout the curriculum be infused together and that will pay special attention to anti- discriminatory, anti- racist, anti- sexist and special needs issues.
- Curriculum documents are simplified by producing a National Curriculum Statement for ECD, GET, FET and ABET. The National Curriculum Statement should express in clear terms what is to be learnt and at what level it is to be assessed.
- A streamlined National Curriculum Statement be produced which should include: critical outcomes and learning area statements comprised of learning outcomes and assessment standards. This means dropping the 66 specific and assessment criteria, phase and programme organizers, range statements, performance indicators and expected levels of performance. The emphasis should be on clear and accessible documentation.
- The overload of too many learning areas should be reduced by rationalizing learning areas from 8 to 6 in the GET band (languages, mathematics, science and technology, social sciences (history and geography), arts and culture, life orientation and specifying three learning programmes in the Foundation Phase and six in the Intermediate and Senior Phases.
- Conceptual coherence should be promoted by specifying learning outcomes and assessment standards by grade and providing more time for languages and mathematics in the GET band. Promote integration across learning areas by using critical outcomes and assessment exemplars. Promote integration within learning areas by learning area statements and learning programmes (HSRC, 2005).

Following these recommendations, a Revised National Curriculum Statement was released in 2002, still based on the GET, FET band structure and the 8 learning areas, including Technology. Environmental education had been built into each learning area, ensuring that environmental issues were dealt with across the curriculum. The new curriculum had less design features and focused on learning outcomes and assessment standards.

## **2.8 Curriculum and Context**

Despite all of this work to generate a national curriculum statement with national standards indicated by the learning outcomes and assessment standards, curriculum cannot be understood outside of a social context, and appropriate theoretical tools are needed to consider these educational changes in a rural school context more critically (Ethridge J.S.S.).

To understand different approaches to curriculum, Grundy (1987) draws on Habermas's (1972) theory of knowledge interests to explain different kinds of curriculum. This theory explains how people think about knowledge, and how knowledge is organized in society. Habermas (1972) proposed three different knowledge interests in society, the technical, the practical and the critical, which Grundy (1987) interprets as different approaches to curriculum. According to Grundy (1987) curriculum in the critical paradigm is curriculum as praxis and is a social process that develops through the dynamics of action and reflection. She means that curriculum is not a simply a set of plans to be implemented, but it is constituted through an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process. This new curriculum has implications for the teacher and his /her role in the curriculum process.

According to Cornbleth (2000), curriculum is contextually shaped both structurally and socio-culturally. By structural context she refers to the established roles and relationships, including operating procedures, shared beliefs and values. As shown in the review above, the structural context can be considered at several layers, from the structural factors at individual classroom level to the school organization to the national department of education policy framework. By socio-cultural she refers to the environmental context beyond the education system. Socio-cultural includes demographic, social, political and economic conditions, traditions and ideologies and other factors such as language that influence the curriculum. Within this context Cornbleth (2000) considers curriculum to a dynamically changing process. Within this change process, it would be important to consider trends in curriculum planning that support more participatory, deliberative approaches. Grundy (1987) introduces a stronger process approach to curriculum development.

Grundy (1987) takes a critical perspective and views curriculum as constructed within an actual learning situation where learning is a social process and knowledge is socially constructed. Cornbleth (1990) sees a curriculum as an ongoing, contextualized social process comprised of interactions between teachers and students knowledge. She refers to curriculum knowledge as knowledge that is made available to students through opportunities in which they construct, reconstruct and analyze knowledge. She further indicates that such processes are influenced by structural and socio-cultural factors as outlined above. Cornbleth (1990) articulates that the structures that influence curriculum shape participant's experiences of learning. According to her, these structures include legislation and political systems and the way the national department of education works.

Participatory and contextualized approaches to curriculum development have received attention in southern Africa environmental education processes, as approaches have been sought that enable communities to participate in their learning in ways that allow critical contextual dialogue and action at a local level (Lotz 1999). Janse van Rensburg (1998) encourages the involvement of the user community in curriculum review and development. She states that if the curriculum review or development is to develop learners or communities it has to involve them and draw from the vast experiences they possess. Lotz (1999) describes a process of curriculum deliberation which is participatory.

The works of Cornbleth (1990), Grundy (1987) and Lotz (1999) form part of a broader body of curriculum theorizing in the twentieth century. According to M'Kernon (2008) the twentieth century has been productive in putting forward a number of alternative theories relating to curriculum. He classifies this large body of work into different categories:

- Personal progressive
- Critical political
- Academic rational
- Technical behavioral

- Practical deliberative

He explains that the academic rational approach is the oldest approach influencing western education, while the technical behavioral curriculum was very popular following the rise of behavioral psychology and behaviorist theories of learning. He explains that, if uncritically implemented, outcomes based education can also become technical behaviorist, which would not be very different from former apartheid education models. For this reason, I am drawing on Cornbleth's, Grundy's and Lotz's views that consider the context of curriculum processes more critically.

## **2.9 Technology in the SA school curriculum**

As mentioned previously, Technology was introduced as a Learning Area with C2005 and was retained after the revision and streamlining process. The Technology Learning Area, like other Learning Areas is outcomes based and is structured according to learning outcomes and assessment standards. According to the DoE, OBE considers the process of learning as important as the content. Both the process and the content of education are emphasized by spelling out the outcomes to be achieved at the end of the process.

In the Revised National Curriculum Statement, Learning Outcomes and Assessment Standards were designed down from the critical and developmental outcomes. These are derived from the Constitution and are contained in the South African Qualifications Act (1995). They describe the kind of citizen the education and training system should aim to create.

## **2.10 The Critical and Developmental Outcomes**

The Critical Outcomes envisage learners who will be able to:

- Identify and solve problems and make decisions using critical and creative thinking.
- Work effectively with others as members of a team, group, organization and community.
- Organize and manage themselves and their activities responsibly and effectively.
- Collect, analyze, organize and critically evaluate information.

- Communicate effectively using visual, symbolic or language skills in various modes.
- Use Science and Technology effectively and critically showing responsibility towards the environment and the health of others.
- Demonstrate the understanding of the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation.

The Developmental Outcomes envisage learners who are able to:

- Reflect on and explore a variety of strategies to learn more effectively.
- Participate as responsible citizens in the life of local, national, and global communities.
- Be culturally and aesthetically sensitive across a range of social contexts.
- Explore education and career opportunities.
- Develop entrepreneurial opportunities.

Important for this discussion, is the functional process of Critical Outcomes and the Developmental Outcomes and the emphasis they give to Technology. In this context, Technology needs to be used with due responsibility to the environment and health of others as indicated above. As mentioned before, problem solving approaches working with others, citizenship, entrepreneurial skills etc. are also significant for Technology Education.

The Revised National Curriculum Statement as a whole and by implication Technology, attempts to embody and uphold a democratic vision of the society and the citizens that should emerge from the school system. RNCS grades R – 9 builds on the vision and values of the Constitution and Curriculum 2005, and foregrounds a set of interrelated principles which include:

- Social Justice,
- Healthy Environment,
- Human Rights, and

- Inclusivity.

The DoE (2002) states that curriculum can play a vital role in creating awareness of the relationship between human rights and a healthy environment, social justice and inclusivity and that it needs to be sensitive to issues of poverty, inequality, race, gender, age, disability and such challenges as HIV/AIDS. This is significant for Technology, because it requires Technology teachers to pay attention to issues of social justice and a healthy environment, while also dealing with issues of poverty, gender etc. The broader curriculum principles and goals have influenced the purpose of learning outcomes and assessment standards of the Technology Learning Area. The purpose of the Technology Learning Area, according to the DoE (2002, p.4) is outlined below.

The Technology Learning Area will contribute towards learners' technological literacy by giving them opportunities to:

- develop and apply specific skills to solve technological problems.
- understand the concepts and knowledge used in Technology, and use them responsibly and purposefully.
- appreciate the interaction between people's values and attitudes, technology, society and the environment.

The Technology Learning Area has three Learning Outcomes which are meant to be interrelated. They are:

#### LO.1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.

#### LO.2: Technological Knowledge and Understanding

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.

### LO.3: Technology, Society and the Environment

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

#### **2.11 Environmental Trends and their influence on Technology education.**

As indicated above, when the White Paper on Education and Training was released in 1995, it included a principle statement that environmental education should be integrated into all phases and grades of the South African Education system. Following this, environment was defined as a phase organizer, which integrated environmental issues across Learning Areas. When the curriculum was revised, environment was identified as being a critical component in all learning areas, due to the curriculum principles, derived from the Constitution, which emphasized the need to create and maintain a healthy environment for the well being of all South Africans.

As can be seen from the critical outcomes and from the learning outcomes in the Technology Learning Area (outlined above), environment is an integral feature of Technology Education in South Africa today. As a result, environmental education can take place in the Technology Learning Area.

Booth et. al. (1994) identifies positive and negative aspects related to the environment in South Africa. The positive aspects are the trends in systems of governance that are presently developing and the way science is being applied in various environmental contexts. These positive aspects have an influence on educational processes as well.

In terms of governance, the trend towards greater democracy and public participation in decision-making is a strong positive factor affecting the environment because of wider involvement in the process of policy development, greater commitment to policies once developed and increasing accountability.

Booth et. al. (1994) note that public participation should encourage people to take more responsibility for their actions, and participation in policy processes should give attention to the role of women and youth in the decision-making processes. Hence it should emphasize education programmes to get young people more involved. Democratic and participatory processes and individual and group responsibility in the school curriculum, contribute to the development of youth capable of operating in such a governance milieu.

Booth et.al. (1994) also identify applied science as an important positive trend, which they define as the creation of (i) more efficient and non-polluting technology, and (ii) increased and improved infrastructure such as roads, dams, water and sanitation services, and rural infrastructure.

This indicates the important role that technology education has to play in developing the knowledge, skills and values to inform development of non-polluting, sustainable technologies that improve the quality of life to people and minimize harm to the environment.

Booth et.al. (1994) go on to describe the negative trends which are having an impact on the environment in Southern Africa as:

- Industrial and agricultural products (unsustainable technologies)
- Poverty
- Population growth and distribution
- Education and culture (to enhance sustainable technologies)
- Natural disasters and their management (that requires better technology)

They explain that pollution and other environmental damage are caused largely by uncontrolled and unregulated emissions created by dirty technologies. Both commercial and subsistence agricultural systems often abuse the living soil, slowly draining its productivity and decreasing biodiversity, again through unsustainable technologies and practices.

These issues are exacerbated by rapid population growth which increases competition for resources and requires more capacity (human and technological) to manage the environment.

Rapid urbanization adds additional challenges as rapid technological adaptation does not always keep pace with human migration patterns. This is harmful to the environment because urban infrastructure is not able to cater for the unplanned movements towards towns, e.g. building of new houses, sanitation, water reticulation etc.

Non-holistic approaches to formal education and training, which are often foreign, biased and out of touch with the environment, have often destroyed the role of traditional education and culture. Through this process, valuable local and indigenous technological knowledge and experience has been marginalized and lost. These trends relate to technology and the environment, all of which have a bearing on the Technology Learning Area. For example, learners can learn to design technologies that avoid unnecessary pollution, or activities can be designed to solve technological problems associated with urbanization etc.

Activities to recover lost or marginalized indigenous technologies can also be developed. As mentioned in chapter 1, and in my research question, this study is linked to the SANBI project of greening schools, and therefore to issues of biodiversity. How then, would a focus on biodiversity be relevant to the Technology Learning Area?

## **2.12 Biodiversity.**

Biodiversity refers to biological diversity, which is the richness and vast variety of forms of life on earth. The 1992 Earth Summit in Rio de Janeiro, Brazil, finalized a global Convention on Biodiversity which came into effect at the end of 1993. But most people have no idea what biodiversity is, or why it is important.

There are almost 1.5 million species on earth which have been classified and named, including insects, birds, fish, mammals, plants and other life forms. Scientists do not know exactly how many species there are, but estimate in the region of 5 – 30 million, at least three times as many as we already know about. And this says nothing about the huge range of differences within each species (UNEP, Earth Summit Paper, 1992, vol.7).

Ecologists point out that the more we know about ecosystems, the more we understand how every species has a relationship with all the other species, and that if we remove these building blocks the whole system could collapse. No one knows how many extinctions is too many. What we do know is that the normal rate of extinction was low until recent history, but by 1992, the extinction rate had accelerated to one in every 12 minutes, which is over 40,000 each year (UNEP, Earth Summit Paper, 1992, vol.7, p.1).

In a context of increased extinctions, there is a need to conserve and protect biodiversity, and to understand the relationships between biodiversity and technology. While crops and livestock originally came from the wild, agriculture now depends heavily on technologies (some of which are unsustainable) to develop new seed. Many life preserving drugs have been developed from wild plants through technology, and the loss of a particular species or variety might destroy a possible cure for cancer.

We live in a world where species go extinct every day, and with them the whole range of possibilities that once existed within that species. When people talk about conservation of biodiversity, they really mean, the prevention of extinction, and efforts to maintain the huge range of differences among and within the species of the earth (UNEP, Earth Summit Paper, 1992).

Why preserve biodiversity? Some people feel that moral reasons should suffice. If human beings hold the fate of a species in the balance through over-utilisation or destruction of habitat, there is a moral obligation to preserve that species. Others make more pragmatic arguments. Since all of our crops and livestock originally came from the wild, if an undiscovered disease were to wipe out all the commercially grown maize, we could turn to some wild variety to develop new seed. Many life preserving drugs have been developed from wild plants and the loss of a particular species or variety might destroy a possible cure for cancer. Technologies are also used to enhance and protect biodiversity. For example, an application of manure to fields is a well known technique that improves crop yields, and increasingly more sustainable technologies are being sought to replace older, damaging ones. There is little doubt that manure can replace commercial fertilizer, but its use is not very wide spread because, paradoxically, there are not enough cattle.

Experiments at a Zimbabwean research station showed that about eight tonnes of manure are required for each hectare annually to maintain high maize yields on granite soils. It takes approximately six cows to produce enough manure for one hectare of cultivated land, over a six month period. Six cows require 36 hectares of grazing land, although the average subsistence cattle herd sizes are not enough to provide the basic minimum of 8 – 10 cattle per house hold, and grazing lands are not adequate to support more cattle (Scotney et.al. 1990).

Scotney et. al. (1990) state that not only is the quantity of manure important, but also the quality, which varies considerable with the quality of feed available to the cattle. They note that manure from cattle on commercial ranches has double the nutrients of cattle from communal lands. Low quality manures actually depress growth on young maize plants, showing that while it is desirable to try to generate more sustainable approaches to technology, it is not always easy, due to a range of contextual factors.

### **2.13 The school garden context.**

The school garden is the context of this case study. The discussion above shows that lessons from the broader field of environment and technology can be applied or considered in a school garden context.

Instead of using cattle manure, learners can be taught to use compost instead to enrich the soil and improve their harvests. Common vegetables like, spinach, cabbage, peas and potatoes can be planted by using compost or cattle manure, usually with favourable results.

Other environmental technologies, such as irrigation systems that do not waste water, or planting technologies that are more efficient, can also be developed and used to teach some of the broader concepts and issues of sustainable technology.

### **2.14 Conclusion.**

In this chapter, I briefly reviewed some of the issues that relate to rural education in South Africa. I then provided a profile of Ethridge Junior Secondary School, which is located in a rural area. I argued that it is not possible to understand curriculum change in this school, without a broader

knowledge of the educational transformation process in South Africa. With this background, I then focused on the interest of this study, namely technology education, and I outlined some of the trends associated with environment and technology that influence curriculum thinking. This chapter also provided insight into ways of thinking about curriculum change. In the next chapter, I describe the research methods used in this study to investigate the research question.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter deals with the methodology and methods used in this research. This research was concerned with school teaching and learning and integration of an environmental focus in the Technology Learning Area (LA) using the school garden. It therefore follows that teachers teaching, learners learning, community assisting in administering the school to support community values and the use of the school garden, were the cornerstones of this research.

The approach used in this study was that of a case study, and the data generated was mainly qualitative. Lincoln and Guba (1985) argue that studies should be set in their natural setting, as the context is important in making meaning. The context of this study was the school, and more specifically the teaching of three technology activities in the senior phase.

#### 3.2 Research orientation

Researchers have defined case study research in different forms and from different perspectives. Nisbet and Watt (1984), define a case study as a specific instance that is frequently designed to illustrate a more general principle. Adelman et. al. (1980) further define case study along the concept of “instance” by saying, that the single instance being studied represents a bounded system, for example, a classroom, a school, or a community. A case study provides a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply by presenting them with abstract theories or principles. Hitchcock and Hughes (1995) suggest that case studies are distinguished by the methodologies that they employ, which often require detailed, qualitative data to allow for thick description of the case.

Considering the characteristics of case study research as laid out above, it would seem important for the researchers to be particular and accurate in data collection and recording, to allow for in-depth description of the case.

This case study research consists of three activities that were implemented cyclically and sequentially. By cyclical, I mean that all the activities follow the same cycle. By sequential, I mean that, the activities had a particular logical sequence, i.e. we could not do planting before we had finished making compost. The activities therefore followed each other in this order: composting, planting and irrigation, and only once the planting had been done could we focus on irrigation. This case study boundaries were therefore defined by:

- The place where the activities took place (i.e. Ethridge JSS school garden).
- The grade of learners involved (i.e. grade 8 learners).
- The three technology activities (i.e. composting, planting and irrigation).

### **3.3. Data generation**

To generate data that would adequately capture the detail of each activity, I used four qualitative research data generation methods:

- Interviews
- Observation of technology activities
- Workshop
- Document analysis

These are discussed in more detail below.

#### **3.3.1 Interviews**

Interviews can yield a great deal of useful information, and through interviews the researcher can ask questions related to any of the following:

- Facts e.g. biographical information.
- People's beliefs and perspectives about the factors.
- Feelings.
- Motives.
- Present and past behaviours.

- Standards for behaviour, and
- Conscious reasons for actions or feelings. (Silvermann, 1993)

Cohen et al. (2003) explain that interviews normally differ in the degree of structure in the interview, which itself, reflects the purposes of the interview. Lincoln and Guba (1985: 269) suggest that the semi-structured interview is useful when the researcher is aware of what he does not know and is therefore in a position to frame questions that will supply the knowledge required while also allowing for discussion and response in the interview. Terre-Blanche and Durrheim (1999) describe face-to-face interviews as a process of getting to know each other.

### **3.3.1.1 Face-to-face semi-structured interviews.**

Because the interviewee's were mature respondents, who understand the purpose of the questions, a semi-structured interview approach was used. These were conducted face-to-face with teachers and community member (Figure 3.1). Focus group interviews were also conducted with learners.

The purpose of the interviews was to try to access knowledge that may not be possible to discover from the respondents through observations.

The semi-structured interviews allowed me to adjust questions where necessary. Tuckman (1972) argues that at a meeting, the interviewer should brief the respondent as to the nature or purpose of the interview, to make the respondent feel at ease. In the case of this research, interviewees were teachers and community members (members of the school governing body). I informed these interviewees timeously at the workshop that we would need to conduct interviews after every activity to reflect on the activities and plan the work ahead.

**Figure 3.1: Face-to-face semi-structured interviews with teacher 1**



**The list of interviewees, date of each interview and purpose of interview are all outlined in Table 3.1 below.**

**Table 3.1: Interviewees, dates and purpose of interviews, and codes for each interview (The code in the last comment refers to teachers – see list of acronyms).**

<b>Interviewees</b>	<b>Interview Date</b>	<b>Purpose of the interview and sample explanation</b>	<b>Code</b>
<p>Teachers</p> <p>1. Mr V. Nomaqhiza</p> <p>2. Mr B. Mampofu</p> <p>3. Ms H. Jwente</p>	<p>13. 08. 07</p> <p>18. 08. 07</p> <p>02. 08. 07</p>	<p>Find out Environmental and Technological understanding among teachers of gardening activities. These teachers are teaching Technology at senior phase, and were therefore selected for the study sample.</p>	<p>TI-1</p> <p>TI-2</p> <p>TI-3</p>
<p>Parents</p> <p>1. Mrs L. Sitiya</p> <p>2. Mrs Nikwe</p> <p>3. Mrs Ntshangase</p>	<p>24. 07. 07</p> <p>30. 07. 07</p> <p>09. 08. 07</p>	<p>An interview with three parents was conducted to determine how much support there is among parents for the gardening activities. These interviews helped in determining what the parents supported – whether their children should learn gardening, whether they accept that gardening must be taught in school and whether the vegetables should be sold. These parents were randomly selected.</p>	<p>PI-1</p> <p>PI-2</p> <p>PI-3</p>
<p>Learners (Grade 8)</p> <p>Group 1 and</p> <p>Group 2</p>	<p>15. 08. 07</p> <p>22. 08. 07</p>	<p>Two focus groups with grade 8 learners were held. These were to find out how much learners know about gardening activities and what their interest is in the gardening activities. Do learners support that they should be made to work in the garden, is this not forced on them? How many regard</p>	<p>FG - 1</p> <p>FG - 2</p>

		gardening as an instructional medium and not punishment for wrong doing? The focus group interviews helped in revealing their understanding of biodiversity.	
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### 3.3.1.2 Face-to-face focus group interviews with learners.

The focus group interviews were conducted with learners using a semi-structured interview schedule (see Figure 3.2 and Appendix 2). They were conducted in groups of ten learners, and all learners were given an opportunity to answer questions. A focus group interview such as this is useful when time is limited. Furthermore, people often feel more comfortable talking in a group than when alone, and interaction among the participants is often more informative than when individually conducted (Cresswell, 1998; Neuman, 1994).

The interviewees were given time long before the interview process was carried out, to prepare for the interviews. Patton (2000) comments that in a focus group discussion (interview), it is not important for the people to agree or disagree, but rather to get high quality data of different views in a social context. Terre-Blanche and Durrheim (1999), note that when one works with a group of people, one gains access to understanding differences between people, who might previously have been thought of as a homogeneous group (learners). I tried to manage the interview in such a way that it was not dominated by and single individual.

**Figure 3.2: Grade 8 learners doing the focus group interviews (semi-structured interviews)**



Two focus group interviews were conducted with the learners as shown in Table 3.2 below.

**Table 3.2: Grade 8 learners in the focus group interviews.**

<b>Interviewees</b>	<b>Interview Date</b>	<b>Purpose of the interview</b>	<b>Codes</b>
Group 1: 10 learners from Grade 8	15. 08 . 07	To find out how much learners know gardening activities. What their interest level is in the gardening activities.	FGI-1
Group 2: 10 learners from Grade 8	22 . 08 . 07	As above	FGI-2

### **3.3.2 Observations**

Patton (1990) suggests that observational data should enable the researcher to enter and understand the situation that is being described. According to Morrison (1993) observations enable the researcher to gather data on different settings e.g. human setting, physical setting, interactional setting and programme setting. In this study I use both unstructured

observations, and structured observations. Un-structured observations allowed me to gather data on the human and physical setting, while structured observations allowed me to gather data on the interactional setting (i.e. what was happening in the three activities) and the programme setting (i.e. the technology teaching programme in the school garden). In this process I was able to shift focus from one thing to another as new and potentially significant objects and events presented themselves as discussed by Leedy and Ormrod (1989). Observations were captured using field notes. Observations in this study were based on the teaching of three technology activities : composting, planting and irrigation. This intervention programme using these three activities provided insight into the research question which focused on the use of school gardens for teaching environmental activities in the technology learning area. Including the three activities in the study was necessary since Technology is a practical subject, and it was the only way I could observe the technological process in the school gardens.

### **3.3.3 Workshop**

The data collected from the interviews and observations was brought into a workshop for discussion. The purpose was to verify and triangulate the data. Cohen et. al. (2003) refers to the comparison and pairing of data as triangulation. They argue that triangulation is the use of two or more methods of data collection on the study of some aspects of human behaviour.

In this research, the research participants were teachers, learners and community members, represented by the School Governing Body or SGB. A total of 26 people participated in the workshop and deliberated on data in relation to what was happening in the school.

I prepared guiding questions to lead the workshop process (see Appendix 3 for notes on the workshop). These were meant to guide the discussion process and not to confine or constrain it. A number of topics outside the question guidelines were raised by the participants, I refer to these topics as floor topics since they were raised from the floor. I saw these questions as having equal status to the topics that were based on the questions. According to Moon (2001) a workshop is a way of turning experiences into knowledge.

When different knowledge backgrounds came into conflict with each other in the workshop, I had to intervene by accepting all forms of answers or knowledge as being worthwhile (learners understanding of the issues, teachers academic knowledge and parents or community knowledge). From this process I realized that different perspectives can be put to

discussion by the different stakeholders at the same time and a solution could be found through proper guidance.

After identifying the issues, the participants were organized into smaller groups to deliberate their issues in fine detail. Each group captured their discussions on a flip chart so that their deliberations could be presented and shared among all members of the workshop at the end of their deliberations. The workshop discussions confirmed what other sources of data collection i.e. interviews and observations had indicated. The three methods combined confirmed that categories of data that were emerging from the research were valid and were true reflections of the school issues. Another means of triangulating data is that of document analysis, which was also used in this study.

**3.3.4 Document analysis**

To gain a more in-depth understanding of the teaching style and processes used by teachers, and of learner achievement, I needed to use a data gathering method that would provide insight into classroom practice and learner achievement. Monitoring tools like class work, lesson plans, tests and homework, to mention a few, needed to be looked at closely, because they provided insight into how the teachers were teaching and they showed how much the learner understood. Deviations from intended plans, or changes in understanding were evident in documents relating to classroom practice, which provided a useful means of identifying gaps in understanding the issues.

In this research, I analyzed teachers plans and learners work to see whether an environmental focus was considered during the lesson, and how it was being dealt with in the Technology L.A. In this study I collected and analysed a number of documents related to classroom practice as shown in table 3.3 below.

**Table 3.3: Documents that were analyzed and the purpose of the analysis.**

Documents	Who produced the documents	Why I analyzed the documents	Codes
Grade 8 learners worksheets	All grade 8 learners	To see what learners had documented from	L earners Work - LW

		the composting activities	
Teachers lesson plans	Grade 8 teachers	To see if the teacher had included an environmental focus in their lesson plans and to see what LOs and AS were listed.	LW
	Grade 8 learners	To see if all technology teachers do include the garden activities in their weekly plans.	LW

### 3.4 Data Analysis

After every data generating method session completed, I formed an information organizer (analytic memo). This is the first data analysis attempt that makes data analysis easy to carry out after all bulk data has been generated. After all the information I collected from the interviews in particular, there was much data which needed condensing down and summarizing to more manageable forms.

Miles and Huberman (1994) attach much importance to coding of interview responses as a way of reducing what is typically data overload from qualitative data. Coding has been defined by Kerlinger (1970) as the translation of question responses and respondent information to specific categories and for the purpose of analysis. At the end of each interview, I revised the interview schedule to realize the areas of common themes related to the research question. In the coding exercise, issues of the same type or meaning were given the same colour code. This coding process was applied to all the data collected i.e. interviews, workshop, observation and learners work analysis. Some new codes and themes were coined during observations, the workshop and the document analysis.

All coded themes were then combined to form categories according to their resemblance or near resemblance. Categories were then reduced to form sub-categories.. All themes with the same meaning, resemblance or reference were given coded names e.g. I1L, I2T, WD. I1L -

Interview one (1) for Learners, I2L - Interview two (2) for learners, WD - Workshop document.

Table 3.4 below reflects the early categorization process which was used to structure the analytic memos for the three technological activities (see Appendix 4 for an example of the analytic memo). Three analytic memos (of the three activities) were used to structure chapter 4.

Table 3.4: Categories and sub categories of coding data

<b>Category</b>	<b>Sub-categories</b>
Technological processes	Designing (drawings, sketches and labeling) Making (measuring, ground cleaning and box making and filling) Evaluating (comparison and use of evaluation sheet) Communicating (reporting, writing, oral )
Technological knowledge and concepts	Activity knowledge. Activity concepts
Technology, society and environment	Relevance to society. Relevance to the environment. Cultural bias
Structural factors and teaching	Timing of lessons. Teachers experience. Resource availability. Education system. Socio-economic conditions
Socio-cultural factors and teaching	Learners prior knowledge. Learners experience. Language use. Community knowledge

The categories of analysis as outlined above, firstly used the technology learning outcomes as outlined below :

### **Learning Outcome 1**

Technological process :This requires that the learner be able to show understanding of designing, making things, evaluating the completed task and communicating results to others and to the teachers.

### **Learning Outcome 2**

Technological knowledge and concepts : This requires that the learner show ability to understand the activities and concepts that are used in the project.

### **Learning Outcome 3**

Technology, Society and Environment : To achieve this learning outcome, learners should be able to understand the relevance of the activity to society, relevance to the environment and be able to notice that the activity has no cultural bias, e.g. is not gender biased.

This helped to identify what the learners were doing and achieving. An additional two categories were used to interpret the structural factors that influenced the activities, and the socio-cultural factors that influenced that activities. Relevant sub-categories were developed from the data.

## **3.5 Research ethics**

I carried out this research with three groups of people, i.e. learners, parents and teachers.

Leedy (2005) talks of ethical issues in research as four categories:

- protection from harm,
- informed consent,
- right to privacy,
- and honesty with professional colleagues.

### **3.5.1 Protection from harm**

Researchers should not expose their research participants to undue physical or psychological work or harm. The risk of participating in a study should not exceed the normal day-to-day risk of living. Those participating in the research process should not be exposed to unusual stress, embarrassment or loss of self esteem or be subject to dangerous situations like the loss of limbs or life (Leedy 2005).

The case study was carried out in an open environment, in a school garden during day time and in the presence of all participants. There was no possibility of danger in the gardening research.

### **3.5.2 Informed consent**

Participation in a research study should be strictly voluntary. Participants should be told beforehand that they have a right to participate or not to participate. Also they must be told of their right to withdraw from the research process at any time they so wish. One common practice is to present an informed consent form that describes the nature of the research project as well as nature of the participation in the project. The participants that were involved in this study (parents, learners and teachers) were actually told how the research study is going to work and why the study was conducted. They knew beforehand what was expected of them, this practice is called “informed consent” according to Leedy (2005).

### **3.5.3 Right to privacy**

This covers the respect for the participant’s right to privacy. Participants behaviour or conduct during the research process should not be exposed. Their names should not be mentioned at all in the report in the research unless their consent has been obtained first. We agreed together with the participants that their names will not be mentioned at all in this research report without themselves agreeing first.

### **3.5.4 Honesty with professional colleagues**

Researchers should report their findings in a complete and honest fashion without misrepresentation. A professional researcher should not fabricate other researchers work in any way. Any use of other peoples work, ideas or words demands full credit and acknowledgement Leedy (2005). All professional work that has been quoted in this research project has been acknowledged.

Wellington (2000) argues that participants in a research study have the right to be informed about the aim, purpose, findings and their potential consequences. At the start of this research project I organized a meeting for everyone to listen and be listened to what their views were about the work we were going to start in the garden. This was an informative and discussion meeting where all the views were respected and taken note of. This somehow strengthened the research participants resolve in the research process. This also facilitated their will to discuss all the ideas and to learn from all the research participants in a positive

way. All research participants were asked to comment about their understanding of events in each data generating process, and this was done at end of each data generating activity.

### **3.6 Validity and trustworthiness**

Multiple sources of information e.g. face-to-face interviews (teachers ), group interviews (learners), workshops and learners work analysis were used to make sure that data generated by one means was verified using another means of data generation. All categories and sub-categories identified in the coding process cut across all the four data generating processes to confirm their trustworthy and validity.

## **3.7 REFLECTIONS ON THE USE OF THE RESEARCH TOOLS**

### **3.7.1 Interviews**

I carried two interviews with two teachers, one male and one female, the male teacher being the one teaching technology at the school. These interviews were done in English. did two interviews with school parents who are SGB members. Both these interviews were done in isiXhosa, because both parents could not speak English at all. The parents were an important source of knowledge as they know exactly what the community wants from their kids who are at school.. Interviews with learners were done in groups. This was the more useful format as their subject knowledge can be limited, and their use of the English language not always clear.

### **3.7.2 Observation**

This was a useful as it only required me to write down only what I was noticing and make no judgements about the phenomena.

### **3.7.3 Workshop**

Only one workshop was conducted by the research participants, and this was done at the end of the whole research process to give everybody a chance to report on each activity and answer questions and take suggestions that were given. Most of the reports were oral reports.

This is influenced by the fact that, teachers wanted to open up a face-to-face communication with the learners. There has to be no marking of language or notes, questions were to be answered quickly for a particular project. From talking, learners learn to talk too, the skills of mastering any language is in the talking and in the continuous use of that language. We

sometimes experienced challenges in the workshops as some parents could not understand English. On the other hand teachers enjoyed discussing all the activities with the learners in English. This, the teachers claimed, would boost the ability of using the second language among the learners. This became an issue in the workshop as parents interpreted this as meaning that they (the parents) were not important in the research process. I intervened by convincing the teachers and parents alike, about the importance of letting people use whichever language they feel most comfortable using, and to help others where needed. Both parties agreed and the issue of language was over.

### 3.7.4 Learners work

I used learners work as a way of determining knowledge gained during the activities. I checked test results and learners notes to see if the content corresponded with the activities or assignments form. In this study tests were used as a form of assessing how much the learners understood the instructions that were given to them by their teachers. I converted test marks to percentages so as to make them comparable. Percentages were further converted to levels as per OBE assessment criteria, to determine the levels of success. Learners marks were categorized as is in the following table. (this is an example of how the results were obtained).

Table 3.5 Conversion of Learners marks

Learners	Mark allocation out of 60	Percentages	Levels	Achieved/Not achieved
A	35	58,3	3	Achieved
B	30	50	3	Achieved
C	22	36,1	2	Not achieved but condoned
D	16	26,1	1	Not achieved
E	38	63,3	3	Achieved

I analysed three tests but grouped them into a total mark allocation of 60.

### **3.8 Conclusion**

It is appropriate that the methodology that is used to collect data is in harmony with the research question and its goals. Since the research in this study was to examine the use of school gardens to teach environmental activities in a particular school, a case study approach, gathering qualitative data, was considered most appropriate. In the next chapter I present the data using the categories and sub-categories discussed in this chapter.

## **CHAPTER 4**

### **RESULTS**

#### **4.1 INTRODUCTION**

This chapter reports on the three technology activities that form the basis of this case study. It presents a thick description of the activities and the research participants responses to the activities. It also reflects the understandings of the research participants as technologists in each of the three garden activities in this research process. The three activities are composting (compost) (see section 4.2), planting (see section 4.3) and the irrigation (see section 4.4) in the school garden. As articulated in Chapters 1 and 3 these activities were carried out in the school garden by Grade 8 learners to achieve the outcomes of the Technology Learning Area. They were conducted in a cyclical and sequential manner, and are reported as such in this chapter.

The Learning Outcomes and the Assessment Standards associated with them are discussed below, and then each of the three garden activities are evaluated in the light of these assessment standards.

#### **4.2 TECHNOLOGY LEARNING OUTCOMES AND ASSESSMENT STANDARDS**

The Technology Learning Outcomes (LO) have been repeated here for the reader's convenience. The Assessment Standards (AS's) associated with these LO's describe the level at which learners should demonstrate their achievement of the learning outcomes and the ways of demonstrating their achievements. They are grade specific and show how conceptual progression will occur in a Learning Area. They embody the knowledge, skills and values required to achieve learning outcomes. The grade 8 AS's for the three Technology Learning Outcomes are as follows:

##### **LO 1: Technological processes and skills.**

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.

## **Assessment standards**

Since LO 1 aims to develop technological skills, the learner should be exposed to a particular problem and be required to engage in a systematic process that allows the development of solutions that solve problems or satisfy needs (DoE, 2002). This involves the design process of designing, making, evaluating and communicating which form the backbone of this LO. In the design process learners are assessed on communicating and listing specifications of their design as well as choosing one solution from a range of possibilities. In the making process they need to develop a plan choose appropriate tools, adapt their plan and work safely. In the evaluation process they need to test their product or system based on objective criteria as well as evaluate efficiency of the plan. In the communication process they have to present their ideas in a drawing or other appropriate means for a target audience.

### **LO 2: Technological knowledge and understanding.**

The learner is able to understand and apply relevant technological knowledge ethically and responsibly.

#### **Assessment Standards**

The AS's in this outcome are organized under three core content areas:

- Structures: this focuses on practical solutions to whatever is being constructed, and learners have to consider issues of strength and durability.
- Processing: learners need to be able to demonstrate practical ways in which materials may be processed
- Systems and control: learners need to be able to show knowledge and understanding of a mechanical or electrical system

Learners should be able to demonstrate achievement of these Assessment Standards in the process of completing practical project work (DoE, 2002).

### **LO 3: Technology, Society and the Environment.**

The learner will be able to demonstrate an understanding of the inter-relationship between science, technology, society and the environment.

## **Assessment Standards**

The AS's are organized under the headings:

- Indigenous Technology and Culture: learners must consider how different cultures have solved similar problems.
- Impacts of Technology: learners must consider the positive and negative impacts of products of technology.
- Bias in Technology: learners must consider the effects of technology on human rights issues.

The learners were highly involved in the technological process participating in the different stages of the process. Most learners appeared to be enjoying the activity so much so that they requested, that the lesson be repeated. This can be seen as a sign that learners enjoyed the activities which consisted of learning by doing process. The processes and responses are discussed in detail below. Where there are capital letters in brackets these refer either to comments made by various individuals or to documents. These have been listed in the list of acronyms at the beginning of this thesis.

### **4.3. COMPOSTING**

#### **4.3.1 Introduction**

This activity is a preparatory activity that prepares the manure for the planting season. The manure here involves a technological process of enriching manure, soil and organic matter through a method called composting. Learners, teachers, parents and SGB members were all involved in preparing the compost. The mean daily temperatures at the end of August in the Bizana area were 18 to 25 degrees Celsius, a good temperature for the quick decomposition of organic material making this a good time for this technology activity. While making the compost, learners were learning about composting and they were developing skills. They also wrote tests and undertook exercises to determine their level of understanding and achievement.

From time immemorial African people have used compost in the form of cow-dung manure for enriching their fields before planting. Most of the time they used this type of compost before planting mielies, beans, pumpkins and barley.

It is known that all the harvest remains were left in the field for the sole purpose of encouraging rotting (decomposition of organic matter) thereby increasing the chances of fertilizing the soil for the next season.

#### **4.3.2. Technological process (LO 1)**

Learners undertook this activity in different stages:

- Designing the compost box.
- Making the compost.
- Evaluating the finished compost box and compost, and
- Communicating the outcomes to the teachers and parents.

This four-stage process reflects the Assessment Standards of Technology Learning Outcome 1 (LO) in the Learning Area, Technology in senior phase grades (Grades 7, 8, 9).

##### ***Designing the compost box***

In designing the compost box learners used their pens (lead pencils) and papers from their books to draw design plans. They were asked by the teacher to indicate what layers of soil and organic matter could be used design a compost heap. To facilitate the activity further learners with prior experience of composting worked with those who had never been involved in or who had never seen compost being made. This facilitated peer learning where those with more experience could help others with less experienced. The learners were divided into two groups of ten each, so as to make co-ordination and participation easier. Each small group was put under the supervision of a teacher. In each group, teachers were required to explain the sequence of layers of compost and say why layers are needed.

Teachers told me that it was difficult for a small number of teachers to explain to a large number of learners why layers cannot be put in any order and why only the prescribed layers and materials could be allowed. To make this easier, they sub-divided the group of ten into two groups of three and one group of four (i.e. three smaller groups). This also made it easier for the learners to produce their design sketches. Teachers compared the finished design sketches to find out which one was the best. The designs from groups that were flawed, as recognized by the teachers and learners, were then discarded.

Teachers and learners agreed on the best design sketch and they took it to the next stage, which involved the making of compost.

In constructing their designs, learners were given instructions as to what materials were available. This group of learners planned to use rafters and wood boards for their compost box. Learners had to produce a three dimensional design, showing their measurements. This group designed an 8m x 4m compost box which was 0.7m high.

### ***Making the compost***

After designing the compost box, making it was the next step for learners and teachers. The first stage of the composting work therefore involved a construction of a compost box using non-rusting materials like wood. It was clear, however, that they could not avoid using nails. Learners collected old rafters left over from the new school building material which had not disposed of. Learners cleared a small patch of ground that they identified together with their teachers and parents. They hardened the ground by stamping it with sticks and planks. Teachers said that stamping the soil prevents loss of too much water from the ground (AMI). Learners modified the measurements of the compost box because of a shortage of materials and to lessen surface area covered by the box to the acceptable sizes: length = 3m, breadth = 1,5m and the height = 0,7m. These new sizes were negotiated with all the learners and teachers.

After learners finished the box making they put it into place in a specified area. This was done carefully by learners to avoid missing the shape of the stamped area. Long rafters were used to support the empty form until all the nails were in place, which gave it strength to stand firm. From their facial expressions, one could deduce that learners enjoyed what they were doing (see Figure 4.1 below).

**Figure 4.1: Learners filling in the compost box: size is: 3m x 1.5m x 0.7m**



Next the learners placed stones in the box. The teacher explained to the learners that they needed to use small stones so that they did not take up too much space. After this, the learners added a number of layers, each about 15cm depth. Firstly they added a layer of red loam soil. Teachers explained to the learners that red loam soil was important as it would quicken the decomposition process of compost. Compost needs time to decompose before the planting season (AMW). The next layer was black soil mixed with grass so that the grass would be broken down in the decomposition process by heat produced by organisms in the loam soil. On top of the black loam soil, learners placed a layer of cow-dung manure which would produce a lot of heat both in this layer and in the layers beneath it. The final layer was a thick grass layer. Teachers explained that the thick layer of grass on top of the compost would prevent evaporation on the one hand and also would prevent too much water seeping through to lower layers. The teachers told the learners that the compost making was complete and was ready to start decaying and breaking its component material into a humus.

Figure 4.1 shows learners filling in the compost box. Through the observation process I noted that the making of the compost box was challenging, in that, (a) it appeared that not all the learners were very familiar with the use of the measuring tape, and (b) some learners seemed unfamiliar with the use of nails and hammer as some injured themselves. I also observed too that only boys were filling in the compost box (Figure, 1.1), girls were standing at a distance from the boys.

## *Evaluation*

Evaluation followed shortly after completing the making of the compost. Learners wanted to evaluate their compost box to see if their design was successful and if it had been designed according to plan. They took the original design drawing and checked measurements. The measurements of the compost box did not match the design as these were altered during the box making process (AMW) although this had been reworked after agreement among the groups (OD). Once the compost was filled up, a vertical cross section (A-A) was established which showed different layers of compost (see Appendix 5). This section did not destroy the compost to reveal the layers.

Learners used an evaluation sheet (see Appendix 6) to check that each layer had been done as planned. The workshop data indicates that learners discussed and argued about the relevance of the compost box to their original plan (AMW). The faulty areas were corrected by making them fit to the measurements of the plan (OD).

## *Communication*

Learners reported their achievements to the teachers and parents. They did their reporting orally, although the designs or sketches were written down (see Appendix 7). Learners described the process from the initial measurements to the methods that were followed to arrange compost layers to the finished product. I noticed that if teachers and parents did not agree with the learners explanation or with learners' methods, the issue was not easily resolved and sometimes required intervention from me.

### **4.3.3 Technology knowledge and understanding (LO2)**

Technology knowledge and concepts that were being developed in the lesson included design and measurement, compost making, gardening skills, group work and reflection (AMI). Learners were taught to identify materials and plan and design their projects before the actual implementation (AMO). Teachers and parents wanted to make sure that the learners were able to evaluate their work after completion (AMI). Learners were taught a technology of how to use the environment around them and the use of biodegradable material (AMW) to make garden compost and enrich the soil for planting. Learners were also taught how to do a vertical cross section of compost for the purposes of evaluation (AMLW).

Teachers taught learners to communicate about their work through oral means (AMW) and through written evaluations (the cross section worksheet) and through drawings (the designs).

#### **4.3.4 Technology, society and environment (LO3)**

All participants, learners, parents and teachers, referred to compost as African manure, (AMW), indicating that it is a well known technology in rural communities. The compost is used by society and communities around the school for planting vegetables in the gardens (AMI).

During the workshop it was the parents who revealed that the community around the school use compost for their gardens before planting vegetables. Parents said that the community had no money for buying expensive fertilizers (AMW), and that composting was a more sustainable technology. Learners indicated that their parents used compost in the form of dry cow-dung which is mixed into the soil (AMLW) for planting potatoes. Everyone agreed that compost is an environmentally friendly technology in that it is biodegradable, it mixes easily with the surrounding environment, and it contains no chemical substances. There was a gender bias in the compost making process in that most of the activity was done by boys only.

#### **4.3.5 Structural factors and teaching**

There were a number of structural factors that influenced this activity which included the season, availability of materials, teachers prior knowledge and experience, policies and the socio-economic status of the community. Everyone agreed that the timing of compost making was excellent, in that there was sufficient time for the compost to decompose before spring planting (AMI). The teacher's experience was used only to guide the learners as the teachers did not make the compost themselves. Almost everything that was needed to complete the compost from the start to the end was available in the school. However, learners were required to buy the 4 inch nails from the neighbouring shop. Learners were taught by their teachers that the National Environmental Act (NEMA) requires everyone to use the environment with care and responsibly, indicating that policy influenced the lessons learned (AMW). Learners were also informed that the education policy requires teachers and learners to be creative and to use available resources (to improvise) if actual resources are not to be found (AMI).

The interview with the parents revealed that Ethridge school community is very poor and that they cannot afford to buy expensive chemical fertilizer, and that this influenced the relevance of the technology activity in their community (PI-1).

#### **4.3.6 Socio-cultural factors and teaching**

There were three significant socio-cultural factors that influenced the composting activity, namely, local knowledge, learner's familiarity with making compost (i.e. their prior knowledge and experience) and language used in the lesson process. It appeared that local knowledge affected the activity positively because most learners used compost at their homes (AMO). The habit of keeping cattle in home kraals contributed in making learners familiar with cow-dung manure at home which is also used as manure for planting vegetables and mealies, so the activity was not too difficult to explain or implement. Learner's knowledge of different kinds of soil facilitated the ease with which the compost was made (AMLW).

Communication using both English and *isiXhosa*, was easy and multi-directional (TI-1). However, use of English became problematic when learners explained procedures during the workshop and in their tests (AMLW). Learners used their community knowledge of compost making linking it with what the teachers told them (AMLW).

### **4.4 PLANTING**

#### **4.4.1 Introduction**

After making the compost the next activity was planting which started with soil preparation. As our school garden is very large learners started by planting the top part of the garden. The lower part will be planted after the big rains come. The planting process involved both plot planting and tyre planting. The plot planting needs a lot of attention while the tyre planting needs very little attention, and learners could compare the two technologies.

#### **4.4.2 The technological process (LO1)**

In the garden planting process the technological process involved the same four technological processes outlined in Learning Outcome 1 in the Technology Learning Area:

- Designing
- Making

- Evaluating and
- Communicating

### ***Designing***

Before designing their plot sizes and how they would plant the seedlings, learners first prepared the soil, using rakes, forks and spades. Learners collected raked rubbish and threw it into the compost heap so that it could decompose over time. This was not the compost in their compost box, but a compost heap that was started as a rough model of compost in the centre of the garden. All the unwanted degradable rubbish was thrown there to rot.

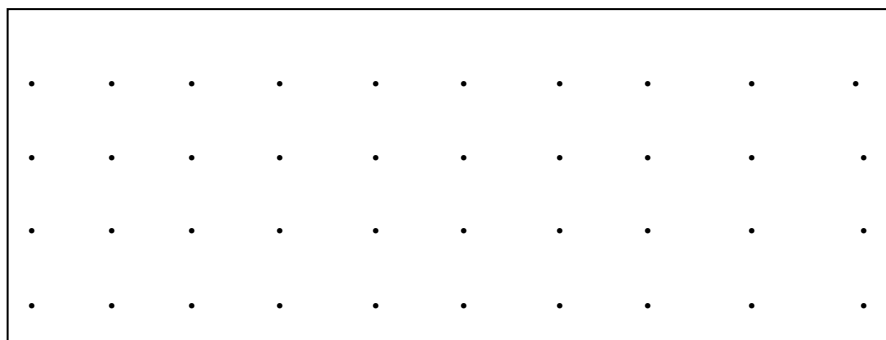
After the soil was leveled by using rakes, learners again grouped themselves into their original sub-groups. These were two groups of three learners and one group of four, a total of ten. This time teachers mostly walked between the learner groups, a sign that they were not too much in demand, though their guidance and direction was indispensable. Learners (groups) were asked to design and measure plot sizes and plan the planting process. Each group designed plot sizes and the type of cultivars that were to be planted in each plot (AMI). They calculated the number of plants that could be planted in each plot and made design sketches. They were also expected to calculate the number of seedlings that were to be planted in each tyre and the number of tyres that were to be planted (AMLW). Most learners decided that 6 spinach seedlings would be enough in each tyre (AMW) as the tyres were not big enough for a larger number of plants.

### ***Making***

After completing the design, learners regrouped into a larger group and with the teachers guidance, decided to choose the best design to implement. A majority decision was taken and the teachers had to give guidance to facilitate decision-making.

Learners decided that the best design was 8m x 4m and contained 10 x 4 seedlings Figure 4.2. They explained that each line or row would have 10 seedlings and there were 4 lines in each plot, a total of 40 seedlings per plot, (AMLW). All the seedlings were bought from the local vendor; the commonly used cultivars were spinach and cabbage (leafy vegetables).

**Figure 4.2: An example of a plot of 8m x 4m with 10 x 4 seedlings.**



I observed learners using a measuring tape, a sharp stick for corners and a fishline to make straight lines (AMO) (Figure 4.3). Teachers explained that this sort of exercise helped learners that were not familiar with the use of a measuring tape to make measurements using the metric system. I also observed some learners preparing four tyres (Figure 4.4) two at a time, for planting (AMLW). These tyres were cut and opened up, filled with soil and compost and learners planted spinach seedlings. Each tyre contained 6 spinach seedlings as agreed in the design stage (AMW).

**Figure 4.3: Learners preparing soil for planting**



Learners opened up planting holes using sharp sticks and put plants in each small hole, most of the plants were spinach seedlings, though there were also cabbage seedlings.

**Figure 4.4: Learners planting in plots and in tyres.**



### ***Evaluation***

After planting learners completed an evaluation exercise. They compared plot design with finished plots.

They also evaluated the tyre activity by counting the number of tyres and the number of plants that were planted in them (AMO). Small differences such as an extra seedling in a wrong place were corrected or were ignored if the difference was not important. These exceptions were required to be part of their report. The evaluation appeared to take a very short time and learners appeared to be rushing in order to continue with the next stage of the technological process.

### ***Communication***

For communication, learners used both English and *isiXhosa* to explain to their teachers and parents their design and sketches, (AMO). I observed the learners talking among themselves too, in English and *isiXhosa* (AMI). The reports were done verbally and some rough sketches were also used to explain points.

#### **4.4.3 Technology knowledge and understanding (LO2)**

The technology knowledge that was being taught here to learners was design and layout of garden plots using a measuring tape to measure size and area (AMO). Teachers explained in the interview that this emphasized for learners the need to plan before they started implementation, even in everyday life activities such as planting (AMLW).

Learners were also taught to use tyres for planting vegetables, especially in arid soil conditions or if the home gardens were not tilled (AMW) thus teaching them that there are different ways of achieving the same goal.

The concepts that were being taught here were making functional and environmentally friendly vegetable gardens (AMO). Learners were also taught critical thinking skills in that they had to plan everything before the actual action (AMLW), and they were asked to evaluate their actions against their plans, although they did not seem to do this thoroughly enough.

#### **4.4.4 Technology, society and environment (LO3)**

From my observation, this technological activity was relevant to societies that love ploughing and planting (AMO). From the interviews with the teachers, it became clear that this technological activity was relevant to society as people need vegetables in their diet (AMI). The workshop discussions revealed that this technological activity is teaching learners to obtain food in a positive way without harming the environment (AMW).

Through my observations I concluded that the very act of planting of vegetables (without damaging fertilizers) is an environmental act (AMO) as it is a sustainable agricultural practice that does not harm the environment and also helps to ensure food security. Learners said that they have learnt that the environment should be cared for in the same way that we care for people (AMLW). My observations were that only western types of vegetables were planted in the school garden by learners (AMO). When asked about this, however, no one objected to the planting of African or wild vegetables, like *mambumbu*, *irhwaba* etc.

Learners agreed that there was integration of all cultures in the planting activities (AMLW) because the indigenous plants were not planted due to their scarcity and not by design. Boys and girls worked together as one in this activity with less gender bias than was observed in the composting activity (AMW).

#### **4.4.5 Structural factors and teaching**

There were a number of structural factors that influenced this activity which included the growing season, teacher's knowledge and experience, availability of local resources and low cost options, the policy on environment and the socio-economic status of the community.

From my observation I noted that timing was a positive structural factor in that the planting took place at the start of the growing season, at the end of August when it was already warm in Bizana because of the warm Mozambique current (AMO). The teachers, however, complained that it was still winter and they thought that planting at that time was not good timing for the activity (AMI).

The workshop discussions showed that teachers knowledge and experience contributed positively to guide the learners in the lesson as they were able to use the tape measure correctly, and as such teachers provided guidance where necessary (AMI).

Learners used the available resources positively, which allowed them to complete in good time (AMO). The education system and broader policy on environment encourages schools and teachers to produce learners that are interested in farming as food security is enhanced by those who produce food (AMI). Participants in the workshop agreed unanimously that the school greening project needs teachers, parents and learners to actively participate in making their gardens “green” (AMW). Having a garden was therefore a structural factor that influenced the activity positively.

I have observed that the communities around the school are very poor communities, and they need learners who are interested in producing vegetables (AMO) to contribute to household food security. This resulted in the introduction of tyre planting technology as it could be used at home and at school. Teachers agreed that producing vegetables in their community needs to be done in cheaper ways, because the community has no money to buy expensive materials (TI-1). Parent interviews revealed that the poor communities around the school were pleased that their children are taught cheaper ways of producing vegetables by their teachers (PI-1).

#### **4.4.6 Socio-cultural factors and teaching**

Learners agreed that their prior knowledge of planting influenced their ability to finish the activity faster (AMLW). I observed that all learners were familiar and were enthralled by the planting activity (AMO). Teacher interviews revealed that learner’s prior knowledge made them more motivated as they had enough confidence in their ability to finish the planting activity timeously (AMI). The interviews with learners revealed that learners did not mind doing physical work, particularly when it related to the environment (LGI).

It appeared that only minimum guidance was needed from the teachers because learners were experienced enough to do planting (AMI) but they did need assistance with the measuring process. The workshop deliberations indicated that most learners had had enough experience to be considered competent in planting vegetables (AMW). Learner interviews showed that learners were pleased to be able to share their planting knowledge in a practical way (LGI).

The languages that were used by the learners, both *isiXhosa* and English, influenced the activity in a positive way, according to my observation (AMO). Learners' notes showed that some learners had difficulty in understanding a second language, that is English, and that this affected their communication (AMLW). This showed that some learners need a lot of practice in using English.

## **4.5 IRRIGATION**

### **4.5.1 Introduction**

Many irrigation schemes are big and cost a lot of money and are used by large scale farmers or government agencies. Many of the irrigation technologies (such as overhead irrigation) are also not very sustainable as they use a lot of water. In recent years more sustainable options have been designed (such as drip irrigation) but these are not always accessible to the small scale subsistence farmer. The irrigation technology that I am presenting here is a very small scale, low cost irrigation practice. It is irrigation that is done in the school garden, with very limited garden material. The factors that influenced the decision were that (a) the communities around the school do not plant vegetables because they cannot afford to buy expensive commercial garden watering cans, (b) the fact that communities cannot use a lot of water for irrigation, especially where it has to be carried from water sources away from the homestead. Southern Africa is also a water scarce region and water is be protected at all costs, as indicated in the National Water Act 36 of 1998 (RSA 1998). Education activities that teach learners to be water wise and water responsible are relevant as encouraged by the Department of Water Affairs and Forestry (DWAF). Expensive watering cans for irrigation in the school or home gardens can be substituted by use of other available materials such as in this irrigation activity.

#### **4.5.2 Technological process (LO1)**

As in the previous two activities, the irrigation activity followed the same sequential process for the technological process outlined in Learning Outcome 1.

. These are the following :

- designing
- making
- evaluating the finished product and
- communicating the results.

#### ***Designing***

To start this activity, learners were given an instruction to design an irrigation can out of an old tin. They were shown the tin but were not told how are they going to do it, and they were left to work out how this could be done. This was the first part of this activity. Learners once again, grouped themselves into the three groups with 2 sub-groups of three learners each, and 1 sub-group of four learners, making ten in each group.

Learners used lead pencils and a sheet of A4 paper to design their irrigation sketches (AMLW) showing how the 20l tin can could be transformed into an irrigation tool (AMI). Learners claimed that this would provide a good substitute tool for a watering can, and that it could be used for irrigation and would also save water. Explaining this further, they claimed that it would save water if the holes underneath the can were designed so that only little water could pour out of the can onto the seedlings.

#### ***Making***

From the designs learners made, they chose only one design which they all agreed to make. Learners used 6 inch nails and a hammer to make holes at the bottom of the can (AMLW).

I observed that there were only a few holes at the base side of the tin as planned in the design to save water (OD). They claimed that their design used less water than a normal watering can, although they did not test this claim.

### ***Evaluation***

Learners checked and compared their designs with the finished irrigation can. They also tested their product for efficiency by using it immediately for irrigation (AMO). At this stage, I observed that learners were very happy and appreciative of their completed product as it worked well.

### ***Communication***

Learners demonstrated to the rest of the participants how their products were used. They used both English and *isiXhosa* in communicating (AMW) and I observed that some learners had a problem in using English as a language for communication. Learners also communicated their designs by drawing sketches of what they envisaged. These sketches also communicated how their irrigation tool works.

#### **4.5.3 Technology knowledge and understanding (LO2)**

In the irrigation activity learners were taught the technological way of looking at the situation by having to identify a problem and design a solution (AMLW). These skills were also referred to as critical thinking skills by teachers in the interviews (AMI). Teachers also noted that learners were being exposed to the technological process of Learning Outcome 1, which is designing, making, evaluating and communicating the outcomes (AMO). Learners explained that the National Water Act 36 of 1998 forced them to try to find something that would save water during irrigation in the school garden (AMLW) which showed a broader understanding of why they were designing and making something. They were also able to assess the value of their technological design in relation to other technologies (i.e. the watering can).

#### **4.5.4 Technology, society and environment (LO3)**

This irrigation activity was relevant to society in that it was intended to develop ethics to save water from being wasted in school garden irrigation, so that the saved water could be used elsewhere for some other activities (AMO). Workshop deliberations indicated that learners were also involved in recycling of tins (AMW).

Teacher interviews revealed that getting tins for this purpose required no money. Furthermore, all metal tins are bio-degradable (AMI). All interviews and observations indicated that there was no cultural or gender bias in this activity.

#### **4.5.5 Structural factors and teaching**

Most research participants indicated that the timing of the irrigation activity was a bad practice because of the season. They claimed that in August there is no rain in the area, therefore water was not available for irrigation.

The workshop discussions, however, showed that the timing of the activity was good as learners could understand the importance of water by teaching them about low impact irrigation while water was not freely available (AMW). The learners drew on the teachers experience during the activity. There were plenty of old tin cans in learner's homes, and it is not difficult to find unused old tins in the Bizana area, thus locally available material helped to facilitate the activity.

The education system encourages learners to be curious and to invent new products and new ways of doing things (AMI). The National Water Act 36 of 1998 requires that all citizens conserve water using all means possible thus the environmental policy also supported the activity.

#### **4.5.6 Socio-cultural factors and teaching**

Learner's prior knowledge about the scarcity of water in their area was a motivating factor that encouraged learners to invent a new water saving device (AMO). They claimed that an industrial watering can has too many holes that wastes a lot of water.

The workshop deliberations showed that the new product was very reliable in limiting the amount of water that was required by the plant.

Everyone understood the discussions in languages, *isiXhosa* and English. There appeared to have been an improvement this time in learners understanding the English language. Communication, therefore, seemed to be easier among the research participants in their second language.

## **4.6 CONCLUSION**

This chapter reported on the cyclical technological process followed in each of the three sequential technology activities. It showed how in each activity, learners were engaged in design, making, evaluation and communication processes. In one case (the irrigation activity) the activity was problem oriented. The descriptions in this chapter also showed that while learners were engaged in achieving Learning Outcome 1, they were also achieving aspects of Learning Outcome 2 (Technological knowledge and concepts) and Learning Outcome 3 (Technology, society and environment). Each activity was influenced by both socio-cultural and structural factors.

## **CHAPTER 5**

### **DISCUSSION**

#### **5.1 INTRODUCTION**

Drawing on the findings of this study, a number of analytical statements have been formulated. These are discussed in this chapter, drawing on the literature in Chapter 2 to address the research question. Through this process of analysis and discussion, I also reflect critically on the research question, process and goals. Where there are capital letters in brackets, these refer either to comments made by various individuals or refer to documents - and these have been listed in the list of acronyms at the beginning of this thesis.

In Chapter 2 it was reported that Grundy (1987) considers curriculum as praxis, which is a social process that develops through the dynamic interaction of action and reflection. That is, curriculum is not simply a set of plans to be implemented, but rather is constituted through an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process. Cornbleth (1990) also sees curriculum as a social process that emphasizes aspects of teaching and learning in the curriculum development. She notes that technical approaches to curriculum have very little impact on classroom practice. She was trying to find an approach to curriculum work that would realize the potential of curriculum to contribute to a meaningful and empowering education for young people. These views have been useful to me as I have tried to explore how school gardens can be used for teaching in the Technology Learning Area. As indicated in Chapter 1, the research questions and goals were:

- To examine how environmental activities in the school garden can be used for technological problem-solving through the application of the technological process.
- To examine how environmental activities in the school garden can be used to consider the relationship between technology, society and environment (through considering issues of impact, bias and culture in technology).
- To examine how environmental activities in the school garden can be used to develop technological concepts and knowledge.

- To examine the structural and socio-cultural factors that influence the use of environmental activities in the school garden for Technology education (factors affecting the contextualisation of Learning Outcomes).

As indicated in these research questions, I aimed to explore how school gardens could contribute to the new curriculum framework that requires knowledge, skills and values to be developed within an Outcomes Based approach. I also wanted to develop a deeper, more critical view of the curriculum by identifying how structural and socio-cultural factors shape and influence the implementation of the curriculum.

Goodson (1990) argues that if we are to understand the curriculum models and how they come to be, it is important to develop a historical perspective on the socially constructed nature of curriculum discourse. This means that history can help to develop curriculum with full understanding of our past, which will shape the present. The present tells us what the future holds for us, so we can prepare for it by understanding the past. For this reason I also consider the curriculum activities in this study in relation to the history of the school and its community, and the history of curriculum change in South Africa, as outlined in Chapter 2.

Cornbleth (1990) talks of curriculum knowledge as the knowledge made available to students. She describes this as the knowledge that presents opportunities to construct and reconstruct knowledge as well as the common offering of knowledge as if knowledge were a product or commodity. She emphasizes that curriculum should be conceived as what actually happens in the classroom; an ongoing social process comprised of the interactions of students, teacher and knowledge. I therefore consider these curriculum development arguments in relation to the use of school gardens for teaching technology.

Based on these broad perspectives on curriculum and the research goals, I formulated five analytical statements to structure the discussions in this chapter. The analytic statements are:

**Analytic statement 1.** Use of locally available materials in technology activities in the school garden facilitates contextualisation of Technology Learning Outcomes (LO) in the senior phase.

**Analytic statement 2.** School gardens provide a context for achieving Learning Outcomes in the senior phase Technology Learning Area.

**Analytic statement 3.** Technology teaching in the school garden is influenced by socio-cultural factors.

**Analytic statement 4.** Technology teaching in the school garden is influenced by structural factors.

**Analytic statement 5.** Teacher and learner views on using the school gardens for teaching and learning influences the teaching of technology.

**5.2 Analytic statement 1.** Use of locally available material technology activities in the school garden facilitates contextualisation of Technology Learning Outcomes.

As indicated in Chapter 2, the Technology Learning Area has three Learning Outcomes. In the curriculum statement it is categorically stated that LO 1 reflects the essence of the Learning Area Technology. LO 1 is, for this reason, weighted more heavily than the other two Learning Outcomes, (LO 2 and LO 3). For LO 1, the weighting is 50, and for other two, the weighting is 25 each. However, all LO's need to be used in an integrated manner because LO's in the Technology Learning Area compliment each other. All the LO's are interdependent and should be treated in that way and not be taught in isolation.

Learning Outcome 1 is essentially about the technological process which, as shown in Chapter 4, involves various processes of designing, making, evaluating and communicating. The application of the technological process forms the bases of all technological projects, tasks or activities. In accordance with the critical outcomes, the learner should be able to apply the technological processes and related skills ethically and responsibly, in ways that do not harm people or the environment. As shown in Chapter 4, the school garden, and especially the use of locally available materials, helped to contextualise this Learning Outcome, while enabling development of knowledge (concepts), skills and values related to the other two Learning Outcomes.

As described in Chapter 4, all the materials that were used in designing the compost activity were available in the school, and no additional materials were needed as learners used their counter-book papers, lead pencils and rubbers. For the making of the compost box, all materials came from the school. The used rafters were school property as they were left after the additional school classroom was finished. The two pound hammer and tape measure belonged to the school. Nails (4 inches) were bought by learners from the local retail shop with money that was collected by the participating teachers. Spades and hoes, used for preparing the compost, came from the school store room and some were borrowed by the learners from their parents at home. Stones and the red loam soil were collected from the old toilet pit dump.

Black loam soil was obtained from the school garden site, and grass was collected from the mowed school lawn, while newspapers are readily available in the school office and classrooms. Newspapers are supplied by the department for learners on a quarterly basis. The locally available materials facilitated the successful completion of the activity in good time.

In the planting activity similar materials were used i.e. the gardening tools and the measuring tapes. Tyres for the tyre planting activity were easily sourced from the community. Again, the availability of these materials and tools facilitated the activity, and enabled learners to complete the activities in good time.

Many researchers in South Africa have commented on the lack of adequate resources for teaching and learning in South African schools (Taylor and Vinjevd, 1999; Curriculum Review, 2000; Czerniewicz et. al., 2000; Lotz-Sisitka and Raven, 2000). These studies have all shown that available materials influence the teaching and learning process, and they have all argued that for OBE to work, adequate resources are needed for teaching and learning as C2005 and the NCS require teachers to use resource based approaches to teaching and learning. As indicated in the three activities in this research, it is possible to source locally available materials for technology teaching in rural schools where communities are not wealthy. Using these materials in the school garden provides valuable learning opportunities for Technology teaching.

### **5.3 Analytic Statement 2.** School gardens provide a context for achieving Learning Outcomes in the Senior Phase Technology Learning Area.

As described in Chapter 4, the activities were framed according to the main Learning Outcome (LO 1) of the Technology Learning Area. Data also indicated that aspects of the other LO's were being addressed. Table 5.1 below summarises what was achieved in relation to the LO's and AS for Grade 8.

#### **Table 5.1: Achievement of LO's using AS's in Grade 8 (senior phase) in Technology Learning Area.**

Learning Outcomes	Assessment Standards	Composting Activity	Planting activity	Irrigation Activity
LO 1 Technological Processes and Skills	Learners will be able to do designs, making, evaluating and communicating these ethically and responsibly	Learners designed a compost box, made the box using locally available materials, evaluated the box to see if it fitted their standards and communicated these findings to the other participants.	Learners designed planting plots and planting tyres, they made measured plots and cut open tyres and filled these with compost. They planted vegetable seedlings in both plots and tyres, they evaluated the process against their designs and communicated the processes to their participants.	Learners designed an irrigation can using an old 20 litre can, evaluated its water saving capacity and communicated these processes to other participants.
LO 2 Technological Knowledge and Understanding	Learners are able to understand and apply relevant technological knowledge ethically and responsibly. AS's are arranged under the headings: Structures, processing and Systems and Control.	Learners designed and made the structure of a compost box (LO 2) using locally available materials (LO 3). They evaluated and communicated these to other participants (LO 1)	Learners used a tape measure to determine the length of plots and used sharp sticks to make straight lines (LO 2).	Learners designed and made a water saving device (LO 1 and LO 2).
LO 3 Technology, Society and the Environment.	AS's are grouped under Indigenous technology and Culture. Impacts of Technology. Bias in Technology.	Learners designed and made compost for planting (indigenous technology). There was a gender bias when only the	Learners planted seedlings in plots and in car tyres using the compost (indigenous technology and Culture, Impacts	Learners designed and made a water saving device ( a watering can) using the locally available materials

		boys filled in the compost box with soils.	of technology)	
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As outlined in Chapter two, Grundy (1987) talks of a practical knowledge interest, which is primarily focused on achieving practical outcomes through curriculum. As shown through the analysis of the achievements in the activities above and the LO's and AS's, the Technology curriculum seems to have a strong practical knowledge interest. However, because of the social change goals that emphasize environmental and social justice ethics, the Technology Learning Outcomes also seem to have a critical knowledge interest, which for example concerns itself with issues of cultural bias, gender roles and environmental sustainability and impact. Grundy (1987) continues to say that particular forms of action result from the different knowledge interests and concepts associated with the practical knowledge interest are primarily understanding and interaction, while concepts associated with the critical knowledge interest are social critique and change.

As shown in this study, the school gardening activities become a curriculum development activity that involves teachers, learners and the community in a social process. There is evidence of interaction between these participants as envisaged by Cornbleth (1990). This interaction between teachers and students in the school garden is an ongoing social process through which knowledge is made available to students through opportunities in which they construct, reconstruct and analyze knowledge of a practical nature and of a critical nature.

In all the activities, learners were deeply involved in achieving the practical interest of Learning Outcome 1. Learners were involved in designing, making, evaluating and in communicating what they were designing and making (i.e. the practical outcome). The irrigation activity and the composting activity also had a strong values aspect, as the activities were oriented towards environmental sustainability, and to the knowledge that would be of value to the community in response to poverty concerns.

However, not all opportunities for social critique were used in the activities. For example, the gender roles in the composting activities were not questioned, and learners did not engage in socially critical activities that examined why water was not easily available in their school community, or why poverty and food security was an issue. From this

discussion, it can be said that the school gardens do provide a context for achieving the Learning Outcomes, particularly the practical knowledge interest of the Technology Learning Outcomes. There is also evidence that critical knowledge interest of the outcomes can be achieved, but that this requires teachers, learners and parents to ask deeper questions that probe why things are the way they are (e.g. gender roles).

Drawing on the work of Mc’Kernan (1991) I argued that if OBE is not simply to become another form of behaviourism, then it would be important to attend to critical aspects of the curriculum process, which involve an understanding of socio-cultural and structural factors.

**5.4 Analytic statement 3.** Environmental Technology teaching in the school garden is influenced by socio-cultural factors.

By socio-cultural I refer to values and beliefs (including the community values) that manifest themselves in the school curriculum through various processes. Some of these values and beliefs are embedded in the cultural experience of learners or teachers and some are community based, while others (e.g. human rights) are more universal. Learners come from their communities with particular cultural and social backgrounds. They come to school with these social and cultural experiences and encounter other views and experiences in school education. Their social and cultural orientations become factors that shape the direction of teaching and also influence the time the learner will take to follow and understand a particular paradigm of learning, concept or activity.

As indicated in Chapter four, learner’s previous experience with composting and planting facilitated the learning process.

According to Cornbleth (1990) socio-cultural factors also refer to the environment beyond the education system and include demographic, social, political, and economic conditions, traditions and ideologies, and events that actually or potentially influence the curriculum. As indicated in Chapter 2, socio-cultural factors influencing our school and therefore the activities included the apartheid and former homeland history, the language of the learners (*isiXhosa*), the South African history of educational neglect in black schools and communities (i.e. parents do not read) and the farming traditions amongst the *amaXhosa*. The South African political change and the new curriculum also influenced the study.

Hart (2004) also indicates that socio-cultural factors influence teaching rather than a systematically organized body of knowledge. Teacher participation is a shared body of practical knowledge based on the values existing in messy, indeterminate, often problematic, socially structured contexts.

The school is a socio-cultural context where all the above social and cultural components exert themselves through individual learners, teachers and parents. In this study I emphasized socio-cultural factors relevant to learners since the research itself is about learners learning in the school environment and the study clearly shows that learners prior knowledge and experience influences the learning process, as does their language use. These are, however, shaped by broader socio-cultural factors as defined by Cornbleth (1990) above, and these influence what and how learners learn. For example, learning about sustainable technologies was influenced by a concern for an environmental ethic in society, as expressed in the critical outcomes and Technology Learning Outcomes. Different learners interpreted what they saw in terms of what he/she believed as relevant to a particular form of understanding. This meant that the same word could have different meanings to different learners. These are the dynamics of teaching in open organizations such as public schools as in this study. These organizations are influenced to a large extent by the socio-cultural dynamics of the surrounding communities.

Grundy (1987) argued that social interaction (e.g. curriculum) takes place within a context which impinges upon the situation and often constrains it in unrecognized ways.

Taking her arguments further, she emphasized that if a particular set of social interactions is to be improved, it is often the case that the social and material contexts within which those interactions occur also need to be improved, and it is always the case that these contexts need to be understood. In our case, the social context I am talking about is the learning that takes place in the school garden and the social factors are combined with the cultural factors to influence the school teaching of learners in the school gardens.

As indicated in Chapter 4, the teaching in the school garden was about teaching Technology within an environmental focus. Cornbleth (1990) argues that the nominal context is not necessarily the relevant context of curriculum, which includes social, political, economic and demographic conditions which are translated into constraints, demands and priorities by groups with diverse and often conflicting interests.

For example, there was some contestation as to when it would be most appropriate to do the exercise for the irrigation technology due to the scarcity of water in the community. So, even if the nominal context in the curriculum statement was related to appropriate technology, it could not be predicted that a contestation based on local people's experience of the issue (such as water scarcity) would develop.

As indicated in Chapter 4, socio-cultural factors were influenced in the activities, particularly where learners were able to relate home knowledge to school knowledge (AMO). Learners were able to draw on their knowledge from home in all three activities (AMI). Their difficulties with measurements, however, showed that formal measurements using decimal measuring instruments was not a socio-culturally familiar activity, and learners needed more help from the teachers with this. The study also highlighted that use of English for communication was a bit problematic but was not a hindrance (AMLW, TI-1). Language issues were raised when parents became part of the process showing that different language conventions are used in different socio-cultural contexts (i.e. home and school).

**5.5 Analytic Statement 4.** Technology teaching in the school garden is influenced by structural factors.

As reported in Chapter 4, there were a number of structural factors that influenced the activities. These included: seasons (time of year), availability of resources, the policy environment, teachers training and poverty in the surrounding community.

By structure, Cornbleth (1990) refers to the established roles and relationships, including operating procedures, shared beliefs and norms which are often documented in policies. Structural context can be considered on several layers or levels, from the individual classroom to the school organization to the national education system.

As shown in this research, structural factors influencing the activities involved many things acting together as one (e.g. the change in curriculum policy and teachers knowledge of technology) or acting as separate variables (e.g. the seasons), illustrating Cornbleth's (1990) point about structural factors being multi-layered.

Structural factors also influence the development of knowledge, concepts and the learning process. For example, what is appropriate to plant is influenced by the seasons. Another example is how poverty influenced parents' views on what was useful knowledge for their children.

Grundy (1987) as cited by Cornbleth (1990) states that curriculum is constructed within actual learning situations with actual students, i.e. learning is a social process and curriculum knowledge is socially constructed and subject to critique and reconstruction as shown in the case where learners developed what they considered to be a better technology than the watering can. Cornbleth (1990) argues that in a technocratic curriculum and in associated rational curriculum models (as outlined Chapter 2) existing patterns of school organization and other structural factors can often be ignored, as do underlying values and interests (i.e. socio-cultural factors).

McKernan (2008) warns that although some decisions are made by local actors and the curriculum is expected to be more sensitive to and responsive to learners, OBE can become technocratic, however, no guidance is given to teachers on how to contextualise the curriculum taking account of structural conditions and socio-cultural influences. The result is that a critical approach to working with OBE, and a more sensitive and responsive curriculum is unlikely to emerge.

**5.6 Analytic Statement 5.** Teacher and learner views on using the school gardens for teaching and learning influences the teaching of Technology.

As indicated in Chapter 2, South African schools are in the process of experiencing massive transformation which includes new ways of working, new knowledge and new methodologies.

There has also been limited teacher education to support these changes, and implementing the new curriculum is not always on the top of teachers agenda's.

Ethridge J.S.S. works with a system of three heads of division (HoD) in the senior phase. According to this division system, Technology and environmental education fall under the Sciences portfolio. This would require that all science division teachers, under the guidance of the Science HoD, are supposed to participate in research activities and curriculum change initiatives.

Despite this, very few teachers were interested in becoming involved in this research process, and only the Technology teacher in the senior phase and one Life Skills teacher agreed to participate. Even teachers who were participants, showed some signs of avoiding the physical side of gardening activities (TI-1).

Grundy (1987) and Usher et al. (1997) note that learning takes place when grounded in real experiences, not in hypothetical examples. It would therefore seem that teacher involvement in grounded activities was potentially a useful curriculum change initiative. To follow up on the lack of involvement of more teachers I decided to probe this further in informal discussion with the teachers (*see* Appendix 8a). I asked why the teacher was not assisting in the garden, at least to assist with managing the learners. This was a personal communication and not a formal interview. She responded by saying that she did not come to school to make herself dirty by doing activities in the school garden (AMI).

I also approached the second teacher who is different from the first in gender and qualification, attitude and friendship grouping. The first teacher was a female with a teachers diploma and the second teacher was a male with a teachers certificate and was older than the female teacher. I posed the same question to him, not in an interview, in a simple personal communication (*see* Appendix 8b). He responded by dismissing the work that is done in the school garden as something that is unproductive (AMO). I was surprised as I did not expect the same answer from somebody I regarded as a school veteran. So while these teachers participated in the activities, they were clearly not very motivated to undertake the activities independently in the school garden. This was likely to influence the use of school gardens in Technology teaching in future.

As mentioned in Chapter 1, Ethridge Junior Secondary School had a learner registration of about 750 in 2007, and a total number of 22 teachers. All teachers are employed by the Eastern Cape Department of Education, they all form a cluster of well qualified teachers. Learner's ages are on average of about 16 years, and a good number of teachers are over 50 years old.

It is very demanding for the teachers to meet the learning needs of this great number of learners particularly in a context stressed by poverty as outlined in Chapters 1 and 2. Lotz (1999) notes that when developing new courses, it is important to know and to take into account the nature of the context and to be clear about the specific interest of participants. Given the socio-ecological context and the impacts of poverty and other problems as described in Chapter 2, it would seem appropriate to explore the possibilities of an emancipatory orientation to the curriculum or a combination of practical and emancipatory interests in the application of the curriculum in the school, as discussed above.

However, this is not an easy process, if learner attitudes to learning are not particularly positive. I found, for example, that some learners ran away when it was time to go to the garden (AMLW). When questioned by the disciplinary committee as to why they ran away during break, they responded that they do not like gardening activities (AMW).

While some learners enjoyed some of the activities, as reported in Chapter 4, learners also complained that they were getting dirty, their polished shoes were affected seriously by the dust, and their uniforms were becoming dirty in just one day (AMO). It appears that a solution was needed to allow learners to do the environmental garden activity without fear of getting dirty. Cornbleth (1990) defines curriculum construction as an ongoing social activity that is shaped by various contextual influences within and beyond the classroom, which include teacher and learner attitudes to different kinds of activities such as technology activities in the school garden.

## **5.7 Conclusion**

In Chapter 2, I described the introduction of a new curriculum for South Africa. In Chapter 4, I described how the three technology activities were implemented in the school gardens, as a potential site for learning. As indicated in the curriculum policy, an environmental component needs to be integrated in all Learning Areas that are offered in the school. The curriculum requires that learners should be taught the importance of a healthy environment and the use of sustainable technologies such as making compost, planting and irrigating gardens.

In this chapter, I have provided a more in-depth view of such curriculum activities, and I have highlighted the importance of being able to use locally available materials in technology activities. I have also indicated that if the OBE Technology curriculum is to be implemented beyond just a practical knowledge interest, then a deeper understanding of the socio-cultural and structural factors influencing the curriculum is needed. In addition, I have demonstrated that teachers and learners attitudes and experience of curriculum content influences the learning process.

In the following chapter, Chapter 6, I make recommendations that have emerged from the study, and reflect on the process of the study.

## CHAPTER 6

### RECOMMENDATIONS

#### 6.1 Recommendations

***1) Teachers should use materials that are locally available in the school surroundings to contextualise the teaching of Technology in the senior phase.***

This study focused on how the school garden could be applied in teaching in the Technology Learning Area using the local environment in the senior phase. It showed how contextualisation could be achieved by teachers in the senior phase through using the local environment and locally available materials in the school context. This study has shown that this can contribute towards achievement of the learning outcomes.

Issues that will need to be considered are:

- Changing teacher and learner attitudes towards the use of the school garden for teaching and learning purposes.
- Including school garden activities in the school timetable at the beginning of the year to ensure composting and planting etc. at the right time of the year.
- Explaining the whole process and the aims of using the garden for learning to learners and parents.
- Further use and development of activities in a planning process so that teachers can introduce the activities in a coherent and structured way
- The shift from the classroom to the school garden as a site for learning will need the full support of the whole school staff and the whole community around the school.

***2) Make use of school gardens to achieve relevant teaching and learning outcomes in Technology in the senior phase, however, there is a need for further studies to explore how this could be achieved.***

Most of South African schools are in rural areas, which are referred to as the remote rural schools by the education policy makers. These schools have few resources and may easily be referred to as incomplete schools. It is incumbent upon the teachers to devise means of

going forward as professionals, as the learners need to be taught and the community is expecting them to perform satisfactorily. This research has shown that school gardens can provide a relevant teaching and learning context for Technology in the senior phase. The study therefore recommends that teachers continue to make use of school gardens for achieving Learning Outcomes in Technology in the senior phase, along with other activities and learning contexts.

Teachers, as shown in this study, work best when learners and parents assist each other in an activity.

***3) Teachers should take account of socio-cultural factors that may influence Technology learning.***

It is well understood that most of South African schools have a poverty related problem. This is evident in many rural schools in this country, particularly in the Eastern Cape (NMF, 2005) as is the case in Ethridge J.S.S.

As shown in this study, the communities and learners in the school have local knowledge of agricultural practices and technologies that they have learned from their parents. This study showed that this knowledge can be the basis of some of the technology activities, but that it needs to be extended by teachers using other forms of knowledge (e.g. mathematical knowledge). Taking account of socio-cultural factors will allow for better integration of local knowledge and scientific knowledge, which can help to ensure that learning outcomes will be realized. There is also a need to consider the use of the English language as it affects the teaching and learning process.

***4) Teachers should take account of the structural factors that influence Technology teaching.***

The education system in South Africa requires that learners must access training in different fields of environmental education or farming. Learners generally work well in the school garden because there are gardens at their homes and they have enough knowledge of planting and weeding.

School garden activities should not be a daily routine otherwise it could easily lead to exhaustion.

As shown in this study there are various structural factors that influenced the teaching of Technology activities in the school gardens. Based on this, the study recommends that teachers should take account of the following structural factors when planning and teaching such activities:

- Seasons (timing)
- Policies
- Available materials
- Teachers previous experience
- Poverty issues in the community.

## **6.2 Recommendations for further research**

This research has identified how structural and socio-cultural factors influence Technology teaching using school gardens. This question could be broadened to investigate other contexts relevant to environmental learning in technology. Another issue which could be researched in more depth is teachers and learners views on using the school garden for teaching and learning.

There is also a need to do further research on how teachers could work more effectively in teams in their daily curriculum duties. This research has indicated that teachers do not work together in a coordinated way in carrying out their duties. OBE requires that curriculum planning needs to be done per phase and the planned work should be integrated, not individualized.

To do this successfully, teachers need to work in teams, but this is not happening at this school, as teachers are not concerned about what other teachers are doing. If there are activities that are to be done outside the classroom, teachers need to support each other. At this school I observed that this is not easily achieved, because teachers are not prepared to assist each other.

## **6.3 Reflections on this study**

This research has helped me to gain a deeper understanding of the Learning Outcomes in Technology more explicitly.

When I started the research, I did not realize that the Learning Outcomes in the Learning Areas can be realized simultaneously and that Learning Outcome 2 can be realized in an activity that was planned to realize Learning Outcome 3 for example. This has been a very interesting part of my study. It is going to allow me to handle the Technology Learning Area more confidently in future. It is my understanding that most teachers in other rural schools have the same problems of understanding the Learning Outcomes as I had, and hope that this case study will enable me to show other teachers how to go about working with these Learning Outcomes.

This study has also helped me to understand that the use of the school garden can help teachers and learners to realize the Learning Outcomes, especially when use is made of locally available materials. Despite being given a school garden by SANBI our school has not used the school garden for teaching purposes before. It is possible for all the teachers to see how the school garden can be used to realize their Learning Outcomes, not just for Technology. The school garden is for everyone, not just the senior phase only. This study has shown that the school garden can be a valuable resource for learning.

If I had to do the research again, the first thing I would do is to make sure that the whole process was thoroughly organised. I would implement a longer introductory phase where the plan of action can be thoroughly debated. The second area for improvement is to motivate the participants to be punctual and diligent, particularly the teachers and parents of learners. It has dawned on me that research processes such as these require intrinsic motivation which cannot simply be taken for granted.

#### **6.4 Conclusion**

As indicated above, I have learned many things through conducting this research. The research has provided insight into how the SANBI Greening the Nation Project can ensure that the gardens they are providing in schools can be effectively used for curriculum purposes. The research has shown that this is not an easy process, but one that would seem to be worthwhile in the long term if teaching and learning in South Africa's rural schools is to improve and change.

## CHAPTER 7

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