



Learning to be Waste Wise

A CURRICULUM GUIDE



Department of
Environmental
Protection

Learning to be Waste Wise: A Curriculum Resource

Original author: Pat Armstrong

Other contributors: Eric Bottomley, Cinnamon Evans, Gil Freeman, Angela Jenkins, Sandy King, John Laffin, Janine Lawrie, Deirdre Lenhoff, Anne Lundgren, Rosemary MacLean, Stuart McQuire, Joseph Natoli,

Kelli Nunes, Maree Pollard, Bob Winters and Jenny Zerafa

WA Editors: Jenny Anderton and Suzanne Mills

WA Contributor: Louise Neilson

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Original Project Manager: Steve Malcolm

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**National Library of Australia
cataloguing-in-publication data**

Armstrong, Pat, 1947–.

Learning to be waste wise: a curriculum resource.

Bibliography.

ISBN

1. Refuse and refuse disposal – Study and teaching (Primary).
 2. Environmental education – Problems, exercises, etc.
 3. Recycling (Waste, etc.) – Problems, exercises, etc.
- I. III. Title.

363.728071



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Acknowledgments

For assistance in the preparation of this publication, the author would like to thank:

Alan Mayberry, Jim Grant (Gould League)
Steve Malcolm (EcoRecycle Victoria)
Dr John Andrews (Department of Education)
Peter Devery (Catholic Education Office)
Geoff Emmett, Cherry Andrews, Bruce Tamagno, Mike Hoye, Robyn Timmins,
Madeleine Jenkins, Imre Hollosy, Alma Rylie Jones (Board of Studies)
Sue Elliott (Environmental Education in Early Childhood)
Dr Annette Gough (Deakin University)
David Robertson (Association of Independent Schools)
John Laffin (Earthcare Education)
Anne Lundgren (Black Rock Primary School)
Jenny Zerafa (Tintern AGGS)

The authors would also like to thank the following teachers who provided valuable information and feedback on their respective school's experience in waste minimisation.

Robin Wood and Maria Ramsden (Bimbadeen Heights Primary School)
Eddie Natzis (Broadmeadows Primary School)
Molly Butcher (Campmeadows Primary School)
Steve Ramsay (Clayton North Primary School)
Con Photopoulos (Cranbourne North Primary School)
Margaret Kentler (Doncaster Primary School)
Dianne Mallerick (Eltham East Primary School)
Judy Walsh (Fairfield Primary School)
Fiona Kelly (Greensborough Primary School)
Susan Goodall (Knox Park Primary School)
Sue Saunders (Monash Primary School)
Julie Kearney (Oakleigh South Primary School)
Karen Fitzsimons (Penola Catholic College)
Grant Phillips and Julie Ellis (Presbyterian Ladies College, Junior School)
Dianne Wilson (Preston Girls Secondary College)
Anastasia Florence (Santa Maria College)
Margaret Hirth (Strathewan Primary School)
Marie Kick, Joanne Witt and Paul Wyss (Southmoor Primary School)
Ross White (Upfield Secondary College)
David Altis (Wales Street Primary School)
Judy Casleton (Westmeadows Primary School)
Anne Yardy (Wonga Park Primary school)
Pauline Musgrave (Yarrabah School)

DEP would welcome feedback from teachers about the usefulness of this publication, as well as any suggestions for improvement.

Introduction

Effective waste and litter education in schools offers a range of important benefits. This is increasingly being recognised and some schools have already established impressive programs.

A best practice approach to waste and litter education involves the integration of curriculum and waste-conscious school operations, which offers not only educational benefits and reduced environmental impact, but also cost savings to the school and, in many local communities, a valuable element for a school's marketing strategy.

A key focus is to use waste and litter as a theme within Learning Areas and TEE studies, rather than as an 'add-on' which requires extra curriculum time. Environmental issues such as waste and litter have shown themselves to be very useful themes which schools can use to simultaneously address both environmental/S&E learning outcomes and outcomes in a diversity of all other learning areas and at all Curriculum Framework levels.

This book is part of the *Waste Wise Schools Kit*, which has been produced by drawing together the best ideas from the many excellent projects undertaken by schools and educational organisations in this field.

The Kit is consistent with the Ministerial policy for environmental education, *Investing in the Future: Environmental Education for Victoria's Schools*, released in May 1998, and allows schools to apply the policy in the practical real-life situation of waste management.

The major components of the Kit are:

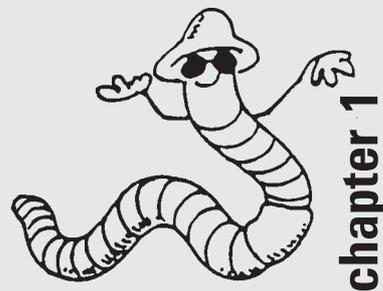
- *No Time to Waste* video
- *The Waste Wise Way: Savings, Benefits and School Operating Practices*
- *Learning to be Waste Wise: A Curriculum Guide*
- Waste Information Sheets
- *Waste Wise Schools Case Studies Booklet*
- *Ollie Recycles* CD-ROM

The Kit was designed to help schools achieve all the elements of a best practice approach to waste and litter education and is based on the collective experiences of many schools, both primary and postprimary.

For further details on the *Waste Wise Schools Kit*, refer to the Introduction in the companion book: *The Waste Wise Way: Savings, Benefits and School Operating Practices*.

1

THIS CHAPTER PROVIDES GUIDELINES
TO SCHOOLS FOR DEVELOPING
EDUCATION PROGRAMS AND UNITS OF
WORK ON WASTE AND LITTER,
SHOWING HOW THESE CAN LINK TO
THE CURRICULUM FRAMEWORK.



Getting Started



Some Groundwork

Before you actually launch into writing your programs and units, take some time out to conduct some essential research. This book has much information that you will find helpful in this research.

Form Working Groups

These working groups could investigate the best way to introduce waste and litter education programs in the school. These groups could be formed in different ways, perhaps at year levels or on a department basis. One person should be responsible to coordinate each group's findings and report back to the whole staff.

Contact Waste Wise WA to find out how a staff member from your school could undertake professional development as part of the Waste Wise Schools Program.

Conduct Curriculum Audits

Find out where the topics of waste minimisation and litter are currently being

covered in the school at each year level and in which Learning Areas. How well are the topics being covered? What problems have there been? Is there any coordination, so that there is a sequential approach or are the same topics being repeated year after year? Are some topics not covered at all? Draw up a table summarising the current units and programs on waste and litter in the school at each year level Learning Area. Identify the gaps.

Check the Resources Already in the School

Identify what resources you already have in the school. Resources could include:

- books
- posters
- videos
- CD-ROMs
- cassette tapes
- unit planners
- games
- models.



Identify New Resources and Contacts

Use the information in Chapters 5 and 6 of this handbook. Ask colleagues in other schools or at Learning Area Network meetings to recommend key resources, contacts, excursions, etc. Budget to buy some of these key resources. Write to some of the key contacts to obtain relevant information. Check out the major sites on the Internet. Alternatively, ask the students to do this for you. Plan for interesting excursions or incursions.

Identify the Links

Establish what links there are between the topics of waste and litter and the following documents and programs.

Identify where the topics of waste and litter would be relevant to your school's charter.

Look through the section in this chapter, 'Links with the Curriculum Framework', starting on page 5, noting how many learning outcomes can be achieved by students through studies of waste and litter. Identify the relevant examples for your students.

Identify the Talents and Knowledge in Your School Community

At a staff meeting find out about staff, parents, grandparents, etc., who have skills or knowledge in the waste and litter area. For example, a parent with experience in composting may be able to speak to the students about their experiences. Find out if there are staff who have attended professional development programs on waste and litter or have experience in these areas.

Identify Other Useful Contacts and Resources in Your Local Area

Check with the waste minimisation officer or conservation officer at your local council.

Choose an Approach

There are many ways that a school could introduce the topics of waste minimisation and litter reduction. Some of these are listed below:

Integrated

Waste minimisation topics can be integrated across middle schooling and can be used to develop 'Values' outcomes.

Faculty Emphasis

This could be a topic in S&E or Science, for example.

Cross-curriculum Themes

Look for opportunities for cross-curriculum themes in Learning Areas such as Science, S&E, Physical Education and Health, English, The Arts and Technology.

Environmental Subject

More applicable to postprimary schools, waste minimisation topics could be included in subjects such as Environmental Studies or Geography.

An Event

This could involve an excursion or incursion to a waste education centre or waste treatment plant, with appropriate previsit and postvisit activities. Education centres such as the Southern Metropolitan Regional Council's Education Centre, Cleanaway or City Farm. Involvement in Clean-up Australia Day could become a focus for a litter education. Refer to Chapter 6, 'Contacts and Services'.



Competitions and Festivals

Preparing a school for a competition can provide the stimulus for either setting up or improving a waste minimisation program in a school. Examples include National ARC Schools Competition and Earth Schools.

Topic

Waste minimisation could be a theme for a unit of work in almost any subject. The topic could be a part of the curriculum or take advantage of a particular current event or issue, e.g. kerbside recycling. It could be a theme for a level or even the whole school during a special period, such as World Environment Day, Arbor Week, Rubbish Free Lunch Challenge or World Recycling Day.

Look for opportunities for topics that relate to the school's waste and litter operating practices. For example, if the school has set up a worm farm, there are obviously wonderful opportunities for the students to study compost worms, completing learning outcomes in Science, Mathematics and possibly other Learning Areas.

Look for Opportunities for Home Projects or Assignments

Home projects can provide opportunities for the students to take home ideas learnt at school and put them in place in the familiar environment of the home, thus establishing life-long habit changes. They may also lead to an important flow-on effect of sound waste and litter reduction habits from the school to other members of the family.

Examples of home projects might include:

- developing a family waste action plan
- starting a worm farm
- maintaining a compost bin.

Record and Pool Your Research Information

The working party should take responsibility for collating all this information, making it available to other staff.



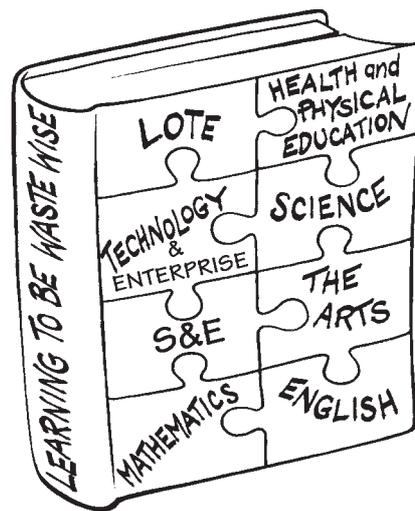
Links with the Curriculum Framework and Judging Guides for Assessment

Compiled by Louise Neilson

This section gives a detailed description of how the topics of waste and litter can be used to assist students achieve learning outcomes in two Learning Areas (*Science* and *Society and Environment*) for all levels of the Curriculum Framework.

The topics are also relevant to many other Learning Areas as shown in the middle schooling documentation of learning outcomes (Chapter 2).

Also included are judging guides for *Science* and *Society & Environment* which give pointers about types of student achievement expected at different levels. A number of assessment tasks are suggested as a guide only and are not intended as a complete list.



Learning to be Waste Wise in Science

Links with the Science Curriculum Framework

This section gives a detailed description of how the modules of waste can be used to assist students to achieve learning outcomes in the *Life and Living* and *Natural and Processed Materials* strands within the Science Learning Area. Suggested activities are a guide only and illustrate how students can respond to the waste modules with different levels of understanding. Some of the activities can be used across a range of levels (eg. Foundation to 3 [F-3] and also [3-5]).

It is important to note that it is the students' responses that are levelled, not the activities themselves.



Curriculum Framework Science Outcome Statements

LIFE & LIVING

Students understand their own biology and that of other living things, and recognise the interdependence of life.

Relevant Waste Modules:

- Composting
- Waste & the Environment

This work can be linked to outcome statements from Foundation to Level 8.

Life and Living Strand Outcome Statements

- LLF Demonstrates an awareness of own personal features and basic needs.
- LL1 Understands that people are examples of living things and that, like all living things, they change over time.
- LL2 Understands that needs, features and functions of living things are related and change over time.
- LL3 Understands that living things have features that form systems which determine their interaction with the environment.
- LL4 Understands that systems can interact and that such interactions can lead to change.
- LL5 Understands the models and concepts that are used to explain the processes that connect systems and lead to change.
- LL6 Understands the concepts and principles used to explain the effects of change on systems of living things.
- LL7 Understands the role of science in developing knowledge about systems and change.
- LL8 Understands how to assess the role of science in helping people to understand systems and change.

From Science Outcome Statements (1998, page 72)

NATURAL & PROCESSED MATERIALS

Students understand that the structure of materials determines their properties and that the processing of raw materials results in new materials with different properties and uses.

Relevant Waste Modules:

- Introduction to Waste
- Reduce, Reuse & Recycle
- Waste & the Environment

This work can be linked to outcome statements from Foundation to Level 8.

Natural and Processed Materials Outcome Statements

- NPMF Demonstrates an awareness of materials and their properties.
- NPM1 Understands that different materials are used in life and that materials can change.
- NPM2 Understands that materials have different uses, different properties and undergo different changes.
- NPM3 Understands that properties, changes and uses of materials are related.
- NPM4 Understands that properties, changes and uses of materials are related to their particulate structure.
- NPM5 Understands the models and concepts that are used to explain properties from their microscopic structure.
- NPM6 Understands the concepts and principles used to explain physical and Chemical change in systems and families of chemical reactions.
- NPM7 Understands the role of science in developing knowledge about the Structure, change and use of materials.
- NPM8 Understands how to assess the role of science in helping people describe the structure, change and use of materials.

From Science Outcome Statements (1998, page 92)

Introduction to Waste: Science Curriculum Links

(Natural and Processed Materials)

Module Overview:

1. What is waste?
2. Where does it come from?
3. Where does it go?
4. Problems associated with too much waste.
5. Minimising waste through the 3Rs: reduce, reuse, recycle.
6. Overall impact of 3Rs on school or local environment.

PRIMARY SCHOOL (YrK-6) LEVELS F-3	PRIMARY SCHOOL (Yr7-9) LEVELS 3-5	PRIMARY SCHOOL (Yr10+) LEVELS 5-8
<p><i>Emphasis is on classroom or school waste</i></p> <ul style="list-style-type: none"> • Aware that we produce and need to remove waste. • Aware that different materials have different properties and uses. • Describe the shape, size, texture and materials of waste items in a 'feelie box'. • Sort class rubbish and identify waste items and the materials used in their production eg. Plastic, glass. • Identify problems of too much waste in school. • Carry out a lunch box audit in terms of waste produced through packaging food. • Describe observable changes to a variety of materials placed in a compost bin or as litter. • Suggest ways that the 3Rs can be put into practice in the classroom. 	<p><i>Emphasis is on household waste</i></p> <ul style="list-style-type: none"> • Perform experiment to test which materials will rot or change over time either in a compost heap or on the ground as litter. • Sort household rubbish and identify waste items and the materials used in their production. • Carry out a home audit of waste. How much does our family throw out in a week/year/month? • Research where household waste goes. • Investigate the effect of various chemicals on the breakdown of different waste material. • Field trip to recycling centre or landfill site. 	<p><i>Emphasis is on the community – domestic and industrial waste</i></p> <ul style="list-style-type: none"> • Categorise community and state wide rubbish and identify waste items and the materials used in their production. • Study waste disposal practices that produce gas (eg. Methane) that pollute the atmosphere and discuss alternatives. • Investigate Local and WA government policies that relate to litter and waste in regard to protection of natural environments. • Research the chemistry involved in recycling procedures such as in Aluminium cans or paper recycling. • Compare different technologies associated with waste disposal.



Composting: Science Curriculum Links

(Life and Living)

Module Overview:

1. Elements of the compost bin: living and non-living.
2. Identify and classifying living things according to structure (phyla & classes).
3. Internal and external structures of compost creatures.
4. Life cycles (eg. Worms).
5. Interactions in the compost bin (as a habitat) including the compost as a food web.
6. Importance of decomposers.
7. Compost conversion of waste to nutrient rich soil (transformation of material and energy).

PRIMARY SCHOOL (YrK-6) LEVELS F-3	PRIMARY SCHOOL (Yr7-9) LEVELS 3-5	PRIMARY SCHOOL (Yr10+) LEVELS 5-8
<ul style="list-style-type: none"> • Identify and list living and non-living things in a compost bin. • Cut and paste the pictures of scrap food that can be put into compost bins. • Create 'bottled compost'. • Discuss the needs of compost creatures, ie. food, shelter, water. • Identify the external features of animals in a compost heap and describe how these features help them to survive and thrive. • Observe size, colour and shape of different compost creatures and use these observations to sort the animals. • Use an identification chart to identify all creatures in a compost bin. • Make a simple compost creature showing basic body parts, eg. Worm: saddle, segments, mouth. • Create compost creature jigsaws. • Investigate life cycles of compost worms in a worm farm. • Make compost posters. 	<ul style="list-style-type: none"> • Sort compost creatures into groups according to various criteria such as number of legs, wings or no wings, antennae or none. • Use a key to identify a variety of compost creatures and classify them into relevant phyla and classes. • Use a hand lens/microscope to identify body parts of compost creatures and describe how they work. • Discuss camouflage in compost creatures and how it helps the animal survive. • Play games such as: Bug Bingo, Build a Bug, Tops and Tails (From Waste Matters). • Investigate the best conditions for compost. • Map relationships between living things in a compost habitat. • Draw simple food chains for compost creatures. • Design a brochure about why and how to compost. 	<ul style="list-style-type: none"> • Research the importance of decomposers in food webs. • Observe, record and discuss population growth in a worm farm. • Test which factors affect decomposition of organic material in a compost bin and prepare report on test results. • Explain the role of compost creatures in converting green waste into nutrient rich soil. • Draw a flow chart showing the transfer and transformation of material and energy through a food web in a compost heap. • Conduct research into the impacts on various ecosystems of using composted waste in parks and reserves. • Research the types of composting – backyard, commercial, worm farms and the processes and merits of each.

3Rs – Reduce, Reuse, Recycle: Science Curriculum Links

(Natural and processed materials)

Module Overview:

1. Sorting rubbish into different groups.
2. Visible properties of materials, identification of recyclable materials.
3. Testing decomposition of materials.
4. Describing processes involved in producing various recyclables from raw material to end product.
5. Using and sorting recyclables relating to properties of materials.
6. Using waste as an energy source.
7. Recycling of matter in ecosystems.

PRIMARY SCHOOL (YrK-6) LEVELS F-3	PRIMARY SCHOOL (Yr7-9) LEVELS 3-5	PRIMARY SCHOOL (Yr10+) LEVELS 5-8
<ul style="list-style-type: none"> • Describe the visible properties of the following materials and brainstorm uses: cardboard box, milk carton, soft drink bottle (PET), old newspapers. • Prepare a written report describing the processes involved in producing: plastic from petroleum products; glass from sand, soda ash and lime; aluminium from bauxite; paper from trees. • Display different types of plastic packaging and explain why particular plastics are used for certain purposes. • Construct a timeline showing the durability of common packaging materials. • Research the role of fuel in recycling processes. • Research and describe the burning of waste materials as fuel, eg. old tyres as fuel for cement kilns. 	<ul style="list-style-type: none"> • Investigate products made from recycled materials and used for insulation (eg. Ceiling insulation made from newspapers or fleece jackets made from PET bottles). • Investigate the rate of decay of different types of litter. • Design and conduct a series of tests to discover the properties of a particular plastic used to package softdrink and prepare a written report of results. • Conduct research and prepare a report about the uses for old tyres, including using them for fuel. • Show how different plastics can be separated using a flotation tank. • Show how magnetic materials can be separated from non-magnetic ones eg. Steel cans from aluminium cans. • Describe the process of converting waste gas to energy. 	<ul style="list-style-type: none"> • Conduct research to determine the composition and properties, such as density, flexibility and hardness, of plastics commonly used in packaging. Discuss why certain plastics are used for particular purposes in packaging. • Investigate the problems of contamination in recycling processes and the effects of this contamination on the products made from recycled materials. • Research variations in the relative percentages of virgin and recycled paper fibre that are used in various types of recycled paper manufacture. • Present findings to class about investigation into degradability of different materials used in packaging and the advantages and disadvantages of these materials. • Demonstrate the production of methane from decaying matter. • Research the economics of recycling.



Waste and the Environment: Science Curriculum Links

(Natural and Processed Materials/Life and Living)

Module Overview:

1. Identify and define waste.
2. Describe where waste comes from.
3. Collection of waste.
4. Sorting waste.
5. Uses of waste items (linked to properties).
6. Where does waste go?
7. Problems with waste.
8. Minimising waste (3Rs)
9. What can schools/individuals do to help?

PRIMARY SCHOOL (YrK-6) LEVELS F-3	PRIMARY SCHOOL (Yr7-9) LEVELS 3-5	PRIMARY SCHOOL (Yr10+) LEVELS 5-8
<p><i>Natural & Processed Materials</i></p> <ul style="list-style-type: none"> • Identify materials that could be recycled or reused at school or home. • Set up a 3 bin system in the classroom for: food scraps, paper and rubbish. • Monitor waste in the classroom (how much) and determine where the rubbish goes to. • Identify litter problem areas at school. • Examine changes that occur over time to a variety of waste materials found in class rubbish. • Compare degradability of different materials found as litter. • Suggest ways of minimising classroom waste by using the 3Rs. 	<p><i>Natural & Processed Materials</i></p> <ul style="list-style-type: none"> • Monitor waste in the home, how much does your family throw out per week/month/year? (include recyclables, compost, rubbish). • Determine where household waste goes (landfill site, sewerage system, recycling depot). • Investigate the use of recycled plastic to produce agricultural piping, softdrink bottles, clothing, and floor tiles or reused wood to produce new products for consumers. • Determine why litter is found in certain areas at school and suggest ways it can be reduced. • Investigate attitudes of people/students to littering. 	<p><i>Natural & Processed Materials</i></p> <ul style="list-style-type: none"> • Investigate wastes produced in WA (domestic, commercial, building, industrial, medical, toxic and radioactive). • Trace waste back to sources and research how it is created and how to dispose of it. • Investigate household rubbish, car tyres and methane gas from sanitary landfills as alternative energy sources. • Compare the economic and environmental costs of making iron and iron alloys from virgin and recycled materials. Research effectiveness of national and state litter campaigns. • Analyse the cost and benefits of recycling materials compared to the consumption of new resources.

Waste and the Environment: Science Curriculum Links

(cont.)

Module Overview:

Waste and the Environment (continued) – Life & Living

PRIMARY SCHOOL (YrK-6) LEVELS F-3	PRIMARY SCHOOL (Yr7-9) LEVELS 3-5	PRIMARY SCHOOL (Yr10+) LEVELS 5-8
<p><i>Life & Living</i></p> <ul style="list-style-type: none"> • Identify all the living and non-living things in the school environment. • Complete a litter survey at a nearby park, beach, creek etc. and look for evidence of the effects of litter on living things. • Investigate and describe the effects of litter on organisms in marine or rural environments. • Research the role of living things in the decay process. • Draw posters with an anti-littering slogan and links to environmental effects. 	<p><i>Life & Living</i></p> <ul style="list-style-type: none"> • Conduct research into the methods used in the disposal of household waste and the effects on various ecosystems. • Compare the different methods of waste disposal at school and describe the effect on different ecosystems. • Investigate what affects the decomposition of organic matter. • Design a brochure to stop people dumping plastics in the marine environment – outline effects of plastic packaging (eg. plastic bags) on marine organisms. 	<p><i>Life & Living</i></p> <ul style="list-style-type: none"> • Collect information regarding the effect of chemicals, waste, fertilisers, litter, dog droppings etc. entering waterways and prepare a report. • Investigate the advantages and disadvantages of recycling certain waste materials from households and industry and then determine the impact, if any, of these recycling processes on ecosystems. • Investigate the role of microbiology and its place in waste management through larger scale composting operations. • Design a model of an industry showing how they can use recycling practices. • Research the government policies that specifically relate to litter and waste production in regard to protection of natural environments.



1



Science Judging Guides

Introduction to Waste Module Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check student's understanding in the *Natural and Processed Materials* strand.

Assessment

- Investigate the waste disposal practices involved in class, school, home and/or community. Suggest ways of minimising waste production by using the principles of the 3Rs (reduce, reuse, recycle).
- Collect and sort your class's /school's rubbish into recyclable and non-recyclable material. Create three new products out of the recyclable material collected. Write a report on each new product including what properties of the material selected make it suitable for its new use. For example, make note pads out of (one-sided) recycled paper or seedling pots from milk cartons.
- Publish a small information booklet on ways to reduce waste in the home.
- Design and make a model of a recycling station to be established at the school.

This could be costed out and presented to the Principal or P&C.

LEVEL	NATURAL & PROCESSED MATERIALS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
F	Demonstrates an awareness of materials and their properties.	<ul style="list-style-type: none"> • Awareness of properties of different materials, eg. Materials feel different, hard, soft, strong or flexible.
1	Understands that different materials are used in life and that materials can change.	<ul style="list-style-type: none"> • Recognises some of the materials that would be found in classroom rubbish. • Describes the shape, size and texture of waste items in a 'feely box'. • Aware that waste materials can change appearance over time. • Recognises that too much rubbish being made can cause problems.
2	Understands that materials have different uses, different properties and undergo different changes.	<ul style="list-style-type: none"> • Lists materials that can be reused or recycled in classroom rubbish. • Describes observable changes to a variety of waste materials found in the classroom rubbish. • States some of the problems associated with too much waste.
3	Understands that properties, changes and uses of materials are related.	<ul style="list-style-type: none"> • Describes the general properties of 'waste' items. • Relates the 3Rs to waste minimisation. • Classifies household or classroom waste into various categories for sorting (uses 3Rs). • Predicts what might happen if too much waste is produced.



LEVEL	NATURAL & PROCESSED MATERIALS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
4	Understands that properties, changes and uses of materials are related to their particulate structure.	<ul style="list-style-type: none"> • When sorting rubbish, identifies waste items and the materials used in their production eg. plastic, glass. • Describes the changes that take place in the different categories of waste over time and can relate these changes to the properties of that material, eg. glass will have little change due to hardness, stable, non-reactive with many chemicals. • Explains how applying the 3Rs helps minimise waste.
5	Understands the models and concepts that are used to explain properties from their microscopic structure.	<ul style="list-style-type: none"> • Applies fundamental model of atomic and molecular structure to explain difference in substances and why particular materials are used for certain purposes eg. recycling. • Uses models of atoms and molecules to represent elements, compounds eg. Aluminium – bauxite, steel. • Understands the meaning of chemical formulae eg. Use recyclable or general waste examples.
6	Understands the concepts and principles used to explain physical and chemical change in systems and families of chemical reactions.	<ul style="list-style-type: none"> • Explains recycling procedures such as aluminium cans or steel, using chemical reactions where possible. • Uses a case study of waste disposal to explain the physical and chemical practices in such a system.
7	Understands the role of science in developing knowledge about the structure, change and use of materials.	<ul style="list-style-type: none"> • Through a critical study of industrial research and development into recycling, explains why understanding reaction mechanisms and factors affecting reaction rates is critical to the efficiency of a process. • Appraises methods used to assess the costs and benefits of recycling materials compared with the consumption of new resources. • Compares and evaluates the alternative technologies of waste disposal eg. incineration, pyrolysis. • Examines the relationships between population size, garbage production and resource consumption in different countries.
8	Understands how to assess the role of science in helping people describe the structure, change and use of materials.	<ul style="list-style-type: none"> • Generates a complex flow diagram to describe the flow of energy and materials involved in a system eg. waste disposal. • Applies their understanding of materials to many kinds of issues, including quality of life, health, economic and environmental issues. For example, analyses the benefits to the individual and community of applying the 3Rs. • Applies their understanding of theories to make recommendations on societal issues eg. Waste production and disposal procedures for domestic and industrial use (government policies).

From *Science Outcome Statements* (1998, page 92)

Compost Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check student's understanding in the *Life and Living* Strand.

Assessment

- Keep a journal to record the changes that occur to the compost bin over time. In particular, concentrate on the compost creatures.
- Choose one of these creatures for an in depth investigation. Describe, classify and examine the interactions of this one creature with all the other compost organisms. What is likely to affect the survival of your creature?
- Make a compost bug from recyclable materials and label each part. Give a talk about your bug, including an explanation of structures, which help it to live in a compost bin.
- Make a 3D model of the food web of a compost bin.
- Design and implement an experiment to test a hypothesis relating to survival of creatures in a compost bin.

LEVEL	LIFE & LIVING STRAND OUTCOME STATEMENTS	COMPOST MODULE POINTERS
F	Demonstrates an awareness of own personal features and basic needs.	<ul style="list-style-type: none"> • Recognises their own need for food, water and shelter. • Aware that we produce waste and need to remove waste (toileting and other).
1	Understands that people are examples of living things and that like all living things, they change over time.	<ul style="list-style-type: none"> • Lists the living and non-living things in a compost bin. • Observes that there are visible differences in structure between the compost creatures. • Draws or makes a model of a compost creature. • Observes changes that have occurred to the compost over time (eg. Volume reduction, colour change, birth or death of animals).
2	Understands that needs, features and functions of living things are related and change over time.	<ul style="list-style-type: none"> • Discusses the needs of the compost creatures (eg. Food, shelter, water). • Draws or makes a model of a compost creature and attempts to label parts. • Identifies some external features of animals in a compost heap and simply describes how these features help them to survive. Eg. Insects with wings that allow them to fly. • Simply writes or draws about the life cycle of one of the creatures in the compost ie. Describes the changes in a worm from egg stage.



LEVEL	LIFE & LIVING STRAND OUTCOME STATEMENTS	COMPOST MODULE POINTERS
3	Understands that living things have features that form systems which determine their interaction with the environment.	<ul style="list-style-type: none"> • Relates structure to function, eg. Discusses camouflage in compost animals and how this might help the animals to survive, eg. hide from predators. • Uses an identification chart to identify all the creatures in a compost bin. • Draws simple food chains for compost creatures.
4	Understands that systems can interact and that such interactions can lead to change.	<ul style="list-style-type: none"> • Relates how structural features of the compost creatures contribute to the organism's well being. Identifies the adaptations that assist survival. • Maps relationships between living things in a habitat, discusses role of decomposers. • Uses a hand lens or microscope to identify body parts of compost creatures and describe how the body parts work together.
5	Understands the models and concepts that are used to explain the processes that connect systems and lead to change.	<ul style="list-style-type: none"> • Observes, records and discusses the population growth of worms (or other creatures) in the compost bin. • Identifies the factors that affect survival of one or more of the compost creatures (eg. moisture, acidity). • Explains the factors that can affect the decomposition of organic material in a compost bin. • Explains the role of compost creatures in converting green waste into nutrient rich soil.
6	Understands the concepts and principles used to explain the effects of change on systems of living things.	<ul style="list-style-type: none"> • Draws a flow chart showing the transfer and transformation of material and energy through a food web in a compost bin. • Pyramid of biomass. • Analyses the impact of using composted green waste in parks and reserves.
7	Understands the role of science in developing knowledge about systems and change.	<ul style="list-style-type: none"> • Examines the pros and cons of the long term impact on ecosystems of increasing use of landfill or more people composting instead of throwing away green waste. • Discusses the importance of biodiversity in the compost, gardens and elsewhere.
8	Understands how to assess the role of science in helping people to understand systems and change.	<ul style="list-style-type: none"> • Assesses the consequences and limitations of not taking and interdisciplinary approach to an environmental impact review into a proposed landfill site on the coast. • Describes the role of different scientific disciplines in a commercial composting operation.

From *Science Outcome Statements* (1998, page 72)

3Rs – Reduce, Reuse, Recycle Module Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check students' understanding in the *Natural and Processed Materials* strand.

Assessment

- Set-up a recycling station for the classroom and/or the whole school. Students can help to sort the waste and investigate the potential to reuse and recycle the waste collected. Students keep a reflective journal throughout the process to consider what they have learnt about materials and their properties in the context of recycling.
- Develop an advertising campaign to educate the students about the correct recycling methods in your school.
- Prepare a video that discusses the 3Rs.
- Show, using a diagram the steps in recycling a can, a glass bottle, and a plastic container.

LEVEL	NATURAL & PROCESSED MATERIALS STRAND OUTCOME STATEMENTS	3RS POINTERS
F	Demonstrates an awareness of materials and their properties.	<ul style="list-style-type: none"> • Awareness of properties of different materials, eg. Materials feel hard or soft, strong or flexible.
1	Understands that different materials are used in life and that materials can change.	<ul style="list-style-type: none"> • Recognises that different materials are used for making different things, eg. Cup is plastic, box is cardboard. • Sorts materials based on their properties eg. Classify wood, metal, plastic or wool as being hard or soft. • Aware that materials can change and describe those changes eg. Leaf – green to yellow to brown.
2	Understands that properties, changes and uses of material are related.	<ul style="list-style-type: none"> • Relates the use of materials to their properties. • Lists the different ways that paper or plastics can be used. • Recognises that looking inside materials is useful in understanding them. • Distinguishes between different changes in materials, eg. Bread goes mouldy when left wet, but plastics don't change.
3	Understands that properties, changes and uses of materials are related.	<ul style="list-style-type: none"> • Relates changes they make to materials to their changed properties, eg. crushing cans. • Relates the properties and structure of materials to their different uses and connects the different properties of material to specific uses, eg. Displays different types of plastic packaging and explains why particular plastics are used for different purposes. • Describes uses for cardboard boxes, milk cartons, old newspapers. • Describes changes to the properties of materials and relates these to the process causing the change, eg. Describes processes involved in producing glass from sand or paper from trees or aluminium from bauxite.



LEVEL	NATURAL & PROCESSED STRAND OUTCOME STATEMENTS	3Rs POINTERS
4	Understands that properties changes and uses of material are related to their particulate structure.	<ul style="list-style-type: none"> • Determines factors that influence the choice of material for specific purposes, eg. Investigate products made from recycled materials. • Uses simple methods to determine properties such as hardness and flexibility eg. Designs and conducts a series of tests to discover the properties of plastic in soft drink bottles. • Groups substances that have several properties in common and specifies appropriate uses for them eg. Sorting recycling waste; magnetic materials from non-magnetic. • Recognises and describes conditions that affect reactions and changes in materials eg. Rusting in metals, biodegradability. • Describes in words common examples of chemical change, eg. Combustion of fuel, decomposition of organic matter. • Describes separation procedures used in recycling eg. Separating plastics in a floatation tank.
5	Understands that models and concepts are used to explain properties from their microscopic structure.	<ul style="list-style-type: none"> • Applies fundamental models of atomic and molecular structure to explain differences in substances and why particular materials are used for certain purposes eg. Use recyclable materials to illustrate this. • Uses models of atoms and molecules to represent elements and compounds, eg. Aluminium – bauxite, steel. • Understands the meaning of chemical formulae, eg. Use recyclable examples. • Describes the process of molecules combining to produce different polymers with different properties, eg. Plastics that are soft or rigid.
6	Understands the concepts and principles used to explain physical and chemical change in systems and families of chemical reactions.	<ul style="list-style-type: none"> • Explains recycling procedures such as in aluminium cans or paper, using chemical reactions where possible. • Investigates the problems of contamination on the products made from recycled materials.
7	Understands the role of science in developing knowledge about the structure, change and use of materials.	<ul style="list-style-type: none"> • Through a critical study of industrial research and development in recycling, explains why understanding reaction mechanisms and factors affecting reaction rates is critical to the efficiency of a process. • Appraises methods used to assess the costs and benefits of recycling materials compared with the consumption of new resources.

LEVEL	NATURAL & PROCESSED STRAND OUTCOME STATEMENTS	3Rs POINTERS
8	<p>Understands how to assess the role of science in helping people describe the structure, change and use of materials.</p>	<ul style="list-style-type: none"> • Generates a complex flow diagram to describe the flow of energy and materials involved in a system, eg. A recycling plant, after visiting one • Applying their understanding of materials to many kinds of issues, including quality of life, health, economic and environmental issues. • Applying their understanding of theories to make recommendations on societal issues, eg. Recycling procedures in place and government policies.



Waste and Environment Module Judging Guide

The example below shows how a judging guide, with content specific pointer, can be used to check students' understanding in both the *Life and Living* and the *Natural and Processed Materials* strands.

Assessment

- Complete a litter survey at school or your local environment. Determine what impact the litter has on the living organisms in that area. What could be done to improve the situation?
- Complete a school waste audit, report and recommendations as given in the *Waste Wise Way*.
- Develop a school litter (or school waste) reduction plan. Implement the plan and discuss the impact this has made on your school's litter problem.
- Develop a waste policy for your class, year or school.
- Prepare a report that describes where school rubbish comes from and where it goes to during disposal. It is important to have a breakdown of the different categories of rubbish collected and to include how the 3Rs could reduce the amount of rubbish collected for waste disposal.
- Create a poster (or video or PowerPoint presentation) on the effect that litter, or rubbish in general, has on the environment. Include pictures and articles to illustrate your points.

LEVEL	N&PM STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS	L&L STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS
F	Demonstrates an awareness of materials and their properties.	<ul style="list-style-type: none"> • Awareness of properties of different materials, eg. Feel hard or soft. 	Demonstrates an awareness of own personal features and basic needs.	<ul style="list-style-type: none"> • Aware that we produce waste and of the need to remove waste.
1	Understands that different materials are used in life and that materials can change.	<ul style="list-style-type: none"> • Recognises some of the features that would be found in classroom rubbish. • Aware that waste materials can change over time. • Aware that litter is a problem at school. • Recognises that too much rubbish can cause problems in the environment. 	Understands that people are examples of living things and that, like all living things, they can change over time.	<ul style="list-style-type: none"> • Identifies living and non-living things in the school environment (or local bushland, etc).

LEVEL	N&PM STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS	L&L STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS
2	Understands that materials have different uses, different properties and undergo different changes.	<ul style="list-style-type: none"> • Lists materials that can be reused or recycled in classroom rubbish and/or litter. • Describes observable changes to a variety of waste materials found in the rubbish. • States some of the problems associated with too much rubbish. • Identifies litter problem areas at school. 	Understands that needs, features and functions of living things are related and change over time.	<ul style="list-style-type: none"> • Lists the needs of the living things found in the school. • Completes a litter survey of their school.
3	Understands that properties, changes and uses of materials are related.	<ul style="list-style-type: none"> • Monitors waste in the classroom and determines where rubbish goes to. • Sorts litter and/or classroom rubbish into various categories of waste. • Relates 3Rs to waste minimisation. • Compares the degradability of different materials found as litter. 	Understands that living things have features that form systems which determine their interaction with the environment.	<ul style="list-style-type: none"> • Describes the effect that litter or rubbish has on living things. • States the role of living things in the composting/decaying process. • Suggests what uses litter may provide for living things, eg. shelter.
4	Understands that properties, changes and uses of materials are related to their particulate structure.	<ul style="list-style-type: none"> • When sorting rubbish, identifies waste product and the materials used in their production. • Compares the degradability of different materials found as litter in terms of their microscopic structure. • Links the uses of waste items to their properties. • Explains how applying the 3Rs helps minimise waste. 	Understands that systems can interact and such interactions can lead to change.	<ul style="list-style-type: none"> • Compares the different methods of waste disposal at school and describes the effects on different ecosystems. • Explains the rates of decay amongst different organic materials found in litter or rubbish. • Researches effects of rubbish on different organisms in different environments.



LEVEL	N&PM STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS	L&L STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS
5	Understands the models and concepts that are used to explain properties from their microscopic structure.	<ul style="list-style-type: none"> • Applies fundamental models of atomic and molecular structure to explain differences in substances and why particular materials are used for certain purposes, eg. Al cans: light and low corrosive. • Uses microscopic structure to explain how recycled plastic has many different uses. 	Understands the models and concepts that are used to explain the processes that connect systems and lead to change.	<ul style="list-style-type: none"> • Explains the interactions between living things and their external environment that occur over time. • Describes the effect that non-biodegradable litter has on the natural cycles of matter. • Applies understanding of food chains and webs when determining the impact that plastic rubbish has on marine organisms, eg. plastic bags resembling jellyfish.
6	Understands the concepts and principles used to explain physical and chemical change in systems and families of chemical reactions.	<ul style="list-style-type: none"> • Explains recycling procedures using chemical reactions where possible. • Uses a case study of waste disposal to explain the physical and chemical practices in such a system. 	Understands the concepts and principles used to explain the effects of change on systems of living things.	<ul style="list-style-type: none"> • Explains the role of microbiology and its place in waste management through large scale composting instead of throwing away green waste. • Analyses WA government policies that relate to litter and waste production in regard to protection of natural environments in WA.

LEVEL	N&PM STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS	L&L STRAND OUTCOME STATEMENTS	WASTE & ENVIRONMENT POINTERS
7	Understands the role of science in developing knowledge about the structure, change and use of materials.	<ul style="list-style-type: none"> • Appraises methods used to assess the costs and benefits of recycling materials compared with the consumption of new resources. • Compares and evaluates the alternative technologies of waste disposal. 	Understands the role of science in developing knowledge about systems and change.	<ul style="list-style-type: none"> • Examines the pros and cons of long term impact on ecosystems of increasing use of landfill or more people composting instead of throwing away green waste. • Analyses WA government policies that relate to litter and waste production in regard to protection of WA's natural environments.
8	Understands how to assess the role of science in helping people describe the structure, change and use of materials.	<ul style="list-style-type: none"> • Generates a complex flow diagram to describe the flow of energy and materials involved in a waste disposal system. 	Understands how to assess the role of science in helping people to understand systems and change.	<ul style="list-style-type: none"> • Assesses the consequences and limitations of not taking an interdisciplinary approach to an environmental impact review of a proposed new landfill site near the coast.

Learning to be Waste Wise in Society & Environment

This section gives a detailed description of how the modules of waste can be used to assist students to achieve learning outcomes in the *Place & Space*, *Natural & Social Systems* and *Resources* strands within the S&E Learning Area. Suggested activities are a guide only and illustrate how students can respond to the waste modules with different levels of understanding. Some of the activities can be used across a range of levels, eg. F-3 and also 3-5. It is important to note that it is the students' responses that are levelled, not the activities themselves.

RESOURCES	PLACE & SPACE	NATURAL & SOCIAL SYSTEMS
<p><i>Students understand that people attempt to meet their needs and wants by making optimum use of limited resources in enterprising ways.</i></p> <p>Relevant waste module: – Waste & Resource Management</p> <p><i>This work can be linked to outcome statements from Foundation to Level 8.</i></p> <p>Resources strand Outcome Statements RF Recognises and manages personal resources and work done. R1 Understands that people use resources in various ways to satisfy their needs and wants. R2 Understands that people cooperate to utilise resources in an effort to satisfy needs and wants. R3 Understands that people make choices when determining how they will use and manage limited resources. R4 Understands that efficient use and management of resources increases the ability to satisfy needs and wants.</p>	<p><i>Students understand that the interaction people have with places in which they live is shaped by the location, patterns and processes associated with natural and built features.</i></p> <p>Relevant waste module: – Waste & Space</p> <p><i>This work can be linked to outcome statements from Foundation to Level 8.</i></p> <p>Place & Space strand Outcome Statements P&SF Recognises features in the environment and cares for those of personal importance. P&S1 Understands that familiar places have a variety of features and that people care for places that are important to them. P&S2 Understands that places in different locations contain specific features and these places are used and cared for by people in the community P&S3 Understands that natural processes affect the natural and built features of places and these features have an influence on</p>	<p><i>Students understand that systems provide order to the dynamic natural and social relationships occurring in the world.</i></p> <p>Relevant waste module: – Waste, the environment & economics</p> <p><i>This work can be linked to outcome statements from Foundation to Level 8.</i></p> <p>Natural & Social Systems strand Outcome Statements N&SSF Responds to elements in natural and social world to meet immediate needs N&SS1 Understands that the natural and social world contains elements which, in various ways, satisfy needs and wants. N&SS2 Understands that the natural and social world contain elements which interact in communities to satisfy needs and wants. N&SS3 Understands that, in natural and social systems, relationships occur to provide order to the interactions found in them.</p>

RESOURCES	PLACE & SPACE	NATURAL & SOCIAL SYSTEMS
<p>R5 Understands that access to ownership and management of resources influence how needs and wants are satisfied.</p> <p>R6 Understands that the extent to which people satisfy their needs and wants is a consequence to their access to, ownership of and ability of manage resources.</p> <p>R7 Understands that the balance between economic growth and ecological sustainability affects the nature and direction of resources use, management procedures and workplace practices.</p> <p>R8 Understands that the degree of balance between economic growth and sustainable development will have implications for resources use, management procedures and workplace practices in the future.</p>	<p>human activity and on people's views about which places need to be cared for.</p> <p>P&S4 Understands that people and places are interdependent, resulting in patterns of features and activities across different places, and that people act to sustain the environment according to their values.</p> <p>P&S5 Understands that a range of factors, processes and values influences the interdependence of people and places and the resultant spatial patterns as well as the different ways in which individuals and groups act to sustain the environment.</p> <p>P&S6 Understands that over time, variations have occurred in the interdependence between people and places, spatial patterns within landscapes and the extent to which people's commitment to ecological sustainability has influenced their care of places.</p> <p>P&S7 Understands that the patterns and processes that explain the spatial variations of features on the earth's surface and people's level of commitment to ecological sustainability.</p> <p>P&S8 Understands that people implement change in response to competing demands for the use of places according to their commitment to ecological sustainability.</p>	<p>N&SS4 Understands that modifications to natural and social systems occur as their elements adapt to changes in the environment.</p> <p>N&SS5 Understands that natural and social adapt to change in their environment in various ways, according to their purpose.</p> <p>N&SS6 Understands that people affect and are affected by the interaction between natural and social systems on a global scale.</p> <p>N&SS7 Understands that people's interactions with natural and social systems varies according to their commitment to the values of ecological sustainability, democratic process and social justice.</p> <p>N&SS8 Understands that the quality of life on earth is related to the degree to which people act according to the values of ecological sustainability, democratic process and social justice.</p>

From *Science Outcome Statements (1998)*



Introduction to Waste: S&E Curriculum Links (Place & Space)

Module Overview:

1. What is waste?
2. Where does it come from and go to?
3. Roles of various groups in the community in waste management.
4. Issues associated with waste.
5. Minimising waste through the 3Rs: reduce, reuse, recycle.
6. People's different attitudes to waste and waste management.
7. Developing a class/school action plan for managing waste more effectively.
8. Overall impact of action plan on school or local environment.

PRIMARY SCHOOL (YrK-6) LEVELS F-3	MIDDLE SCHOOL (Yr 7-9) LEVELS 3-5	LATE ADOLESCENCE (Yr 10+) LEVELS 6-8
<ul style="list-style-type: none"> • Collect food scraps at school and place into a special compost bin. • Collect and display litter found in school grounds. • Sort classroom items suitable for recycling. • Discuss ways of minimising waste (reduce, reuse, recycle and compost) when using public places. • Conduct a litter survey in school/local beach/park and write a report. • List 10 reasons why people litter. • Conduct a rubbish audit at school. • Consider material that can be reduced, reused, recycled or composted at school – in the classroom, office, staffroom, canteen etc. • Investigate the benefits of mulching and describe how mulch can help care for places. 	<ul style="list-style-type: none"> • Visit a landfill site, recycling facility or op shop and describe how these places are contributing to the way the state is reducing its local waste. • Design a method for collecting food scraps and separating them from inappropriate materials for composting. Explain how this will help to reduce the total amount of waste produced by the school. • Design and produce anti-litter posters and slogans for a school display. • Interview/survey students, parents or community about waste disposal practices. • Suggest follow-up actions to waste survey. • Collect newspaper articles about litter and waste and use these to explain how individuals and groups have different points of view in the issue. • Participate in a role-play about community's views on the location of a tip in their area. • Visit local waterways to observe the impact of littering and prepare a report on findings. 	<ul style="list-style-type: none"> • Research use of native forests in paper production and prepare report. • Demonstrate changes in land use of landfill and the effect on water runoff and catchments. • Organise a class debate about using alternatives to wood pulp for the manufacture of paper. • Participate in a role-play that examines the various opinions of the community about the location of a new local landfill site. • Examine and report on the effect of waste and litter on catchment areas. • Explain the impact that recycling can have on the conservation of resources and on the environment. • Develop a campaign to prevent littering in a local park, and draft a letter, that could be sent to local council, about the campaign. • Analyse survey results investigating local opinion regarding effectiveness of local waste management.

Waste, The Environment and Economics: S&E Curriculum Links *(Natural and Social Systems)*

Module Overview:

1. Features of natural systems (living and non-living).
2. Cycles in natural systems and the role of people.
3. Food chains and food webs in the compost bin (flow of energy through systems).
4. Inputs and outputs in natural systems.
5. Adaptations – reactions to change.
6. Impact of humans and increasing population growth on ecosystems.
7. Importance of conservation and ecological sustainability.
8. Management of natural systems and different approaches of groups such as government, industry, conservationists and community groups.
9. Analysing Environmental Impact Statements related to waste management.
10. Economic systems.

PRIMARY SCHOOL (YrK-6) LEVELS F-3	MIDDLE SCHOOL (Yr 7-9) LEVELS 3-5	LATE ADOLESCENCE (Yr 10+) LEVELS 6-8
<ul style="list-style-type: none"> • Discuss the effects of litter in the bush, a river or the beach. • Display pictures of beautiful, litter free environments. • Make a model of a food chain or web within a compost bin. • Investigate the decomposition of organic materials with simple experiments, eg. Bottled compost. • Set up a classroom worm farm and discuss worms' needs for correct food, moisture etc. 	<ul style="list-style-type: none"> • Investigate what happens to green waste in local area and prepare a report. • Illustrate the uses of worm castings. • Draw the sequence of events for: <ul style="list-style-type: none"> – tree to scrap of paper on a beach – bauxite to aluminium can on the street • Role-play of the composting process and the flow of organic materials. • Watch video showing recycling of paper or glass then draw flow chart of the product's manufacturer. • Conduct research into the waste and recycling services used by the school, the costs of these services and how decisions about services are made. • Discuss the legislation that affects waste management practices. 	<ul style="list-style-type: none"> • Investigate and report on the impact of litter in stormwater on marine life. • Investigate the changes to the Earth's atmosphere caused by human activity and assess the relative contribution of manufacturing packaging, waste disposal and production of methane from landfill. • Availability of resources – why are some countries rich or poor with regards to resources and how might this affect waste? • Compare the use of resources, in terms of economic growth, which are required in the production of paper, plastic, glass and metals. • Investigate politics, laws and community rules regarding management of resources and natural systems.

1



PRIMARY SCHOOL (YrK-6) LEVELS F-3	MIDDLE SCHOOL (Yr 7-9) LEVELS 3-5	LATE ADOLESCENCE (Yr 10+) LEVELS 6-8
	<ul style="list-style-type: none">• Consider the rules that help control litter at school and develop new rules to further reduce litter problems.• Debate "fines for littering are an effective means of solving the litter problem."• Describe how factors such as changing values, education, cost to consumer, commodity prices and technology have affected the recycling of certain materials.	

Waste and Resource Management: S&E Curriculum Links (Resources)

Module Overview:

1. Identify different types of resources.
2. Renewable and non-renewable resources – Geography.
3. Uses of resources: influence of government, technology, economics, and global factors.
4. Management of resources – implications of wasting &/or conserving.
5. Legislation relating to protection of natural resources (waste).
6. Examples of industry and business best practice in resource (waste) management.

PRIMARY SCHOOL (YrK-6) LEVELS F-3	MIDDLE SCHOOL (Yr 7-9) LEVELS 3-5	LATE ADOLESCENCE (Yr 10+) LEVELS 6-8
<ul style="list-style-type: none"> • Set up a shop corner in the classroom to display different types of packaging. • Identify products using common items of household packaging. • Create a tip mural – draw things people send to landfill, identify the things that have value and could be used/disposed of elsewhere. • Place lunch leftovers in a school compost and explain why this is important. • Plan and help maintain school vegetable garden using compost. • Set up a 3-bin system to dispose of rubbish in the classroom (food scraps for compost, paper for recycling, rubbish). • Use worm castings for growing seedlings and report on progress. • Use both sides of worksheets and explain how this saves resources. • Recycle classroom scrap paper and explain how this saves resources. 	<ul style="list-style-type: none"> • Compare renewable and non-renewable resources and explain the role of recycling in conserving these resources. • Examine relationships between the location of resources and the world's population distribution. • Examine the effect of demand for resources on natural features and formations, eg. Mining bauxite for aluminium or sand for glass. • Identify future needs and options associated with renewable and non-renewable resources. • Debate 'No green waste should go to landfill'. • Organise a Rubbish-free Lunch. • Role-play 'No household garbage collection for one month'. • Prepare and present speech on 3Rs to class, school or parents. • Identify the types of manufactured resources and goods produced in Australia and how they contribute to waste problems. 	<ul style="list-style-type: none"> • Investigate and report on the relationship between current use of resources used in packaging and the future availability of these resources. • Report on the advances in technology that enable recycled materials to be manufactured into innovative products. • Discuss the issues associated with increasing resource use and waste disposal. • Discuss best practice in waste minimisation and disposal in other countries. • Focus on what can be done to improve the state of the natural environment (waste problems) at community, corporate and government levels.



PRIMARY SCHOOL (YrK-6) LEVELS F-3	MIDDLE SCHOOL (Yr 7-9) LEVELS 3-5	LATE ADOLESCENCE (Yr 10+) LEVELS 6-8
<ul style="list-style-type: none"> • Mark on a map the location of the world's/Australia's important resources, discuss how they are used. 	<ul style="list-style-type: none"> • Make a catchment model showing the influence of litter, chemicals etc on water quality. • Discuss factors that affect the use of a particular resource during and after a visit from a guest speaker from a mining or manufacturing company. • Create a collage showing products and packaging that can be reused or recycled. • Conduct a litter survey and use the information to develop a school litter reduction plan. 	

S & E Judging Guides

Waste and Space Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check student's understanding in the *Place and Space* strand.

Assessment

- Prepare a poster about why waste/litter is an important issue. Include information about types of waste, how waste is generated and environmental impacts.
- Set up a classroom recycling station; monitor and keep a diary of progress and problems.
- Develop an action plan to improve school waste practices. Consider student attitudes to waste and litter (based on the results of a student survey) and how to best encourage their support.
- Compile a litter map of the school identifying problems areas and investigate patterns of litter in relation to other features.
- Draw a flow diagram of how a piece of paper (or other item) goes from being a raw material to litter in stormwater drains.

LEVEL	PLACE AND SPACE STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
F	Recognises features in the environment and cares for those of personal importance.	<ul style="list-style-type: none"> • Aware of waste sources in the classroom (eg. paper) and how to dispose of them.
1	Understands that familiar places have a variety of features and that people care for places that are important to them.	<ul style="list-style-type: none"> • Familiar with facilities and features of the school grounds (including bins, compost etc.) and how they are looked after. • Identifies areas that are well cared (eg. free of litter) for and gives reasons why.
2	Understands that places in different locations contain specific features and these places are used and cared for by people in the community.	<ul style="list-style-type: none"> • Compares features of different local environments: school, parks, bushland, shopping centre (eg. litter, bins, recycling facilities). • Identifies how different places are used and cared for (eg. volunteers clearing litter, gardeners using compost).
3	Understands that natural processes affect the natural and built features of places and these features have an influence on human activity and on people's views about which places need to be cared for.	<ul style="list-style-type: none"> • Understands that mulch/compost can be used to reduce waste and improve gardens/bushland. • Aware that littering can affect other places (eg. marine environments via stormwater drains). • Identifies features of local areas (eg. bushland) that are well cared for and gives reasons why other places are poorly cared for.



LEVEL	PLACE AND SPACE STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
4	Understands that people and places are interdependent, resulting in patterns of features and activities across different places, and that people act to sustain the environment according to their values.	<ul style="list-style-type: none"> • Investigates common features of landfill sites, ie. Why specific locations are selected. • Identifies different opinions towards litter in the school/community and suggests reasons why some people litter.
5	Understands that a range of factors, processes and values influences the interdependence of people and places, and the resultant spatial patterns as well as the different ways in which individuals and groups act to sustain the environment.	<ul style="list-style-type: none"> • Researches community opinions about landfill sites and identifies relationships between values and people’s use of places. • Describes the potential effects of landfill sites on environment, eg. water catchment or bushland. • Discusses why public consultation should/shouldn’t be part of waste legislation.
6	Understands that over time, variations have occurred in the interdependence between people and places, spatial patterns within landscapes and the extent to which people’s commitment to ecological sustainability has influenced their care of places.	<ul style="list-style-type: none"> • Identifies how waste minimisation/recycling can help protect natural environments. • Discusses how people’s values affect their commitment to environmental sustainability and waste minimisation. • Researches and discusses how people’s attitudes have changed over time.
7	Understands the patterns and processes that explain spatial variations of features in the earth’s surface and people’s level of commitment to ecological sustainability.	<ul style="list-style-type: none"> • Understands the “not in my backyard” concept as it relates to waste disposal. • Identifies the national/global environmental issues associated with waste minimisation and recycling.
8	Understands that people implement change in response to competing demands for the use of places according to their commitment to ecological sustainability.	<ul style="list-style-type: none"> • Understands how recycling initiatives relate to changing values about the environment. • Identifies links between change in community attitudes and waste minimisation policy/legislation. • Discusses how other countries’ environments, resources and social priorities influence their environmental/waste reduction commitment.

Waste, The Environment & Economics Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check student's understanding in the *Natural and Social Systems* strand.

Assessment

- Design a brochure about compost, its benefits and how to make it.
- Research one recyclable material (eg. paper) and write a report about its waste impacts, how it is recycled, how to improve recycling rates and the benefits of recycling it.
- Prepare a report about the responsibilities of various groups with regards to waste, eg. individuals, communities, businesses and government.
- Evaluate current waste practices at school/home and devise an action plan to implement and promote better waste practices.
- Develop a public awareness campaign to promote the benefits of waste minimisation.

LEVEL	NATURAL & SOCIAL SYSTEMS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
F	Responds to elements in natural and social world to meet immediate needs.	<ul style="list-style-type: none"> • Identifies basics needs and how to meet them. Can relate needs to waste production (eg. needs to eat...creates waste such as apple core).
1	Understands that the natural and social world contains elements which, in various ways, satisfy needs and wants.	<ul style="list-style-type: none"> • Identifies sources that supply different needs, eg. food comes from..., shelter comes from..(relate sources to waste created). • Identifies the needs of compost worms and how to satisfy them.
2	Understands that the natural and social world contains elements which interact in communities to satisfy needs and wants.	<ul style="list-style-type: none"> • Draws a compost bin food web and identifies how needs are met. • Identifies how families meet their needs and wants and how this creates waste. • Understands why waste needs to be disposed of in household and school.
3	Understands that, in natural and social systems, relationships occur to provide order to the interaction found in them.	<ul style="list-style-type: none"> • Describes how school/household waste is collected and disposed. • Identifies relationships between compost components (eg. between scavenging and predatory insects). • Identifies the role of individuals, households and local government in domestic waste disposal.



LEVEL	NATURAL & SOCIAL SYSTEMS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
4	Understands that modifications to natural and social systems occur as their elements adapt to changes in the environment.	<ul style="list-style-type: none"> • Describes how compost can reduce waste and benefit plants. • Describes how worm farm populations adapt to changes in temperature or food supply. • Describes how people's waste behaviours have changed over time (eg. in Australia since 1788). • Identifies barriers to recycling in the home/school.
5	Understands that natural and social systems adapt to change in their environment in various ways, according to their purpose.	<ul style="list-style-type: none"> • Identifies how recycling participation has change since the 1970s (in response to the 'green' movement). • Identifies economic issues that constrain/ assist recycling. • Assesses the benefits of anti-litter legislation and clean-up campaigns. • Describes how policies and laws have attempted to modify people's waste behaviours.
6	Understand that people affect and are affected by the interaction between natural and social systems on a global scale.	<ul style="list-style-type: none"> • Understands that waste issues are connected with global environmental concerns such as global warming and biodiversity. • Understands that different countries consume and dispose of waste in different ways.
7	Understands that people's interaction with natural and social systems vary according to their commitment to the values of ecological sustainability, democratic process and social justice.	<ul style="list-style-type: none"> • Identifies relationships between population growth and waste issues. • Discusses how economic status affects consumption and waste.
8	Understands that the quality of life on earth is related to the degree to which people act according to the values of ecological sustainability, democratic process and social justice.	<ul style="list-style-type: none"> • Understands that countries' attitudes to waste and environmental protection can depend on social and economic priorities.

Waste and Resource Management Judging Guide

The example below shows how a judging guide, with content specific pointers, can be used to check student's understanding in the Resources strand.

Assessment

- Create a mural of packaging materials and explain how packaging affects resource use.
- Draw a diagram depicting the stages of manufacturing an item from raw materials, eg. bauxite to aluminium cans.
- Prepare a speech about how minimising waste conserves natural resources.
- Create a poster showing how non-renewable resources are used and possible renewable resource alternatives.
- Research and report on best practice resource management in an Australian business.

LEVEL	NATURAL & SOCIAL SYSTEMS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
F	Recognises and manages personal resources and work done.	<ul style="list-style-type: none"> • Identifies resources used for classroom work and that some (eg. paper) create waste. • Names resources at home (eg. food) that create waste.
1	Understands that people use resources in various ways to satisfy their needs and wants.	<ul style="list-style-type: none"> • Describes reasons why food is packaged in certain ways. • Identifies items commonly thrown away. • Identifies which items can be reused.
2	Understands that people cooperate to utilise resources in an effort to satisfy needs and wants.	<ul style="list-style-type: none"> • Identifies the resources used to make common items. • Identifies the stages (and people) involved in manufacturing items (eg. glass bottles) from raw materials and using them to store food/drinks. • Describes how green waste is collected by councils and turned into compost/mulch to be used on gardens.
3	Understands that people make choices when determining how they will use and manage limited resources.	<ul style="list-style-type: none"> • Aware of ways to reduce waste by using the 3Rs. • Produces a rubbish free lunch. • Uses worm farms to recycle green waste and create compost.



LEVEL	NATURAL & PROCESSED MATERIALS STRAND OUTCOME STATEMENTS	INTRODUCTION TO WASTE MODULE POINTERS
4	Understands that efficient use and management of resources increases the ability to satisfy needs and wants.	<ul style="list-style-type: none"> • Describes how compost can reduce waste, enhance soil quality and improve plant growth. • Researches and reports how recycling an item (eg. aluminium can) conserves resources. • Describes how using renewable resources improves environmental sustainability.
5	Understands that access to, ownership and management of resources influence how needs and wants are satisfied.	<ul style="list-style-type: none"> • Understands the relationship between economic status and consumption (waste generation). • Describes the relationship between current use of resources in packaging and the future availability of those resources.
6	Understands that the extent to which people satisfy their needs and wants is a consequence of their access to, ownership of and ability to manage resources.	<ul style="list-style-type: none"> • Identifies potential problems arising if non-renewable resources are exhausted. • Describes how access to resources improves with advances in technology. • Researches and reports how other countries manage non-renewable resources.
7	Understands that the balance between economic growth and ecological sustainability affects the nature and direction of resources use, management procedures and workplace practices.	<ul style="list-style-type: none"> • Assesses alternatives to non-renewable energy and ways to improve their viability. • Describes initiatives used by businesses to achieve sustainable resource use. • Identifies government policies aimed at improving resource use and assesses their likely effectiveness. • Investigates potential ways to convert waste into useful innovative items and identifies possible barriers and solutions to innovations being adopted.
8	Understands that the degree of balance between economic growth and sustainable development will have implications for resources use, management procedures and workplace practices in the future.	<ul style="list-style-type: none"> • Reports on how businesses are adopting a 'Triple bottom line' approach to managing economic, environmental and social resources. • Researches and reports how wise resource use is being implemented in other countries. Identifies factors that make initiatives successful in these cases. • Discusses the relationship between governments' economic and environmental policies.

Values and Learning to be Waste Wise

Links with Values in Curriculum Framework

This section describes how the modules of waste can be used to assist students to achieve outcomes in Values within the Curriculum Framework.

Suggested pointers are a guide only and illustrate how students can respond to the waste modules with different types of values. Some of the pointers can be used across a range of Values. It is important to note that it is the students' responses that are assessed for values not the activities themselves.

VALUE	WASTE MODULE POINTER
<i>Pursuit of knowledge and commitment to achievement of potential</i>	
1.3 Empowerment	<ul style="list-style-type: none"> • Ability to critically assess waste issues and develop behaviours to reduce waste. • Encourages others to become involved in waste reduction activities at school / home.
1.6 Critical reflection	<ul style="list-style-type: none"> • Able to identify waste producing behaviours and design alternatives. • Examine school / home waste process and seek solutions.
<i>Social and Civic Responsibility</i>	
4.1 Participation and citizenship	<ul style="list-style-type: none"> • Illustrates awareness of waste as a social / environmental issue. • Participates in waste reduction actions. • Promotes waste awareness at school / home / community • Promotes waste behaviour change.
4.2 Community	Works within local community to: <ul style="list-style-type: none"> • promote waste minimisation awareness • promote waste minimisation behaviour
4.4 Contribution	<ul style="list-style-type: none"> • Involved in recycling, reducing, reusing • Participates in whole school waste minimisation event.
4.7 Social justice	<ul style="list-style-type: none"> • Recognises that waste to landfill affects future generations' opportunities.



VALUE	WASTE MODULE POINTER
<i>Environmental Responsibility</i>	
5.2 Conservation of the environment	<ul style="list-style-type: none"> • Recognises the need for waste reduction. • Works towards reducing waste at school, home or within the community. • Shows care when dealing with any living creatures (eg. in compost).
5.3 Sustainable development	<ul style="list-style-type: none"> • Awareness of conserving resources for future generations. • Participates in classroom / school waste reduction behaviours.

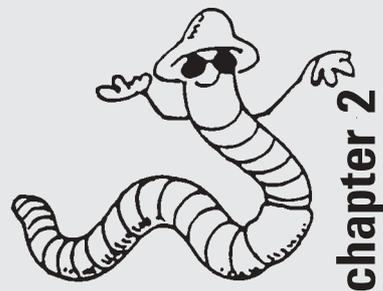
THERE ARE MANY WAYS TO DEVELOP
UNITS OF WORK AROUND THE TOPIC
OF WASTE AND LITTER. THIS CHAPTER
CONTAINS A PROCESS FOR
DEVELOPING A COMPLETE PROGRAM,
AS WELL AS TWO SAMPLE UNITS OF
WORK ON WASTE AND LITTER.

ONE OF THESE UNITS WAS
DEVELOPED AND USED OVER SEVERAL
YEARS BY EXPERIENCED TEACHERS.

THE SECOND WAS DEVELOPED BY
EDUCATORS AT THE GOULD LEAGUE
AND USED BY OTHER TEACHERS IN
SCHOOLS. USE THE UNITS AS

EXAMPLES OF HOW TO DEVELOP
YOUR OWN UNITS FOR
YOUR CLASSES.

2



Planning



Developing a Program of Work for Years P–10 on Waste

This section describes in some detail how to develop a sequential program on waste for Years P–10, so that students do not study the same old topic in the same way, year after year. However, the process described in this chapter could be used equally well to develop single units of work for a particular level.

Introduction

This strategy for writing a comprehensive and sequential program on ‘waste’ for schools was developed by:

- John Laffin (Earthcare Education)
- Pat Armstrong (Gould League of Victoria), and
- Maria Ramsden (Bimbadeen Heights Primary School).

The proforma planner was adapted from one devised by Jan Hayes of Fyansford Primary School, with assistance from Kath Murdoch. While this material is copyright, teachers are welcome to photocopy any of the sheets for the purposes of developing a unit on ‘waste’ for their school.

How to Use the Materials

This set contains the following:

- Some Key Organising Concepts
- Some Key Skills
- Some Key Understandings (from *Waste Matters*, Gould League)
- Overview for Years P–6 Program: ‘Waste’
- Overview for Years 7–10 Program: ‘Waste’
- Sample Unit Planner for Years P–6: ‘Waste’
- Sample Unit Planner for Years 7–10: ‘Waste’
- Sample Units for Level 3, Level 5 and Levels 5–7

Years P–6

There are eleven subtopics listed in the overview. As each subtopic can be considered at each of the three levels (junior, middle and senior), this program has effectively thirty-three modules (units) of work. A planner can be prepared for each of these units, using the lists of understandings, skills, concepts and resources provided. Activities can either be devised by staff at each level or selected from the resources list. It is recommended that schools use an integrated approach to each unit. The set of thirty-three planner forms will provide a school with a customised program on ‘Waste’. The units can be linked to the Curriculum Framework by listing the appropriate Learning Areas, Strands and Learning Outcomes.

Years 7–10

Eleven subtopics are listed in the overview. As each subtopic can be considered at each of the two levels (7–8 and 9–10), this program has effectively twenty-two modules (units) of work. A planner can be prepared for each of these units, using the lists of understandings, skills, concepts and resources provided. Activities can be devised from small group discussions or selected from the resources listed below. The set of twenty-two planner forms will provide a school with a customised program on waste. The units can be linked to the Curriculum Framework by listing the appropriate Key Learning Areas, Strands and Learning Outcomes.

Some Key Concepts

atmosphere	cycles	habitat	recycling
authority	decision making	humus	renewability
bacteria	deforestation	inter-relationships	resources
behaviour	degradability	interdependence	responsibilities
biodegradable	demand	location	rights
causation	distance	magnetism	society
change	distribution	micro-organisms	soil
combustion	diversity	minerals	state
communication/media	endangered species	mulching	supply
compost	energy	needs	sustainability
composting	environment	ozone	technology
condensation	evaporation	photosynthesis	temperature
conflict	food chains/webs	pollution	toxic chemicals
consumption	fungi	power	tradition
cooperation	gases	pressure group	transpiration
culture	greenhouse effect	production	values

Some Key Skills

actively listening	empathising	making decisions	reporting (oral and written)
clarifying values	gathering data	observing	representing data
classifying	gathering information	predicting	solving problems
cooperating	imagining	presenting a point of view	taking action
comparing	interpreting data	questioning	using factual texts as
creating	logical thinking	recording	references

Murdoch, K., 1992, *Integrating Naturally: Units of Work for Environmental Education*, Dellasta.

Some Key Understandings

- We all produce waste materials.
- We need to think before we throw something in the rubbish bin.
- Some materials decay naturally and fairly quickly; some do not.
- Domestic and school waste materials can be classified, according to composition, as organic or manufactured (paper, metal, glass, plastic, composite). However, we should not overlook other domestic waste such as chemicals, rubble, branches, clothing and toys.
- People in different places produce different kinds of rubbish.
- We are producing more rubbish today than in earlier times.
- It costs money to collect and dispose of rubbish.
- Rubbish is disposed of mainly to landfill sites (tips).
- In many cities and towns, the available tipping space is rapidly declining. Other methods of disposing of rubbish, such as incinerators, can be very expensive.
- It is increasingly difficult to find suitable new landfill sites.
- If people discard less waste, then landfill sites will last longer.
- Some materials can be composted; some



can be reused for the same or a different purpose; and some can be recycled into the same or a different product.

- We can all manage and reduce the waste that we produce by recognising and understanding the composition of waste materials, by separating different kinds of waste according to its composition, by composting and reusing products or returning them for recycling.
- Much of our waste comes from packaging.
- Although modern packaging brings many advantages, the packages can create problems when they are thrown away. Packaging as litter can look ugly and harm people and wildlife. Packaging as rubbish takes up valuable landfill space.
- We can reduce the waste problem by choosing products in large sizes, in bulk, with the least amount of packaging,

with packaging that can be reused or recycled, and with packaging that is made all or in part from recycled materials.

- Much of our waste comes from goods that can be described as ‘short-term use/long-term rubbish’.
- We can all reduce our rubbish by using fewer disposable items and by buying goods that are designed to last.
- The materials used in manufactured goods are derived from renewable and non-renewable resources.
- The extraction and processing of the resources used in making everyday products consumes energy and can also led to environmental damage.
- Minimising waste can save resources, conserve energy and reduce environmental degradation.
- Composting, reducing, reusing and recycling are examples of ‘act locally, think globally’.

Overview for P-6 Program: ‘Waste’

TOPIC AND SUBTOPIC	JUNIOR PRIMARY SCHOOL EMPHASIS	MIDDLE PRIMARY HOME EMPHASIS	SENIOR PRIMARY LOCAL COMMUNITY EMPHASIS
LEVELS:	USE JUDGING GUIDES TO DETERMINE STUDENT LEVEL OF ACHIEVEMENT		

1. WHAT IS WASTE?

Types	<p>What is in our classroom rubbish bin?</p> <p>Classify contents as:</p> <ul style="list-style-type: none"> • paper • drink containers • food wrappers. <p>What other sorts of waste are collected at our school? e.g. aluminium cans.</p> <p>Properties of various materials used in packaging.</p>	<p>Types of waste accumulated at home:</p> <ul style="list-style-type: none"> • food and garden waste • packaging (metal, plastic, paper, glass, mixed) • paper and cardboard (including newspaper and junk mail) • kitchen and laundry waste • sewage • discarded clothing, tools • tags, household appliances. 	<p>What type of waste is produced by the community?</p> <ul style="list-style-type: none"> • kitchen/laundry waste • sewage • air pollutants • packaging • food and garden waste • clothing • toys, appliances, car parts, tools • batteries • building • toxic • radioactive.
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TOPIC AND SUBTOPIC	JUNIOR PRIMARY SCHOOL EMPHASIS	MIDDLE PRIMARY HOME EMPHASIS	SENIOR PRIMARY LOCAL COMMUNITY EMPHASIS
Sources	Where do these items come from? <ul style="list-style-type: none"> canteen home. 	Trace types back to source, e.g. shops, sunlight. Processes involved in producing the things we use.	Sources: <ul style="list-style-type: none"> shops homes schools factories offices, hospitals sportsgrounds public places.
Quantities	How much rubbish is in our room today/for the week? (How many bins?)	How much does our family throw out per week/month/year? (Include recyclables, compost and rubbish.)	Shire/city statistics – population, participation rates, volumes of garbage, composition – changes over time.
Destination	Where does the waste go? e.g. Our room: <ul style="list-style-type: none"> compost rubbish paper recycling. Who collects these? How often?	Where does the waste from home go? <ul style="list-style-type: none"> landfill site sewerage system recycling depot. 	Where does the local waste go? <ul style="list-style-type: none"> recycling factories/depots mulch/compost landfill site sea air.

2. PROBLEM SOLVING

Composting	Decomposition of food from the class bin/compost bucket. List living and non-living things in a compost bin. The needs of living things in a compost bin. Lifecycle of a compost worm. Simple examples of adaptations of compost creatures.	How to compost. Survey of home composting. Life cycles in compost bins. Simple classification of the creatures in a compost heap. Diversity of life in a compost heap.	Science of composting: <ul style="list-style-type: none"> ideal conditions requirements temperature changes life in compost – micro-organisms and invertebrates, including earthworms. Population growth of worms in worm farm.
Reduce	How goods are packaged. Materials used in packaging.	Analysis of home garbage. Classifying packaging. Benefits of packaging. Problems of packaging.	History of packaging and shopping practices. Ways to reduce waste by shopping carefully.
Reuse	Reuse materials/objects where possible without buying new ones. What materials are used in craft/art at school?	Reuse materials/objects where possible without buying new ones. Reuse in the home: toys, clothing, plastic bags, jars, etc.	Reuse materials/objects where possible without buying new ones. Attitudes to reuse. Fashion. Peer group pressures. Lifestyles. Convenience.



TOPIC AND SUBTOPIC	JUNIOR PRIMARY SCHOOL EMPHASIS	MIDDLE PRIMARY HOME EMPHASIS	SENIOR PRIMARY LOCAL COMMUNITY EMPHASIS
Recycle	Cycles e.g. water. What do we collect for recycling at school?	What do we recycle at home? Stages in recycling: 1. buy from shops 2. sorting at home 3. collection 4. return to factory 5. remade into new goods 6. deliver to shops.	Technology of recycling. Local community statistics on recycling. People's attitudes to recycling. Papermaking. Uses for recycled products, e.g. insulation.

3. ISSUES ABOUT WASTE

Disposal	Why do we need to have rubbish collected from our classroom? <ul style="list-style-type: none"> tidiness hygiene (smell, germs). Setting up three-bin system in classroom – food scraps for compost, paper for recycling, rubbish.	Why do we need a rubbish collection system for homes? <ul style="list-style-type: none"> large volumes some items do not decay (cannot bury/compost) some items are not recyclable problems of rubbish – smells, disease, attract vermin. History of local garbage collection.	Survey of local people about their attitudes to their city/shire's waste and recycling services. Research into the total cost of garbage disposal in the city/shire. How decisions are made about local waste and recycling services.
Litter	Litter in the school. Problems caused by litter at school. Identifying the problem areas. Classifying litter.	Compare litter in several locations over time: <ul style="list-style-type: none"> school (various places) shops streets surrounding school. The problems this litter creates. Why is the litter in each place? How can it be reduced? Litter pathways.	Problems of litter, especially the effects on organisms in different environments. Rates of decay of different types of litter. How can we reduce littering? e.g. rules, fines. Attitudes of people to littering.
Energy and resources	Needs and wants. Classifying materials: glass, paper, metal, plastic, food.	What are materials made from? Comparison of renewable and non-renewable resources. Flows of packaging products from producer to consumer.	Renewable and non-renewable resources. Manufacture of materials used in packaging. Burning of landfill gas for electricity. Use of old car tyres as a fuel source for cement kilns.

Overview for Years 7–10 Program: ‘Waste’

TOPIC AND SUBTOPIC	JUNIOR SECONDARY LOCAL AND STATE EMPHASIS	MIDDLE SECONDARY NATIONAL/GLOBAL EMPHASIS
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1. WHAT IS WASTE?

Types	<p>What type of waste is produced by the State?</p> <ul style="list-style-type: none"> • domestic • commercial • building • industrial • medical • toxic • radioactive. 	<p>Comparison of waste in Australia and other countries:</p> <ul style="list-style-type: none"> • domestic • commercial • building • industrial • medical • toxic • radioactive.
Sources	Trace types back to sources.	Relate types of waste with standard of living (GNP, etc.).
Quantities	Statistics – cities, urban areas, participation rates, weight/volumes of garbage over time.	Statistics – comparison of statistics for Australia and several developed/developing countries.
Destination	<p>How is the State’s waste disposed?</p> <ul style="list-style-type: none"> • landfill • recycling • incineration • litter • composting/vermiculture. 	<p>Comparison of disposal methods of several developed/developing countries.</p> <p>The impacts of these methods on the environment.</p> <p>Economics of different disposal methods.</p>

2. PROBLEM SOLVING

Composting	<p>Best conditions for composting.</p> <p>School management of composting.</p> <p>Types of composting in the State – backyard, commercial, worm farms.</p> <p>Classification of compost creatures.</p>	<p>Comparison of large-scale composting and vermiculture in Australia and overseas – reasons for any differences.</p> <p>Role of living things in the composting process.</p> <p>Flow of energy and materials during composting.</p>
Reduce	<p>Survey of shoppers practices.</p> <p>Packaging design.</p> <p>Contribution of packaging to household garbage.</p>	Comparison of packaging and shopping practices between developed countries and developing countries.
Reuse	<p>Investigation of the secondhand trade in the State:</p> <ul style="list-style-type: none"> • opportunity shops • secondhand shops • garage sales • advertised secondhand goods. 	Economics of reuse versus recycling for certain goods, e.g. milk bottles.



TOPIC AND SUBTOPIC	JUNIOR SECONDARY LOCAL AND STATE EMPHASIS	MIDDLE SECONDARY NATIONAL/GLOBAL EMPHASIS
Recycle	<p>Products collected for recycling from:</p> <ul style="list-style-type: none"> • industry • commerce • homes • shops • hospitals • leisure and sports venues. <p>Technology of recycling different materials.</p>	<p>Economics of recycling.</p> <p>International trade in items collected for recycling.</p> <p>Ethics involved in this trade, e.g. sale of car batteries to Asian countries.</p> <p>New products made from recycled materials.</p> <p>Impacts of recycling on the environment.</p>

3. ISSUES ABOUT WASTE

Disposal	<p>Field trips to one or more of:</p> <ul style="list-style-type: none"> • sanitary landfill site • materials recovery facility (MRF) • large-scale composting facility • recycling factory. <p>State legislation regarding waste management.</p>	<p>Problems associated with sanitary landfill:</p> <ul style="list-style-type: none"> • landfill gas • leachate • litter • noise • smells. <p>Advantages and disadvantages of deposit legislation.</p> <p>Alternative technologies of waste disposal, e.g. incineration, pyrolysis.</p> <p>Differences between the States regarding legislation in waste management.</p>
Litter	<p>Analysis of school's litter – amount, composition and sources.</p> <p>Composition of the State's litter – land-based and water-based.</p> <p>Impact of litter on marine life in Port Phillip Bay.</p> <p>State campaigns to reduce littering.</p>	<p>Litter in the marine environment:</p> <ul style="list-style-type: none"> • types • sources • problems • possible solutions. <p>Degradability of different materials found as litter.</p> <p>Effectiveness of national campaigns to clean up litter.</p>
Energy and resources	<p>Comparison of different drink containers – raw materials, waste produced, energy consumption, materials and energy saving during recycling.</p> <p>Logging of native forests for the purpose of paper production.</p>	<p>Relationships between population size, garbage production and resource consumption in different countries.</p> <p>Renewable and non-renewable resources – adequacy of resources.</p> <p>The environmental recycling, energy and the greenhouse effect.</p> <p>Drink containers, energy and carbon dioxide.</p> <p>Landfill gas as an energy source.</p> <p>Resources used in packaging.</p>

Sample Unit Planner for Years P–6: 'Waste'

- **Topic:** Problem Solving
- **Subtopic:** Composting
- **Level:** Use Judging Guide

Key Understandings

- Composting is the controlled breakdown of organic materials under ideal conditions of moisture, nutrients and oxygen.
- Micro-organisms (bacteria and fungi) are chiefly responsible for the breakdown of food and garden waste in a compost bin. Small invertebrates complete the process.
- A food web exists in a compost bin.

Key Concepts

Decomposition, change, microorganisms, invertebrates, compost, production, food chains/webs.

Key Skills

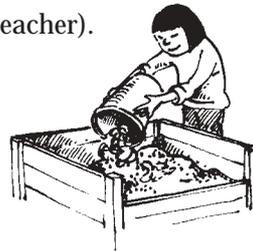
Gathering information, using factual texts as references, solving problems, predicting, taking action, classifying, reporting (oral and written), gathering data, interpreting data, observing, recording.

Key Resources

- Armstrong, P. and Laffin, J., 1993, *Waste Matters: Environmental Education Activities About Waste*, Gould League.
- Environment Protection Authority, *Down to Earth* (video).

Other details that could be included:

- monitoring and assessment procedures (students)
- evaluation (teacher).





Sample Unit Planner – Sequence of Activities

■ Planning through an inquiry-based, integrated curriculum

1. Tuning in

- **S&E: Time, Continuity & Change**

- Show students a plastic bottle full of food scraps and grass clippings. Cover with soil and seal the container. Ask students to predict what will happen and how long this might take.
- Record changes over time.
- Display examples of rotting fruits.
- Discuss what might be taking place.

2. Preparing to Find Out

- **Science: Life & Living**

- What do we know about compost?
- What are decomposers? – group discussion.
- What materials can/cannot be composted? Students draw a compost wheel – things that can be composted, things that cannot be composted, things that live in compost heaps.
- What do we want to find out about composting? – lists.

3. Finding Out

Shared Experiences

- **Science: Life & Living**
- **S&E: Natural and Social Systems**

- 'Mouldy oldies', *Waste Matters*, p. 49.
- 'Decomposition in a carton', *Waste Matters*, p. 48.
- 'Bottled compost', *Waste Matters*, p. 52.
- 'Compost, it's alive', *Waste Matters*, p. 55.
- 'At home with compost', *Waste Matters*, p. 57.
- Interviews with parents/grandparents – How did you get rid of food scraps and garden waste in the 'old days'?

4. Processing

Sorting Out

- **The Arts: Drama, Visual Arts**
- **Maths:**
- **Chance & Data**

- Art – compost heap mural, compost creatures, costumes for compost theatre.
- Language – poetry, scripts for drama, reports of experiments.
- Drama – life in a compost heap – compost theatre.
- Maths – graph results of home composting survey.
- Science – posters oral/written reports of experiments, diagrams.

5. Making Connections

- **Science: Life & Living**

- Students complete concept map with 'composting' as a central word.
- Students write the statement: 'What we know about composting.' Compare statements with original questions.
- Students draw a food web of the compost heap.

6. Taking Action

- **Values: Active Citizenship**
- **English: Writing**

- Design a brochure about how to compost.
- Start a school compost bin.
- Design posters about composting. Display these around the room and at local shopping centres.
- Perform compost theatre to other classes/parents.

Based on Murdoch, K., 1992, *Integrating Naturally: Units of Work for Environmental Education*, Dellasta.

Sample Unit Planner for Years 7–10: 'Waste'

(By Angela Jenkins of Deakin University)

- **Topic:** What is Waste?
- **Subtopics:** Types, Sources, Quantities, Destination
- **Levels:** Use Judging Guides

YEAR	SEMESTER	KEY LEARNING AREA	STRAND/SUBSTRAND
1997	1	Science	Life and living: Living together

CURRICULUM FOCUS	LEARNING OUTCOMES	EVIDENCE DEMONSTRATING ACHIEVEMENT
<p>Developing students' ideas and skills about the topic of waste, and encouraging them to act upon their findings, which may include:</p> <ul style="list-style-type: none"> • joining a group/organisation • participating in a class presentation/display to the local community • setting up a waste management program in their own home or school, and • approaching the local council. 	<p>Level 5 Explain the effects of various environmental changes on living things in ecosystems.</p> <p>Level 6 Explain the role of living things in the cycling of matter and flow of energy in an ecosystem.</p>	<p>Students are able to explain the basic effects that waste has when introduced into an environment, taking in effects on both plants and animals, i.e. sewage affecting marine life.</p> <p>Students are able to simulate the breakdown of organic material in a compost of household waste.</p>

TEACHING AND LEARNING ACTIVITIES

TEACHER	STUDENTS	TIME
<p>Lesson 1: Tuning in The teacher prepares a questionnaire for students to fill out to explore what the students already know about the topic of waste, e.g. what is waste? (See inquiry model.)</p>	Fill out the questionnaire by themselves.	10 minutes
Class discussion about content of questionnaire, led by teacher.	Participate in class discussion, sharing ideas.	10–15 minutes
Show video relating to waste topic.	Watch the video, taking notes if required.	20 minutes
Encourage informal discussion.	Discuss the video and what it is saying with class mates or the entire class.	5 minutes

2



TEACHER	STUDENTS	TIME
<p>Lesson 2: Establish a Subtopic</p> <p>Teacher brings to class magazines and other relevant media (newspaper articles) with large coloured cardboard for poster making.</p>	<p>Students organise themselves into groups of about four, choose a subtopic i.e. litter or industrial waste, and create a poster with pictures and articles on the effects of their subtopic on the environment.</p>	<p>30–35 minutes</p>
<p>Every 10 minutes, teacher heads discussion of different groups, to check on progress, also gives students an opportunity to share what they are learning.</p>	<p>Students work in their groups and every 10 minutes report to the rest of the class what they have discovered and how they have progressed on their poster.</p>	<p>5 minutes within the above 35 minutes</p>
<p>Teacher sets the posters to be finished in the next lesson.</p>		
<p>Lesson 3: Considering Social Action</p> <p>The teacher hands out lists of different environmental community groups.</p>		
<p>The teacher writes on white/black board as students brainstorm ideas for action within their own school.</p>	<p>Students brainstorm waste matters within the school that are developed issues or should be developed into action plans.</p>	<p>10 minutes</p>
<p>The teacher divides class into four groups, each having a different issue at the school. Generates discussion by going to each group, suggesting ideas as to how action can be accomplished.</p>	<p>Students discuss with each other the possible action to take and the resources needed to carry it out.</p>	<p>10 minutes</p>
<p>The teacher brings class back together to discuss any possible opposition to suggested programs and why.</p>	<p>Students again brainstorm and discuss as a class any reason for not being able to reach any goals set for improving a waste matter at their school.</p>	<p>5 minutes</p>
<p>On the board the teacher goes over the basics of writing an official letter.</p>	<p>Students write letters to those they think may object to their setting up of waste programs.</p>	<p>25 minutes</p>
<p>The best letter from each subtopic is voted on by the students and sent to the addressed place, i.e. the school council.</p>	<p>Students vote on the best letters, the remaining ones are displayed with the posters around the room.</p>	

As a follow up to these three lessons, (and perhaps more) teachers are encouraged to organise with students a display of this topic in a large room, and produce an information night for parents and members of the local community. This would give the students the chance to talk about what they have learned, and display the work and

program initiation they have achieved, and the benefits from these.

This could be used as a topic review.

Assessment for this unit will comprise of a mark for students' posters and letters and the rest will be established from class participation (or lack thereof).

A Middle Schooling Approach to Waste Minimisation

Description

This module aims to promote understanding of what waste is and how waste production can be minimised by reducing, reusing and recycling household materials. Students will also be encouraged to consider the economic and environmental benefits of these processes. This outline is written for students in Years 7-9, but it can be adapted for use across the Primary and Secondary years.

Rationale

To enable students to develop their ideas and skills about the topic of waste and to encourage them to act upon their findings.

Assessments

Will vary depending on each Learning Area but overall there will be one integrated task where students will be expected to create an information brochure aimed at reducing waste in the average household and/or school.

- Major Integrated Task
 - Background information on what waste is, where it goes and what can be done about it (Society & Environment).
 - Waste audit including graphical information (Mathematics).
 - Instructions on composting including results from investigations, information on compost systems and environmental benefits of composting green waste (Science).
 - Creative Writing piece on trip to the tip (English).

- Product made from recycled materials (Technology and Enterprise).
- Anti-littering poster in target language (LOTE).
- Healthy, litter free lunch (Health & Physical Education).
- Waste minimisation murals (Arts).

Strategies and Resources

Waste Wise Schools Kit

Activities/Excursions

Make recycled paper or note pads from one-sided paper
Student organised litter-free lunch or recycling poster competition
Visit a waste transfer station, landfill site or recycling business, eg. Red Hill landfill or Cleanaway Materials Recovery Facility
Visit The Homestead at Perth Zoo
Guest speakers including staff from Local Councils, the recycling industry or environmental organisations.



ENGLISH	S&E	SCIENCE	MATHS
<ul style="list-style-type: none"> • Read and analyse 'Spaceship Earth' (<i>Reading</i>). • Describe a trip to the tip in terms of smells, sounds, feelings (<i>Writing</i>). • Letters to local council about waste issues (<i>W</i>). • Advertisements that rely on packaging (<i>Viewing</i>). • Perform a play on waste issues (<i>Speaking & Listening</i>). • Interview other students or key personnel regarding waste (<i>S&L</i>). • Consider the saying 'waste not want not' for meaning (<i>R</i>). • Compare different written text about waste (<i>W</i>). 	<ul style="list-style-type: none"> • Explain how people's use of natural and human environments change over time (<i>Time, Continuity & Change</i>). • Describe grandparents' lifestyle in relation to disposable products (<i>TC&C</i>). • Examine newspapers and other media that have dealt with waste issues (<i>Place & Space</i>). • Conduct a waste audit (<i>Resources</i>). • Where does waste go in the local area? (<i>R</i>). • Role play scenario about waste management decision making in local councils (<i>Natural & Social Systems</i>). 	<ul style="list-style-type: none"> • Introduction to Waste. • Litter survey (<i>Natural & Processed Materials</i>). • Analyse the properties and uses of different materials in a rubbish bin (<i>N&PM</i>). • Effect of litter on environment: impact on natural organisms (<i>Life & Living</i>). • Composting: significance of decomposition. Investigating compost creatures, creating own compost (<i>L&L</i>). • Bottled science activities such as making terrariums from PET bottles (<i>L&L</i>). • 3RS: related to school practices and community. 	<ul style="list-style-type: none"> • Litter Mapping of school and graph results (<i>Measurement & Space</i>). • Estimating weight of packaging (<i>M</i>). • Using waste data, draw a sector graph (<i>M</i>). • Composting activity involving fractions and %s (<i>Number</i>). • Worm farms: calculating volumes etc (<i>N, M</i>). • Biodiversity: counting, recording, graphing (<i>M</i>). • Waste usage activities (<i>N, M</i>). • Audits (<i>Algebra, Chance & Data, N</i>). <p><i>Activities from Footprints Project "Waste Less" by EcoRecycle Victoria, 1998.</i></p>
LOTE	ARTS	HEALTH & PHYS ED.	TECHNOLOGY
<ul style="list-style-type: none"> • Activities on shopping and waste in target language. • Activities on seasons and wastes in target language. • Comparisons between the ways different countries dispose of waste, impact on environment, recycling practices, general attitudes to waste, lifestyle in terms of waste. 	<ul style="list-style-type: none"> • Design anti-littering posters (<i>Communication Art Ideas</i>). • Decomposition in a cartoon. • Create a video of waste minimisation practices at school (<i>Using Art Skills, Techniques, Technologies & Processes</i>). • Compost heap mural (<i>UASTT&P</i>). • Drama and costumes design and manufacture on 'life in a compost heap' or 'being a litter buster' (<i>UASTT&P</i>). 	<ul style="list-style-type: none"> • Survey students at school regarding attitude to litter (<i>Attitudes & Values</i>). • Examine food packaging in relation to litter/ packaging and quality of food (<i>Concepts for a Healthy Lifestyle</i>). • Work with canteen on ways to reduce waste from food (<i>Interpersonal Skills</i>). • Design a healthy lunch meal with packaging than can be recycled or reused (<i>CHL</i>). 	<ul style="list-style-type: none"> • Case study of recycling businesses (<i>Technology in Society</i>). • Ideas for small business that have a 3Rs theme eg. T-shirts with littering slogan, compost or worm farming business (<i>Enterprise</i>). • Investigate the developments in machinery used for sorting materials collected for recycling at kerbside (<i>Technology in Society</i>). • Collect suitable recycled material to design and make a useful item (<i>Materials</i>).

Sample Units

Sample Unit 1: Reduce, Reuse, Recycle, Refuse

A unit of work for Year 3,
at Blackrock Primary School.
Provided by Anne Lundgren.

Judging guides will help determine level of achievement.

- 1. What happens to our rubbish at home?**
– survey, discussion, conclusions.
Assess: Completed survey.
- 2. The rubbish in my life* record sheet** – survey sheet to be completed at home for collation and discussion.
Assess: Completed survey sheet, involvement in discussion.
- 3. Lunchbox leftovers*** – activity sheet to isolate those items that can be reused, recycled or composted.
Assess: Completed worksheet.
- 4. My rotting experiment**** – experiment record sheet, discussion and conclusion.
Assess: Completed record sheet.
- 5. I am already doing these things to reduce, reuse, recycle** – worksheet.
- 6. Composting in a bottle** – observation of changes over time.
- 7. Rubbish sorting** – collect ten pieces of rubbish in the school ground, sort into groups, draw a graph to show what was found.
Assess: Completed graph.
- 8. Where is the most rubbish in the school?** – specific areas tallied, graph drawn, conclusions reached.
Assess: Tally graph and findings.
- 9. What's in the garbage bin?** – activity sheet with related questions.
Assess: Completed sheet, answers to related questions.
- 10. Where does our litter go?** – activity sheet to show how much litter finishes up in our waterways and the sea.
- 11. Waste or save?** – activity sheet focusing on ways to conserve energy rather than wasting it.
Assess: Completed sheet.
- 12. Saving energy in the home** – worksheet.
Assess: Completed worksheet.
- 13. Compost song** – singing.
- 14. Lester and Clyde** reading of story, answering of questions, general discussion.
Assess: Involvement in discussions.
- 15. Needs and wants** – what is the difference? How can limited resources affect choices being made? List some examples of essential needs and wants. Which resources are renewable or non-renewable? What could we do to limit the use of resources?



* from Armstrong, P. and Laffin, J., 1993, Waste Matters: Environmental Education Activities About Waste, Gould League.

** from Reduce, Reuse, Recycle, Gould League Teacher's Package.

Sample Unit 2: School Litter Busters

By Pat Armstrong and Bob Winters
Gould League of Victoria

A program to help reduce litter and waste in schools.

Research into Student Littering

Litter has been an ongoing problem for schools and the community at large for decades. Schools have tried many strategies to deal with school littering with varying degrees of success.

However, before a school can develop truly effective strategies, they need to know why students litter in the first place and conversely why they don't litter. While there has been some research conducted on why people in general litter, there appears to have been very little, if any, research on school littering.

Some recent research, carried out by Socio-environmental Assessment and Policy students from RMIT in Melbourne, has shed some light on school littering. The research was carried out by two students, Sonia Van Klaveren and Mandy Verdon, and coordinated by the Gould League of Victoria. The research was funded by the Litter and Recycling Research Association of NSW.

In this project, students from four postprimary schools in the Melbourne metropolitan area were asked to complete a structured questionnaire that included questions concerning the effect of litter reduction programs, the school environment and students' attitudes towards litter. In addition, observational data and interviews with a staff member were undertaken at each of the four schools.

The study was limited by the small number of schools selected and the narrowness of the type of schools surveyed (i.e. Melbourne postprimary schools).

Some of the key conclusions in this limited study were that:

- Most students do not take responsibility for their littering actions. 78 per cent of students reported littering sometimes or often.
- Surprisingly, there was a weak link between students' concern for environmental matters and their self-reported frequency of littering at school.
- When provided with incentives, students were more eager to pick up litter in the school yard, but they still had to be asked. Yard duty and picking up litter for punishment did not seem to reduce littering in schools. Students, in general, did not believe that yard duty deterred other students from littering.
- The main reasons students gave why other students litter were: insufficient bins, laziness and did not care. The main reasons students gave why other students did not litter were: it spoils the place, fear of punishment and it is wrong.
- There is little evidence to suggest that littering is related to rebelliousness or peer group pressure.
- The canteen was the main source of litter.
- There was little, if any, litter education in the schools studied.

School Litter Busters

One of the more interesting results of the research was that there was only a weak link between students' concern for environmental matters and their self-reported littering behaviour. 76 per cent of students who reported some degree of concern for environmental matters reported that they often or sometimes littered. This suggests that concern for environmental matters does not necessarily lead to less student littering. Many students, it seems, while they are concerned about the

environment, do not see that by dropping litter themselves, they are contributing to a major environmental problem.

The purpose of the School Litter Busters Program is to help create stronger links in students' minds between student littering and minimising school waste in general with concern and care for the environment.

The program provides strategies that will help reduce littering in schools as well encouraging the removal of litter from the school grounds.

In this unit, you will find:

- a checklist for reducing litter in schools
- some steps to assist schools to set up a School Litter Busters Program
- activities and worksheets to help students understand the concepts of decomposition of materials and to analyse the distribution of litter in the school
- a litter questionnaire (a similar one was used in the research discussed on page 57)
- a guide to how litter reduction education programs relate to the Curriculum and Standards Framework.

Steps in Setting Up School Litter Busters

1. Some Introductory Activities

Include education about littering and the effects of littering on the environment in the curriculum. A simple introductory activity, 'Rotten Litter' on page 59, looks at the decomposition rates of some common materials.

As part of geography, science or environmental studies (or even better as a cross-curriculum study) have the students investigate the extent of littering in the school, the composition of the litter, the sources of the litter and the distribution of the litter. The activity 'Litter at school' on page 60 provides a technique for investigating litter in the school and gives a convenient record sheet.

2. Research

- Have the students investigate if the school has a school litter policy.
- Have the students design and conduct a survey on the attitudes of students towards littering and the reported frequency of littering. A sample questionnaire can be found on pages 62–63. The data can be collated manually or with a suitable computer software package and the results expressed graphically. These results should serve as a benchmark for comparing the results of future surveys.

3. Develop a School Litter Plan

Involve the students in a process to develop a school litter reduction plan. A checklist to assist schools can be found on page 43 of *The Waste Wise Way* in the Waste Wise Schools Kit.

4. Take Action

Together with the students implement the school litter plan.

5. Monitoring

- Have the student repeat the sampling of litter on a regular basis to assess the effectiveness of the school's plan. Publicise any reductions in the amount of litter in the school. Modify the school's litter plan if necessary.
- At least once (say after three months) after the implementation of the litter reduction plan, have the students repeat the students' litter survey so that they can identify whether or not the new plan has led to changes in the attitudes of the students towards litter and their reported frequency of littering.



A Guide to Reducing Litter in Schools – a Checklist

Refer to the checklist in *The Waste Wise Way: Savings, Benefits and School Operating Practices*, p. 43.

Rotten litter

Years 5 - 8

Students conduct experiments to determine the different rates of decay of various litter items.

The different materials found in litter break down at different rates. *Biodegradable* materials, such as foods, may be broken down in a few weeks. Other materials that are not biodegradable, for example plastic, might start to degrade under the action of the elements — sunlight, air, water — but this could take many years. The rate at which different materials break down also depends on whether they are on land or in water.

This activity requires:

- four sets of common litter objects chosen from:
 - plastic (bottle, straw, pen, foam cup, bag)
 - metal (aluminium can, aluminium foil, tinned can)
 - paper (sheet cardboard)
 - glass (bottle)
 - food (orange peel, crust of bread, apple core)
 - mixed materials (milk carton)
 - rubber band
 - cloth
- two aquaria (medium size), pond water, soil, pond plants and animals, chicken wire or seedling guard
- a large tray
- a frame of chicken wire or a seedling guard (about 60cm x 30cm x 10cm)

1. Place a set of litter objects in four locations:

- on a tray in a dark cupboard as a control;
- under a frame of chicken wire or a seedling guard on a garden bed that receives some sunlight and rain. The frame or seedling guard prevents the lighter objects from blowing away and animals from disturbing the experiment;
- in an aquarium with tap water; and
- in an aquarium set up as a small pond.

2. For at least three months, record weekly the changes to each of the objects in the four experiments. Look for changes in size, color or shape, and for evidence that it has been chewed or has mould growing on it. At the end of this time compare the four sets of results.

- Did some materials change more outdoors than inside the cupboard?
- Were there differences in the way some materials changed in tap water compared with the pond environment? Explain.
- Could some types of litter cause more problems to people and the environment than others? Explain.



Armstrong, P and J. Laffin, 1993, *Waste Matters: Environmental Education Activities About Waste*, Gould League of Victoria, p. 19.

Litter at school

Years 7 - 10

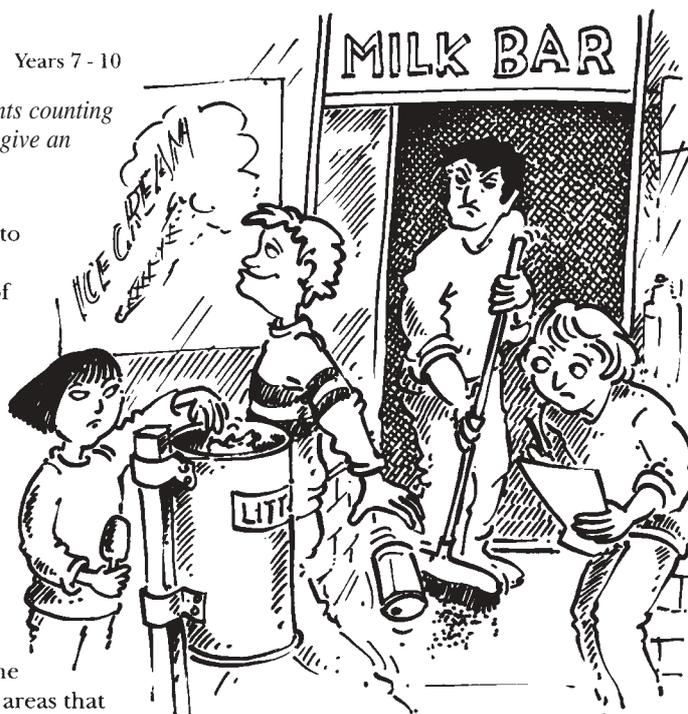
A sampling activity which involves students counting the litter in a number of sample areas to give an

It would be very time-consuming to count and classify all the items of litter present in an area the size of your school. It is far quicker to use a sampling technique to give an indication of the total picture.

For this survey students will need:

- a plastic or wooden hoop (about one metre in diameter),
- a record sheet (see page 21)
- a plan of the school buildings and grounds.

1. Assess the amount of litter in the school ground and choose five areas that appear to have the most litter.
2. Each of five groups studies one of the five selected areas. One person in the group stands in the centre of the study area and flings the hoop a few metres in any direction. All the litter contained within the hoop, including all objects that lie under the hoop itself, is classified, counted and recorded. This sampling process is repeated twice.
3. For the three sample areas, calculate the total number of objects in each category and the total number of objects, as well as the percentage of each litter type for each study area. Count the number of rubbish bins in the group area and mark their positions on the plan.
 - What was the most common litter type and what were the three most common litter objects?
 - Were there sufficient rubbish bins and were they in positions that made it easy for students to use?
4. All groups compare the results of the five study areas. Based on this litter survey, prepare an action plan that will help to



reduce the amount of litter in the school. This is shared with the rest of the school.

5. Conduct a litter count at several places outside the school. Try the footpath outside a milk-bar, a car park at a shopping centre, or a public park.
 - How do the composition and amount of litter at the site compare with that at the school?
 - Where do you think most of the litter objects at the site have come from originally?
 - Will more litter bins and recycling bins help to stop people from littering?
 - What else is needed?
6. Show the results to the local council and discuss possible solutions to the litter problem with the council officers.
7. Obtain a local map showing the stormwater drainage system. Mark on this map the pathway of stormwater (and litter) to the nearest waterway from: your home, the local milk bar, the school and the local shopping centre.



rd sheet

Litter at school record sheet

Description of study area: Type of litter	No. of items at site			Type of litter	No. of items at three sites			Percentage of all items
	1	2	3		1	2	3	
PAPER				METAL				
Boxes				Aluminium foil				
Bags				Aluminium cans				
Newspapers				Tin cans				
Magazines				Other				
Writing paper				Total metal items				
Photocopy paper				FOOD				
Envelopes				Pastry				
Take-away containers				Cakes/biscuits				
Other				Fruit/vegetables				
Total paper items				Bread rolls/sandwiches				
				Other				
PLASTIC				Total food items				
Bottles				MIXED MATERIALS				
Bags				Boxed drinks				
Straws				Milk and juice cartons				
Take-away containers				Take-away food and drink cups				
Pencils, pens, caps, rulers				Ice-cream/pole wrappers				
Food wrap				Other				
Other				Total 'mixed material' items				
Total plastic items				OTHER MATERIALS				
GLASS				Rubber				
Bottles				Leather				
Jars				Cloth				
Broken pieces				Wood				
Other				Other				
Total glass items				Total 'other materials' items				
				TOTAL ALL ITEMS				100

Armstrong, P and J. Laffin, 1993, *Waste Matters: Environmental Education Activities About Waste*, Gould League of Victoria, p. 21.

School Litter Survey

1. What is your age? _____
2. Are you:
 Male Female
3. What things would you call litter?
(Tick one or more boxes.)
 - Lunch wrappers
 - Cigarette butts
 - Food scraps
 - Fallen leaves, twigs
 - Drink bottles and cans
 - Old car in a paddock
 - None of these
4. Which of these things is undesirable litter?
(Tick one or more boxes.)
 - Drinking straws
 - Empty drink bottle
 - Chip packet
 - Dead leaves
 - Apple core
 - None of these
5. Litter can effect the environment in a number of ways. Rank from 1–10 the ways below, from most serious to least serious. *(1 = most serious.)*
 - ___ Is a health hazard
 - ___ Can harm animals
 - ___ Can injure people
 - ___ Is a fire hazard
 - ___ Can block drains
 - ___ Can contain poisons
 - ___ Causes accidents on roads
 - ___ Makes a place look ugly
 - ___ Can be smelly
 - ___ Other _____
6. Do you think your schoolground is:
 - Heavily littered
 - Slightly littered
 - Not littered
7. Do you drop litter?
 Often Sometimes Never
- 7a. If you answered 'Never' to question 7, why don't you drop litter?
(Pick one or more boxes.)
 - You think that litter spoils the appearance of a place.
 - You are afraid of being caught and punished.
 - You know it is wrong.
 - You don't like seeing litter.
 - You know that animals can be hurt or killed by litter.
 - You are concerned that people will be hurt by sharp litter.
 - You are worried that it will be washed into rivers, bays or the ocean.
- 7b. If you answered sometimes or often to question 7, why do you drop litter?
(Pick one or more boxes.)
 - You are too lazy to put it in the bin.
 - If you can't find a bin, so you just drop your rubbish.
 - You don't mean to, you drop it accidentally.
 - You do it so other people will think you are tough.
 - You think that empty bottles and wrappers are dirty and you drop them so that you don't have to hold them.
 - You think it is fun.
 - You don't care.
 - You like being a rebel.
8. Have you picked up litter at school this year?
 Yes No
9. If you answered 'Yes' to question 8, why did you pick up litter at school?
 - Punishment
 - For class yard duty
 - Volunteered
 - Other _____
10. Making students pick up litter at school stops them from dropping litter themselves. Do you agree or disagree?
 Agree Disagree



11. Who should pick up litter in your school?

(Pick one or more boxes.)

- Students on yard duty
- Students caught dropping litter
- All students
- Teachers
- Principal
- Cleaners
- Other _____

12. Who is responsible for the amount of litter in the school?

(Pick one or more boxes.)

- Principal
- Students
- Teachers
- Cleaners
- Other _____

13. Why do you think that some kids litter?

(Pick one or more boxes.)

- They are too lazy to put it in the bin.
- They can't find a bin, so they just drop their rubbish.
- They don't mean to, they drop it accidentally.
- They do it so other people will think they are tough.
- They think that empty bottles and wrappers are dirty and they drop them so that they don't have to hold them.
- They think it is fun.
- They don't care.
- They like being rebels.

14. Why do you think that some kids don't litter?

(Pick one or more boxes.)

- They think that litter spoils the appearance of a place.
- They are afraid of being caught and punished.
- They know it is wrong.
- They don't like seeing litter.
- They know that animals can be hurt or killed by litter.
- They are concerned that people will be hurt by sharp litter.
- They are worried that it will be washed into rivers, bays or the ocean.

15. If you had a choice, would you buy a salad roll from the canteen/tuckshop in:

(Pick one box only.)

- Plastic wrap and a paper bag
- Plastic wrap
- Paper bag
- Paper wrap
- Recycled paper wrap or bag
- No wrapping, but on a clean plate from home
- Other _____

16. If you had a choice, would you buy a drink from the canteen/tuckshop in a:

(Pick one box only.)

- A bottle or can that could be recycled
- A bottle or can that cannot be recycled
- A disposable cup
- A clean cup brought from home
- Other _____

17. Does your school teach you about littering at school?

- Yes No

18. What do you think should be done to reduce the amount of litter in your school?

19. How concerned are you about environmental matters?

(Pick one box only.)

- Very concerned
- Concerned
- Slightly concerned
- Not concerned

Thank you for your time.

School Litter Busters and the Curriculum Framework

The School Litter Busters Program can help students to achieve many learning outcomes in several Learning Areas. Some of the relevant Learning Areas are:

S&E

Strands: Place and space, Resources and Natural and Social Systems

Mathematics

Strands: Measurement, Chance and data and working mathematically

Science

Strands: Natural and processed materials

Technology & Enterprise

Strands: Materials and Information

Depending on the level of commitment of the school to this program, students may be required to:

- research existing waste and litter policies of the school
- design an investigation of the amount, sources and distribution of litter in the school

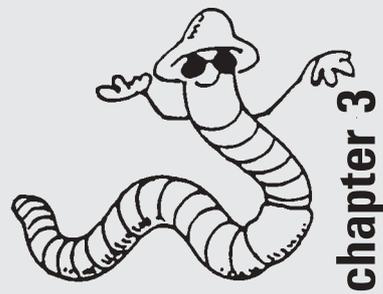
- take measurements for this investigation
- take measurement of the places sampled for the investigation
- take photographs of litter in the school before and after the introduction of the School Litter Busters Program
- analyse the amount, sources and distribution of litter in the school, using graphs and diagrams
- design and conduct a survey of students' attitudes towards litter as well as their reported littering behaviour
- analyse the results of this survey, using appropriate graphical techniques and computer software
- work with other students and staff to develop a litter reduction plan for the school
- take actions to carry out this plan
- promote the plan with the school community
- undertake ongoing measurements of the amount and distribution of litter in the school in order to assess the effectiveness of the plan
- conduct a second survey after the plan has been implemented to judge if there has been a change in the attitudes of the students towards littering and/or their reported littering behaviour.



Students with litter 'picker-upperers'.

3

HAVING DEVELOPED EXCITING PROGRAMS AND UNITS OF WORK ON THE TOPICS OF WASTE AND LITTER, YOU WILL NEED TO WORK AT MAINTAINING THE MOMENTUM AND ENTHUSIASM. THIS CHAPTER PROVIDES SUGGESTIONS FOR MAINTAINING ENTHUSIASM AND INTEREST IN THE TOPICS.



Keeping it Going



Evaluation

Evaluate your own programs. Invite feedback from the students. Did they find the work interesting and relevant? How would they improve the program? Use assessment procedures to determine if the students achieved the expected learning outcomes. Adjust your programs/units on the basis of this evaluation.

Competitions

Enter students' work in competitions, e.g. the WA Environment Award. As the topics of waste and litter are relatively new, there is still so much to be learnt. Hence the topics lend themselves to original research, often without the need for sophisticated equipment.

Integration

It is important that the programs and units of work developed by your school are integrated with the waste and litter operating practices being set up by the school. This will help to ensure that, on one hand, the students understand why the new practices have been set up and, on the other hand, make their classroom studies seem so much more relevant to their everyday lives.

New Ideas and Approaches

It is easy for a topic such as waste or litter to become 'stale' for both teachers and students, if the same activities are used repeatedly or the same approach is used.

Look for opportunities for using new ideas and information in your units. For example:

- media coverage of issues, e.g. kerbside recycling (provided it is balanced)
- new products made from recycled materials
- new ways to compost garden waste
- research results on key problems, e.g. types of litterers.

If one year you use an integrated approach, try a different approach the next, e.g. run a recycling competition or a 'Recycling Olympics'.

Professional Development

Continue to look for opportunities for professional development for staff.

If a teacher from your school has taken part in a professional development program with the Waste Wise Schools Program, then that teacher could inservice the rest of the staff. Take advantage of the free follow-up service provided by the program.



A recycling competition can help maintain interest in recycling.

Invite interesting facilitators to conduct workshops for staff about waste and litter, either on a curriculum day or after school. Contact Waste Wise WA or local councils.

Many teacher conferences include sessions on the topics of waste and litter. This is a great chance to hear from experts in the field and to pick up new ideas. Some of these conferences are:

- conferences held by MESA (Marine Educators Society of Australia)
- conferences held by AAEE (Australian Association of Environmental Education).
- Greenteach, AAEE and Environmental Educators Network advertise upcoming events.

Publicity

Promote the work of your students in these topics at every opportunity. This will not only give value to the topic and the students' work, but will help to educate other students and visitors to the school. Some suggestions here include:

- displays of student work – posters, art and craft, technology
- students work placed on the school's Internet site or some other relevant site (such as the Waste Wise Schools Program), e.g. video clips, survey results, research etc.
- articles in local papers or student magazines
- performances of music, drama etc.



Field trips create interest and help maintain enthusiasm.

Sustainable Development

Use your experiences in developing and teaching units of work on waste and litter to be a catalyst for related units of work, e.g. energy conservation, water conservation, revegetation.

Networking

Share units of work with other teachers in other schools. Ask for fresh ideas at Learning Area Networks meetings. Write articles about your programs and units in teachers magazines. Post your units on the web page of your school.

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