

# **Growing the Living Laboratory**

**Permaculture for Environmental Education in the NCS**

**Intermediate Phase  
Grades 4-6**



**seed**

transforming learning through permaculture

logo; for position and size only

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SEED (Schools Environmental Education and Development), based in the Western Cape, is an organisation that offers training and mentoring for teachers in a Permaculture context. Through workshops and teaching resources, SEED seeks to help educators create a more joyful and stimulating learning experience in a Permaculture garden.

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# About this book

## Purpose

The purpose of this book is to use the principles and techniques of Permaculture to establish school food gardens while meeting many of the content and outcome requirements of the National Curriculum.

Permaculture principles promote, rather than undermine, the natural systems of our planet. Within a school these systems include the way in which we use water and energy, dispose of waste, keep the outside spaces and promote the surrounding community.

Many of our schools are dry dusty places, devoid of the cool comfort of gardens, trees and grass. Permaculture provides a low-cost means to transform our schools into green leafy places that provide safe and healthy environments with improved learning conditions.

Furthermore, Permaculture gardens provide a “living laboratory” for activity-based teaching and learning.

A Permaculture garden also serves as a “role model” to encourage teachers, learners and parents to establish gardens in small urban spaces to provide both food and income.

## Who is this book for?

This is a teacher’s book for use with Intermediate Phase learners.

## How to use this book

The book consists of two sections: worksheets and teacher information.

### Worksheets

The worksheets cover the development of a Permaculture garden. Each worksheet contains one, two or three activities for the learners to carry out. Teachers may photocopy these worksheets and hand them out to the learners in the class.

Each worksheet begins by introducing new ideas to learners. These ideas relate to the content or outcomes of the national curriculum and/or to the development of a Permaculture garden in the school grounds.

### Teacher information

The teacher information pages for each activity include:

- The equipment or materials needed to carry out the activity.
- Information on organizing the class for the activity – whether they should work as a class, in groups, in pairs or individually.
- Answers to any questions learners need to answer during the activity.
- The links to the National Curriculum core knowledge and content and outcomes covered by the activity.
- Suggestions for the assessment of the activity.

## Curriculum links

The following tables list 1) the core knowledge and content and 2) the outcomes covered by all the activities in the book.

These abbreviations are used in the tables and in the teacher information section.

A & C – Arts and Culture

CO – Critical Outcomes

LO – Learning Outcome

NS – Natural Sciences

SS – Social Sciences

## Core knowledge and content of the Intermediate Phase National Curriculum covered by the activities in this book

Core knowledge and content	Activity
<p>NS Life and Living New plants can grow from certain parts of a parent plant. This is called vegetative reproduction and does not need seeds.</p>	3.4
<p>NS Life and Living Green plants produce their own food and grow by using water and substances from the air and soil. Energy from light is needed to change these simple substances into food and plant material. Green plants are the only organisms that can produce food in their own bodies. Animals cannot make their own food, and so animals eat plants for food while some animals eat other animals. All animals ultimately depend on green plants for their food. Soil forms by natural processes from rock and from dead plants and animal material. Substances that plants take from the soil must be replaced to maintain the fertility of the soil.</p>	4.1; 4.2; 4.3
<p>NS Life and Living All living things can respond to their environment in various ways; animals, including humans, have specialised sense organs.</p>	5.4
<p>NS Life and Living Water plays an important role in ecosystems, sustaining both plant and animal life. Industrial, agricultural and domestic uses may have a serious impact on the quality and quantity of water available in an area.</p>	6.3
<p>NS Life and Living Ecosystems are self-contained areas where a wide variety of plant and animal species live and reproduce. They depend on each other and on the non-living environment. The life and reproduction of all the organisms in an ecosystem depend on the continuing growth and reproduction of plants.</p>	7.1; 8.1
<p>NS Life and Living Animals' habitats are the places where they feed, hide and produce and shelter their young. People are destroying the habitats of many types of animals. This is leading to the extinction of thousands of species of animals.</p>	7.2; 8.3
<p>NS Life and Living Sexual reproduction is the process by which two individual plants or animals produce another generation of individuals. The next generation's individuals look like the parents but always have slight differences from their parents and from each other.</p>	9.2; 10.1
<p>NS Life and Living Living things need food for energy, to move, to grow and to repair damage to their bodies. There are three main groups of food. To be healthy, we need to eat food from all three of these groups every day.</p>	9.3
<p>NS Life and Living New plants can grow from parts of a parent plant. This is called vegetative reproduction and does not need seeds. The new plants have all the characteristics of the parent plant.</p>	10.2
<p>NS Planet Earth and Beyond Weather may change from day to day. Weather can be described by measurable quantities such as temperature and precipitation. Other changes take longer to occur. An example of this type of medium-term change is annual seasonal changes which may be described in terms of changes in rainfall, average wind direction, length of day or night and average maximum and minimum temperatures.</p>	2.1
<p>NS Planet Earth and Beyond Weather can be described by measurable quantities such as wind direction and speed.</p>	3.1
<p>NS Planet Earth and Beyond Soil consists of weathered rocks and decomposed organic material. Soil forms by natural processes, but it takes an extremely long time to form.</p>	5.3
<p>NS Planet Earth and Beyond Water changes its form as it moves in a cycle between the hydrosphere, atmosphere and lithosphere in what is known as the 'water cycle'. The quality of water resources is determined by the quality of the catchment area. Proper care and management of catchment areas and water resources is essential.</p>	6.2
<p>NS Planet Earth and Beyond Erosion of the land creates landforms that we see and also results in deposition of rock particles that may be lithified to form sedimentary rocks. Erosion and deposition can be very slow and gradual or they can occur in short catastrophic events like floods.</p>	5.5

<b>Core knowledge and content</b>	<b>Activity</b>
SS Geography Grade 4: Resources and services within a settlement (including land, water, sewerage, waste removal, green/open spaces) and difficulties faced by those without these services.	1.1
SS Geography Grade 4: Mapwork – map symbols and key; map of South Africa showing provinces Grade 5: Climatic regions of South Africa and their temperature and rainfall. Grade 5: Mapwork – cross-referencing information on different maps.	2.1
SS Geography Grade 4: Mapwork – directions (eight points of the compass)	3.1
SS Geography Grade 4: Access to water: ways of accessing water in different contexts in present; wise use and management of these resources. Grade 5: Renewable and non-renewable resources: use and abuse of natural resources in South Africa, with a focus on water and energy resources.	6.4; 6.5
SS Geography Grade 6: Link climatic regions to the use of resources in these regions.	6.4
<b>Outcomes of the Intermediate Phase National Curriculum covered by the activities in this book</b>	
<b>Outcomes</b>	<b>Activity</b>
A & C LO3: The learner will be able to demonstrate personal and interpersonal skills through group participation in Arts and Culture projects.	8.3; 9.3; 9.4
CO1: Identify and solve problems and make decisions using critical and creative thinking.	1.1; 1.2; 6.6; 8.2
CO2: Learners work effectively with others as members of a team, group, organisation and community.	3.3; 3.4; 5.1; 5.2; 5.4; 5.6; 7.3; 7.4; 9.7
CO3: Organise and manage themselves and their activities responsibly and effectively.	5.1; 5.4; 5.6
CO4: Collect, analyse, organise and critically evaluate information.	5.3; 8.3; 9.3; 9.4; 9.5
CO5: Communicate effectively using visual, symbolic and/or language skills in various modes.	5.3; 8.3; 9.3; 9.4
CO6: Use science and technology effectively and critically showing responsibility towards the environment and the health of others.	5.1; 5.2; 5.4; 5.6; 9.1
CO7: Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.	7.3; 7.4; 9.1
Maths LO1: Numbers, operations and relationships: learners recognise, describe and represent numbers and their relationships and can count, estimate, calculate and check with competence and confidence in solving problems.	6.5
NS LO1: Learners conduct investigations and collect and evaluate data and communicate their findings.	3.2; 5.3; 5.5; 6.3; 7.1; 7.2; 8.1; 10.1
NS LO2: Learners know, interpret and apply scientific knowledge.	2.1; 3.1; 4.1; 4.2; 4.3; 5.3; 5.4; 6.1; 7.2; 7.3; 7.4; 8.1; 8.2; 8.3; 9.2; 9.3; 9.4; 10.2
NS LO3: Learners demonstrate an understanding of the interrelationship between Science and the environment.	3.3; 3.4; 5.2; 6.2; 6.3; 6.5; 7.2
SS Geog LO1: Learners use enquiry skills to investigate geographical and environmental concepts and processes.	2.1; 3.1; 3.2
SS Geog LO2: Learners demonstrate geographical and environmental knowledge and understanding.	1.1
SS Geog LO3: Learners are able to make informed decisions about social and environmental issues and problems.	6.4; 6.5
Technology LO1: Learners are able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.	9.6
Technology LO2: Learners understand and apply relevant technological knowledge ethically and responsibly.	9.7



## Getting started

Before beginning to establish a school food garden, the interested staff should meet to carry out a resource and stakeholder analysis.

### Resource analysis

Consider the available resources, including the human resources:

- land availability?
- water supply – rain tanks?
- other staff members?
- support of principal?
- parent community support and involvement?

### Stakeholder analysis

The following questions should be discussed and answered:

What do we want?

How much time do we have to dedicate?

Who is involved?

A work calendar can then be drawn up based on the resource and stakeholder analysis.

## Choosing a site for the food garden

To win the involvement and interest of the school community, place the garden close to the school, in the line of vision.

Other factors to consider in choosing a site include:

- Sun – the garden should have 6-12 hours of sun per day. Building, walls and trees limit sun so the garden should not be sited in the shadow of these.
- Soil – the garden should have deep rather than shallow soil. The fertility of the soil will be improved as the garden progresses.
- Water – although water saving and harvesting techniques will be applied at all times in the garden, there must be a source of water during the dry season or for dry spells during the rain season. Part 6 explores water supply. Look over this section to determine whether you will have sufficient water for establishing a food garden.
- Space to expand

## The outdoor classroom

Building an outdoor classroom provides a place to work quietly outside. The outdoor classroom should be shaded to protect people from the harsh sun. It can be made of recycled materials and planted with snack plants such as cherry tomatoes and peas. The position of the outdoor classroom should be included in the Permaculture design.

## Permaculture zones

Zones are different areas on our land. We use zones as guidelines to help plan where to place different things in a landscape. We can visualise zones as a series of concentric circles. The innermost circle is the area we visit most frequently and which we manage most intensively.

We save energy by putting the things that need regular work in the zones close to the school buildings. Things that need less work can be put into zones further away.

Zones are also about protection. Things that need the most protection, such as vegetable gardens and animals must be kept as close to us as possible.

**ZONE 0:** The things that need the most work go into this zone. At a school this would be in the school buildings.

**ZONE 1:** This zone needs observation, visits and work input. This includes vegetables, herbs, medicinal plants, small animals, a place for tools, compost system, water storage, washing areas, etc

**ZONE 2:** This is the “food forest” zone. It requires less work than Zone 1. Includes dense plantings of mixed orchard trees, shrubs, windbreaks, larger vegetables, terraces, grey water drainage, bees, bird and bee-attracting plants etc. Plant and animal species which require care and observation.

**ZONE 3:** This is the ‘farm zone’ – commercial crops, pastures for animals, green manure, aquaculture, low maintenance trees, large systems, big sheds, woodlot, windbreak etc. Most city schools do not go beyond Zone 2.

**ZONE 4:** This is the ‘harvest forest’ zone: semi-managed/semi-wild area which borders forest – managed for wild gathering, forest and fuel needs, hardy food, unpruned trees, grazing etc

**ZONE 5:** Wilderness unmanaged or barely managed natural wild systems. A place for learning and observing. A place where we are ‘visitors not managers’.