

WASTE

A Teaching Manual

Grade 4 - Plastic

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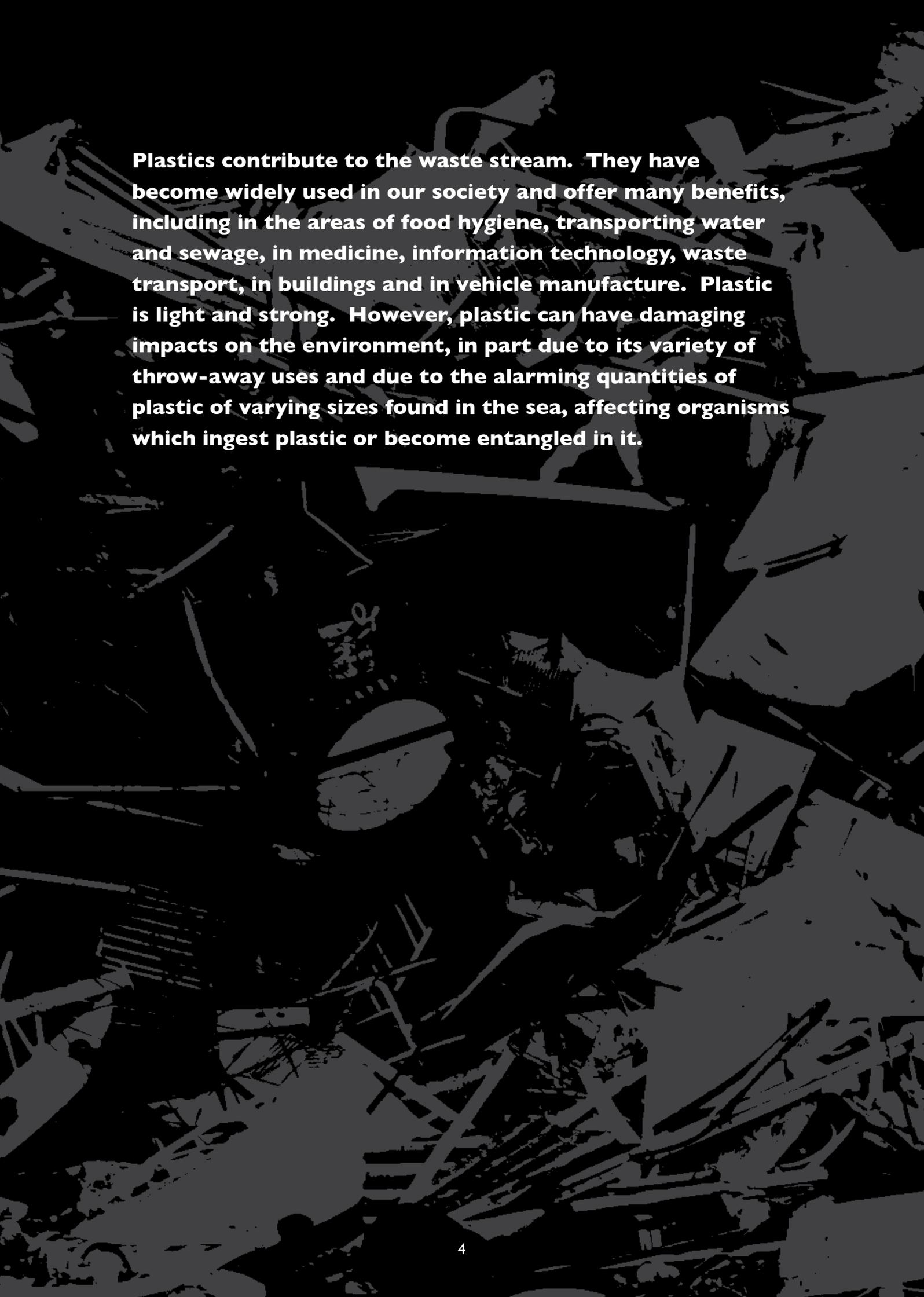
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Plastics contribute to the waste stream. They have become widely used in our society and offer many benefits, including in the areas of food hygiene, transporting water and sewage, in medicine, information technology, waste transport, in buildings and in vehicle manufacture. Plastic is light and strong. However, plastic can have damaging impacts on the environment, in part due to its variety of throw-away uses and due to the alarming quantities of plastic of varying sizes found in the sea, affecting organisms which ingest plastic or become entangled in it.



About this Resource

Waste – A Teaching Manual provides a sequence of pedagogically aligned, hands-on waste-related teaching units for primary school teachers. The units provide learning activities that can be used to develop awareness in students about waste in Tasmania while meeting requirements of the Australian Curriculum in various subject areas, including the cross curricular priority of sustainability. Through the activities students explore how wastes are derived, how students can act to reduce, re-use and recycle wastes and the connection between their individual actions and broader environment impacts.

Through the *Waste – A Teaching Manual*, each year level is provided with a particular waste issue to tackle, both in an academic and a practical sense, in an attempt to deliver a comprehensive picture over an eight year journey from K-6. To complement this, schools could consider developing and implementing a waste action plan for their school.

The RethinkWaste schools program <http://rethinkwaste.com.au/at-school/schools-program/> offers a waste audit toolkit and action plan toolkit to guide schools to set up infrastructure and resources in order to reduce waste in schools and change attitudes and behaviours. The program is free and available to all schools in Tasmania.

In the early years (K-1) there is a strong focus on nature play with the intention of instilling an appreciation of the environment, along with guided activities to support practices such as worm farming and recycling. This is a great springboard into managing litter and paper waste in Grades 2-3. Incrementally, students begin to make connections between their consumption and actions and the impacts this has on the school, the home and the broader environment. For example, Grade 3 students investigate paper consumption and the affect this has on forests and the animals that use forest habitat. In Grade 4, students take on a new challenge, to look at plastic waste. Then in Grade 5, a resource on food waste has been developed, and in Grade 6 there is proposed to be a 'wrap up', providing a snapshot of where these wastes fit into the bigger picture of wastes in contemporary Australia, and a consolidation of the need to address waste and sustainability issues in our time. The embedded philosophy of reduce, re-use and recycle should stand the children in good stead for the future: at home, at work and in the community.

The activities within this unit take students on an active learning journey exploring plastic waste and deploying their prior knowledge and literacies as a setting for their subsequent

academic and hands-on experiences. Most lessons are 45 minutes in duration. Some activities may extend over many lessons, as do some extension activities. References are listed at the end of each lesson.

Where appropriate, for a selection of activities relating to the science curriculum, the 5E model is added as an overlay: Engage, Explore, Explain, Elaborate and Evaluate. Students experience common activities, build on prior knowledge and experience to construct meaning and continually assess their understanding of a concept. This helps teachers evaluate students' understanding.

Expected learning outcomes

After completing the Grade 4 plastic waste unit, students will have had the opportunity to learn the following:

Issues of waste in Australian society

The role and uses of plastic in our world

How plastic is made and where plastic waste comes from

How plastic consumption and waste affects the environment/ biodiversity, particularly in the sea

How students can reduce, reuse and recycle plastic waste

Ways that the school can cut down on plastic use/waste



Curricular links at a glance

The activities covered in the unit have been mapped to various areas of the Grade 4 Australian Curriculum and concurrently meet areas of the sustainability cross curriculum priority. Complementary extension activities are also included where teachers want to 'go beyond' the 14 lesson unit.

			Lesson (L) and Extension (E)
SCIENCE			
Science Understanding	Biological Sciences	Living things have life cycles (ACSSU072)	L-7,8,9,10,11,12,13,14 L5-E1, L8-E1, L14-E1
		Living things, including plants and animals, depend on each other and the environment to survive (ACSSU073)	L-5, 7,8,9,10, 11,13,14 L5-E1, L8-E1, L13-E1
	Chemical sciences	Natural and processed materials have a range of physical properties; these properties can influence their use (ACSSU074)	L-1,2,3,5,14 L4-E1, L14-E1
	Physical Sciences	Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076)	L6-E1
Science as a Human Endeavour	Nature and development of science	Science involves making predictions and describing patterns and relationships (ACSHE061)	L-2,3,9,10
Science Inquiry Skills	Questioning and Predicting	With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (AC SIS064)	L-3,9,10
	Planning and conducting	Suggest ways to plan and conduct investigations to find answers to questions (AC SIS065)	L-3
	Processing and analysing data and information	Compare results with predictions, suggesting possible reasons for findings (AC SIS216)	L-2 L4-E1
	Evaluating	Reflect on the investigation; including whether a test was fair or not (AC SIS069)	L-3
	Communicating	Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (AC SIS071)	L-3
HISTORY			
Historical Skills	Historical questions and research	Pose a range of questions about the past (ACHHS067)	L-1
HUMANITIES AND SOCIAL SCIENCES			
Geography	Geographical knowledge and understanding	The sustainable management of waste from production and consumption (ACHGK025)	L-1,4,6 L6-E2

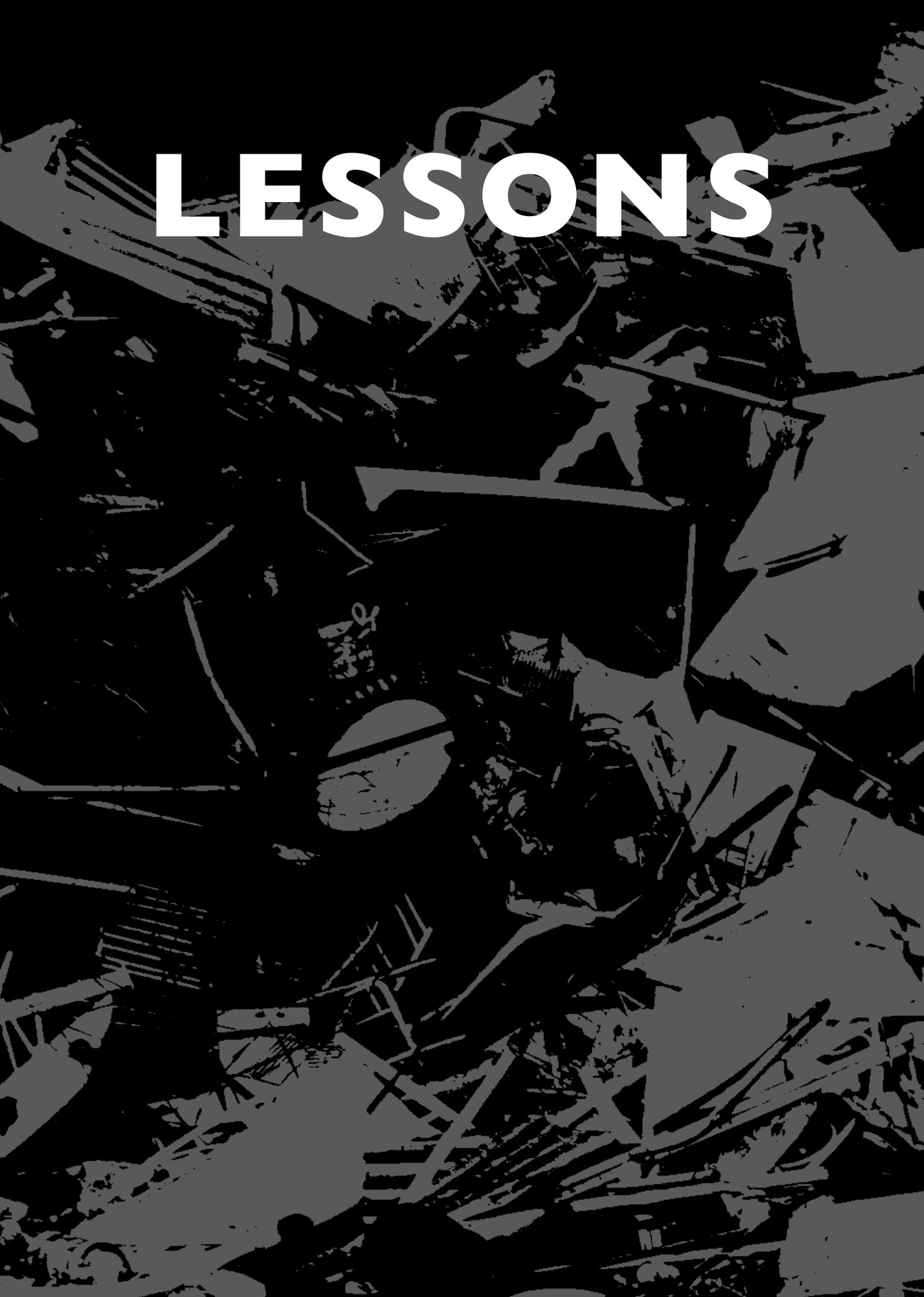


			Lesson (L) and Extension (E)
MATHS			
Number and Algebra	Number and Place value	Recognise, represent and order numbers to at least tens of thousands (ACMNA072)	L-8 L4-E1
Measurement and Geometry	Using units of measurement	Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (ACMMG084)	L-4,13 L4-E1
		Compare objects using familiar metric units of area and volume (ACMMG290)	L4-E1
Statistics and probability	Data representation and interpretation	Select and trial methods for data collection, including survey questions and recording sheets (ACMSP095)	L-4,8
		Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values (ACMSP096)	L-8
ENGLISH			
Language	Language for interaction	Understand that social interactions influence the way people engage with ideas and respond to others for example when exploring and clarifying the ideas of others, summarising their own views and reporting them to a larger group (ACELA1488)	L-3
Literacy	Interacting with others	Interpret ideas and information in spoken texts and listen for key points in order to carry out tasks and use information to share and extend ideas and information (ACELY1687)	L-2,3,5
		Use interaction skills such as acknowledging another's point of view and linking students' response to the topic, using familiar and new vocabulary and a range of vocal effects such as tone, pace, pitch and volume to speak clearly and coherently (ACELY1688)	L-3
	Interpreting, analysing, evaluating	Identify characteristic features used in imaginative, informative and persuasive texts to meet the purpose of the text (ACELY1690)	L-5
	Creating texts	Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features (ACELY1694)	L-10,11
VISUAL ARTS			
		Use materials, techniques and processes to explore visual conventions when making artworks (ACAVAM111)	L-11 L2-E1, L6-E2
		Present artworks and describe how they have used visual conventions to represent their ideas (ACAVAM112)	L2-E1, L6-E2
		Identify intended purposes and meanings of artworks using visual and arts terminology to compare artworks, starting with visual artworks in Australia including visual artworks or Aboriginal and Torres Strait Islander Peoples (ACAVAR113)	L-12



		Lesson (L) and Extension (E)
DESIGN AND TECHNOLOGY		
Design and Technologies Knowledge and Understanding	Recognise the role of people in design and technologies occupations and explore factors, including sustainability that impact on the design of products, services and environments to meet community needs (ACTDEK010)	L-3
	Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes (ACTDEK013)	L-3
Design and Technologies Processes/ Production Skills	Select and use materials, components, tools, equipment and techniques and use safe work practices to make designed solutions (ACTDEP016)	L6-E1
ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA		
Asia-Australia Engagement	Collaboration and engagement with the peoples of Asia support effective regional and global citizenship. (OI.5)	L6-E2
SUSTAINABILITY		
The biosphere is a dynamic system providing conditions that sustain life on Earth. (OI.1)		L-3,5,6,7,8,9,10,11,12, 13,14, L5-E1, L6-E2, L8-E1
All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. (OI.2)		L-3,5,6,7,8,9,10,11,12, 13,14, L5-E1, L6-E2, L8-E1
Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. (OI.3)		L-1,5,6,7,8,9,10,11,12, 13,14, L5-E1, L8-E1
World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability. (OI.4)		L-5,6,7,8,9,10,11,12,13, 14, L5-E1, L6-E2, L8-E1
World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability. (OI.5)		L-1,4,5,6,7,8,9,11,12, 13,14, L2-E1, L4-E1, L5-E1, L6-E2, L8-E1
The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.(OI.6)		L-1,5,6,7,8,9,10,11,12, 13,14, L2-E1, L5-E1, L6-E2, L8-E1
Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments. (OI.7)		L-1,3,4,5,6,7,8,9,10,11, 12,13,14, L2-E1, L4-E1, L5-E1, L8-E1, L14-E1
Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts. (OI.8)		L-1,5,6,7,8,10,11,12,13 L2-E1, L5-E1, L6-E1, L6-E2, L8-E1, L14-E1
Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments. (OI.9)		1,4,5,6,7,8,9,10,11,12, 13,14, L2-E1, L4-E1, L5-E1, L6-E2, L8-E1, L14-E1

LESSONS

An aerial photograph of a massive construction site, likely a bridge or a large-scale infrastructure project. The image shows a dense network of steel beams, concrete pillars, and structural elements. The ground is a mix of dirt, gravel, and some greenery. The overall scene is one of intense industrial activity and engineering complexity.



LESSON 1

Waste in Society

This activity focuses on the kinds of waste people create in their daily lives and how waste is managed as a community. Students consider how waste generation has changed over the past few decades.

Meets English ACELY I694 Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features

Science ACSSU074 Natural and processed materials have a range of physical properties; these properties can influence their use

History ACHHS067 Pose a range of questions about the past

Geography ACHGK025 The sustainable management of waste from production and consumption

Sustainability OI.3, OI.5, OI.6, OI.7, OI.8, OI.9 Understanding how waste is derived and the effect this can have on ecosystems and ultimately our own health. Developing actions to reduce our impact on the environment



Teachers Notes

Tasmanians produce approximately 1.6 tonnes of waste per person per annum. A large proportion of this 828,318 tonnes is buried in landfill and 47% is recovered or recycled (EPA Tasmania 2021). Landfilling poses a waste of resources and can also contribute to land and groundwater contamination, local air pollution and carbon emissions in the form of methane. In this activity, students investigate how waste is created and managed, based on their own experiences. They develop understandings about pressures on the environment, health and ecosystems caused by waste.

Suggested Teachers Script

This year we are going to study plastic and plastic waste, but before we do that, I want to do some exercises to give you a picture of where plastic fits into a bigger picture about the wastes that we generate. Throughout the exercises that we do, we will have the opportunity to understand how we can reduce, re-use and recycle our plastics.

Method

Do Activities 1 and 2 from [Global Education - Waste Matters](#).

As part of Activity 2, invite some grandparents/elders to come in to answer questions from the children about what types of waste there were in their childhood (or for their parents), and how they dealt with wastes and how it is different now. Prompting questions might include “What sort of toys did you play with?” or “What kind of containers were used for milk?” or “were there things available without packaging that are only available packaged today?” e.g. nails and screws.

Discuss the elders' visit with the children. Ask the children to observe what it was like before/in another country and what life is like now in terms of (a) volume of plastic used (b) re-using things and (c) how they value things in other countries. They may make statements such as “we seem to use a lot more plastic than our grandparents”, or “they re-used things in the olden days – we seem to throw more things into the landfill”, or “they built things to last”.

References

EPA Tasmania 2021 Environment Protection Authority Annual Report 2020-21, viewed 24 February 2022, www.epa.tas.gov.au/about-the-epa/corporate-documents/annual-reports

Global Education- Waste Matters, viewed 24 February 2022, <http://www.globaleducation.edu.au/teaching-activity/waste-matters-mp.html>



LESSON 2

Plastic Fantastic?

In this activity, students learn about the origins of plastic, what it is made from, the various uses and even how to make their own plastic from vinegar and milk!

Meets Science ASCCU074 Natural and processed materials have a range of physical properties; these properties can influence their use

Science ACSHE061 Science involves making predictions and describing patterns and relationships

Science ACSIS216 Compare results with predictions, suggesting possible reasons for findings

English ACELY1687 Interpret ideas and information in spoken texts and listen for key points in order to carry out tasks and use information to share and extend ideas and information



Method

ENGAGE

As homework, ask each student to list and count the plastic objects (or predominantly plastic) in four rooms in their respective houses, such as bedroom, kitchen, bathroom and lounge room. How many objects are there altogether? Discuss the uses of plastic in your home.

EXPLORE/EXPLAIN

Follow the activity "Make your own plastic" (Cool Australia) from [vinegar and warm milk](#).

ELABORATE AND EVALUATE

Use the following script as a comprehension exercise. Read aloud the following text (either in stages or as a whole), while

the students fill out the 'Student Worksheet – Lesson 2 on the following page.

Also watch [Where do Plastics Come From?](#) in order to answer questions on the worksheet.

Suggested Teachers Script

What is plastic?

The word plastic comes from the Greek word 'plastikos' which means to mould or form. Plastic is made up of various elements, mostly hydrogen and carbon, linked together to form large chains called polymers. Polymers can be described as being like a string of paperclips. There are two types of plastic: plastic which can be repeatedly softened by heat and reformed and recycled is called *thermoplastic*. The other type, called *thermosets*, are like concrete because they can only be shaped once and cannot be softened again, even when heated.

What are plastics made from?

Plastics are made from oil, gas and coal. Most of the raw materials for plastics come from gases which are waste products from when petrol is made.

Why was plastic developed?

The first plastic material was developed in the 1860s as a replacement for ivory billiard balls – ivory is from the tusks of African elephants and elephant herds were diminishing. Bakelite was developed as a substitute for shellac, a varnish, which is made from Asian insects. When materials such as metals were becoming scarce after World War II, alternatives were being sought, such as plastics.

What are the advantages of plastic?

Plastic materials are light weight, good electrical insulators, insulate against heat, will not grow fungi and bacteria, protect against moisture and chemicals, can be moulded at high speed, can be highly flexible, can be used for padding or packaging delicate items and can be used as a fabric.

What is it used for?

Plastic is used in packaging, building and construction, furniture and bedding, electrical and electronic, transport and housewares.

References

Cool Australia (undated) Activity: Snappy Science – Make your own plastic, viewed 24 February 2022,

<http://www.coolaustralia.org/activity/snappy-science-make-plastic/>

Ironbound Community Corp ICC (2017) viewed 24 February 2022, Where do plastics come from?

<https://www.youtube.com/watch?v=tfqzs7km3IE>



Student Worksheet - Lesson 2 - Plastic fantastic?

1. What are the two types of plastic?	1. 2.
2. Name at least one of the raw materials of plastic	
3. Why was plastic developed?	
4. What are some of the advantages of plastic?	
5. List some uses of plastic.	
6. Before items are made from plastic, how do they arrive in the factory?	
7. What are some of the colours that plastic can be made into?	
8. List some soft plastic items. List some hard plastic items.	



LESSON 2 EXTENSION 1

Plastic collage

Making an art work from plastic pieces is a fun way to re-use plastic and provides an opportunity for children to realise the ‘disposable society’ in which we live, yet the inherent potential in an everyday waste item.

Meets Arts ACAVAMI 11 Use materials, techniques and processes to explore visual conventions when making artworks

Arts ACAVAMI 12 Present artworks and describe how they have used visual conventions to represent their ideas

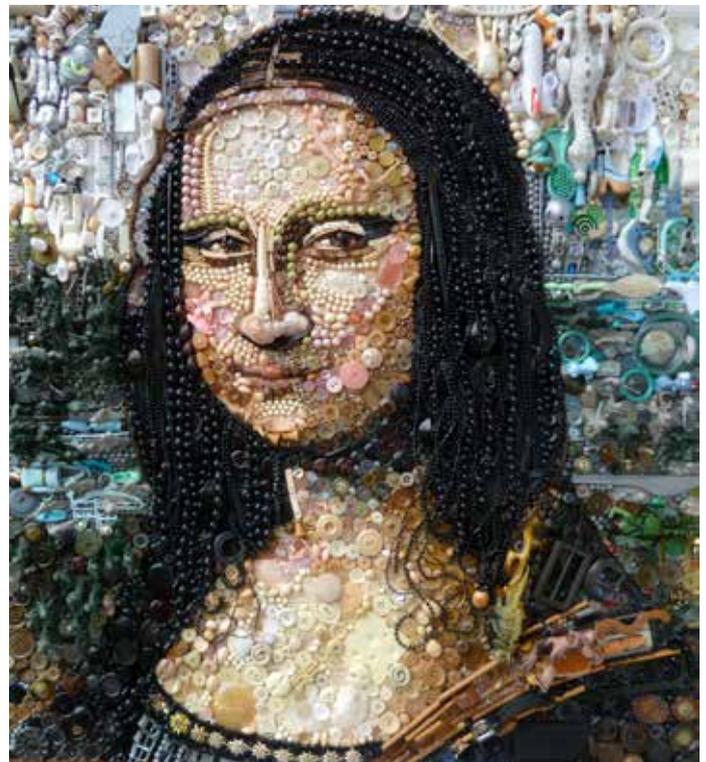
Sustainability OI.5-OI.9 In summary, plastics are useful in society but our over-reliance on disposable or breakable plastics causes a lot of waste, consuming resources and threatening the quality of our environment. We can act to reduce, re-use or recycle.



Method

In anticipation for this exercise, well ahead of time, begin collecting items such as small surplus plastic beads, small pieces of toys, bread tags, plastic coated electronic wire, plastic buttons in various colours and shapes. These could be assembled in colour-coded containers for convenience. During the year, find a large poster, for example, of a famous painting, image or landscape, mount the poster on a board and arrange and glue the plastic pieces onto the poster (with a glue gun or PVA glue) where there is a corresponding colour/shape. Alternatively, create an independent picture from waste. See the images of the work of Jane Perkins below.

Follow the link <http://www.bluebowerbird.co.uk/schools1.htm> to see how some schools have been similarly inspired.



Photos courtesy of artist Jane Perkins, www.bluebowerbird.co.uk

References

Jane Perkins, www.bluebowerbird.co.uk, viewed 24 February 2022



LESSON 3

Packaging

This lesson is covered by undertaking the whole or part of the Primary Connections 'Package it Better' unit. It provides opportunities for students to develop an understanding of the design of packages and the choice of appropriate materials to use. Students design and test a package that will safely deliver a fragile gift. Through investigations, students observe and gather information about what makes a successful package. This leads into Activity 4, where we challenge our dependence on packaging.

Meets several aspects of the Australian Curriculum including Science, English, Design and Technologies and Sustainability, in particular ACSSU074, ACSHE061, ACSIS064, ACSIS065, ACSIS069, ACSIS071, ACELA1488, ACELY1687, ACELY1688, ACTDEK013, ACTDEK010, Sustainability OI.1, OI.2, OI.7

Teachers Notes

The packaging industry has become a huge industry in the modern world, responsible for 37% of all plastic consumption. A large range of items, from food to furniture, can come in a package which might be made from materials such as metal foil or plastic film. Some of these materials didn't exist decades ago. Packages need to protect and preserve contents while being economical, attractive for marketing purposes and preferably having minimal environmental impact. They are often the subject of imaginative design and rigorous testing. But they also use precious virgin resources and become waste.

The Primary Connections 'Package it Better' unit links science and technology with literacy and sustainability in the Year 4 classroom.

'Package it Better' is made up of 8 lessons

1. Packaging pandemonium
2. Peering at packages
3. Plenty of properties
4. Lumps, bumps and crumbs
5. Strong shapes
6. Daring designs
7. Package performance
8. All wrapped up

References

Australian Academy of Science 2022 Package it Better Year 4, Chemical Sciences, Canberra ACT, viewed 24 February 2022, www.primaryconnections.org.au/resources-and-pedagogies/curriculum-units/package-it-better





LESSON 4

Packaging-Free Lunch

In Lesson 3 of the 'Package it Better' unit, students were asked to identify recyclable materials and the environmental impacts of the use of packaging. In this lesson, students are asked to further investigate the environmental impacts of packaging, look at their own use of packaging and see if they can reduce it.

Meets Geography ACHGK025 The sustainable management of waste from production and consumption

Maths ACMMG084 Use scaled instruments to measure and compare lengths, masses, capacities and temperatures

Maths ACMMG095 Select and trial methods for data collection, including survey questions and recording sheets

Sustainability OI.5, OI.7, OI.9 Sustainable futures require actions to be made to protect the environment for future generations e.g. by reducing waste

Method

ENGAGE

Ask the children to recollect the benefits of packaging. Their answers could include:

- Preventing accidental poisoning e.g. via the use of child-proof lids on medicines
- Preserving food
- Transporting goods easily e.g. less spoilage, breakage than glass
- Protecting sensitive products from heat and cold
- Increasing food shelf life
- Protecting fragile and expensive goods e.g. computers, glassware
- Product recognition

EXPLORE

During one lunch time, ask the children in your class to place all lunch scraps and packaging waste in a bucket. Count all food scraps, recyclable packaging and non-recyclable packaging. Graph those results, and store these results.

EXPLAIN

Suggested Teachers Script

We have seen that packaging is very useful. It preserves food and stops it from being wasted, and it ensures that the contents of packages are delivered without being damaged. The problem is, a lot of packaging is used, a lot of it is plastic, and of this, a high proportion is being wasted.

About how much do you weigh? (*Thirty kilos? Forty Kilos?*) In Australia we send about ninety kilos of packaging per person per year to landfill. (e.g. double or triple your weight). Much of this is plastic. Packaging makes up 17% of the domestic and council waste stream, and about 3% of total waste. We recycle about 50% of our packaging: if we could boost that to 65% it would cut packaging to landfill by 500,000 tonnes per year in Australia (Bonnin and McKay, 2008).

Many of the problems associated with plastic have arisen because *single-use or disposable* items have often replaced re-usable, refillable containers. In fact, much of the total amount of plastic used in Australia, around 37%, is used for manufacturing single-use disposable packaging, including plastic bottles, cups, and bags.

Can you think of the *problem* with waste PLASTIC packaging?

Problems could include:

- *it is a wasted resource and could potentially be recycled*
- *it is filling up landfills*
- *it can contribute to litter*
- *it lasts a very long time in the environment*
- *tiny pieces can get into the marine environment, and be ingested by plankton, then these get eaten by bigger fish*
- *animals and birds can ingest plastic, causing them to have their digestive systems blocked*
- *animals such as birds can get entangled in plastic packaging*

ELABORATE

Plan a Rubbish Free Lunch Day, or Nude Food Day, possibly in Nutrition Week 10-16 October. Nutrition Australia has a handy website with everything you need to conduct a Nude Food Day, or Rubbish Free Lunch Day. The website includes things to do before, on and after the day, including packaging-free food ideas and templates for letters to parents.

Brainstorm how to reduce *packaging* with our school lunches. (*List those ideas on the whiteboard as reminders.*)



LESSON 4

Packaging-Free Lunch

continued

whole school? What about changing every-day habits? Should we include morning tea in the rubbish free lunch?

References

Bonnin and McKay 2008, True Green Kids – 100 things you can do to save the planet, ABC Books, Sydney, Australia.



Photo courtesy of Tasmanian Department of Health and Human Services

Examples could include:

- *bring lunch from home rather than buying it at the canteen*
- *re-using e.g. bread wrappers instead of getting a new lunch wrap every day*
- *bring yoghurt in re-usable containers rather than buying individually wrapped yoghurt pots*
- *buying chips (crisps) in large bags, not individually wrapped*
- *harvesting vegies from the school garden to give away at lunchtime e.g. carrots, snow peas*
- *making biscuits at home: have them instead of individually wrapped bars or biscuits*
- *Bringing your own water bottle*

Publicise the Rubbish Free Lunch Day and include some of your packaging-free food ideas in letters to parents. Remind students leading up to the RFLD.

On the day of the Rubbish Free Lunch, ask the children in your class to place all lunch scraps and packaging waste in a bucket. Count all food scraps, recyclable packaging and non-recyclable packaging. Graph those results.

EVALUATE

After the event, discuss the difference in lunch waste between the 'before' and 'after' the Rubbish Free Lunch Day.

Discuss the use of fresh foods vs. packaged food in terms of packaging and energy consumption (and nutrition). Ask the children to make a statement about the exercise of making a rubbish free lunch. Would they commit to having another rubbish free day, maybe once a term? Could they convince the



LESSON 4 EXTENSION I

Packaging at home

Students observe the packaging which is used in their respective homes, and work out ways that their families could reduce their packaging.

Meets Science ASCCU074 Natural and processed materials have a range of physical properties: these properties can influence their use

Science ACSIS216 Compare results with predictions, suggesting possible reasons for findings

Meets Maths ACMNA072 Recognise, represent and order numbers to at least tens of thousands

Maths ACMMG084 Use scaled instruments to measure and compare lengths, masses, capacities and temperatures

Maths ACMMG290 Compare objects using familiar metric units of area and volume

Sustainability OI.5, OI.7, OI.9 Sustainable futures require actions to be made to protect the environment for future generations e.g. by reducing waste

Method

Encourage the students to observe the packaging that their family buys regularly. Ask the children to volunteer to unpack the shopping after their family's next big shopping/grocery outing, and observe each item as they unpack it. The children could record the number of items that have 'unnecessary' packaging, e.g. are over-packaged, or they could even weigh the excess packaging if they have sensitive (digital) scales.

The next week, see if the children can go shopping with Mum or Dad and look at the products/packaging they are buying – see if, together, they can make a difference to the packaging that they buy e.g. count and weigh plastic packaging vs. the packaging from previous week. Are the counts and weights different? If so, why? (*maybe they bought different types of food*) If not, why not? (*maybe there is only a certain amount of packaging that you can reduce*).





LESSON 5

Plastic Bags

In this activity, students consider the way that plastic bags are used and disposed of in Australia, how these bags could affect the environment, and what personal actions people can do to reduce this impact.

Meets Science ACSSU073 Living things depend on each other and the environment to survive

Science ACSSU074 Natural and processed materials have a range of physical properties; these properties can influence their use

English ACELY1687 Interpret ideas and information in spoken texts and listen for key points in order to carry out tasks and use information to share and extend ideas and information

English ACELY1690 Identify characteristic features used in imaginative, informative and persuasive texts to meet the purposes of the text

Sustainability OI.1-OI.9 In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments



Suggested Teachers Script

ENGAGE

In the early 2000s, Australians used 3.92 billion plastic bags a year, which was over 10 million new bags a day! (Bonnin and McKay, 2008). Since campaigns such as the “Say No to Plastic Bags” campaign, and new laws in Tasmania to stop the use of the single trip, lightweight bags, less of these bags are being used – but some people argue that we could do more to reduce plastic bag use.

Plastic bags, if they enter the litter stream, can have devastating impacts on some animals. Can you guess what these impacts are?

Activity

EXPLORE

Have a look at the Chris Jordan art works – [Return to Venus](#) and [Return of the Dinosaurs](#) and zoom in to see the depiction of 240,000 plastic bags consumed around the world every 10 seconds. Discuss Jordan’s use of imagery to assist people to understand the extraordinary level of consumption in the world.

Watch this 4 minute [‘mockumentary’](#) on plastic bags. Ensure that the children listen for key points.

Discuss the movie. Note how the compere gives the plastic bag a character, like an animal. What type of animal? As the plastic bag is made out to be an animal, does this make you get more involved in the movie? Did you notice the music? Or the compere’s accent? Did you think the movie was funny?

EXPLAIN

Ask the children to write down the main points of the movie – (*plastic bags are widely used, they can get lifted in the air, they can travel down storm-water drains, then they enter the sea. They can be eaten by animals such as turtles and dolphins. Off the coast of America, they can get caught in circulating currents and enter the ‘Great Pacific Garbage Patch’*).

Suggested Teachers Script

ELABORATE

So, now that we can see the damage that plastics can cause in the environment, what kind of things can we do to reduce the use, and impact of, plastics on the environment?

Let’s think about how to *reduce* plastic bag waste/litter and list our ideas on the whiteboard.



LESSON 5

Plastic Bags

continued

Ideas could include:

- Use paper or biodegradable bags instead of plastic
- Take re-usable plastic/cloth bags to the supermarket
- After having a picnic at the beach or in the bush, clean up your rubbish, including plastic bags
- On a beach-walk, pick up plastic bags if it is safe to do so
- Do not litter. Litter can enter the stormwater drain via wind or rain, then that drain leads to the sea.
- When fishing from a jetty or rocks, take all waste home, including plastic bags
- Do not let rubbish fall or blow off a fishing boat, including bags

Was it good that the Tasmanian Government banned the use of lightweight shopping bags? Thick plastic bags are now being used and people have to purchase these at shops. Do you think this makes people use less? What if they are re-used?

Activity

EVALUATE

Each child should now write down one personal commitment/pledge to reducing plastic bag litter. Explain the concept of a pledge, defined as a solemn promise or undertaking. Discuss the concept of a personal pledge, rather than a commitment that an adult imposes on a child.

Discuss whether this would only work for an adult, or do some children feel so strongly about something they can remember to meet their goals?

References

Chris Jordan 2011 | Running the Numbers II: Portraits of global mass culture (2009-Current), viewed 1 March 2022, <http://www.chrisjordan.com/gallery/rtn2/#venus>

Chris Jordan 2011 | Running the Numbers II: Portraits of global mass culture (2009-Current), viewed 1 March 2022, <http://www.chrisjordan.com/gallery/rtn2/#t-rex>

HealthBay (2010) The Majestic Plastic Bag – A Mockumentary, viewed 1 March 2022, <https://www.youtube.com/watch?v=GLgh9h2ePYw>

IT'S TIME TO GIVE PLASTIC BAGS THE FLICK!

From 1 November 2013 retailers are banned from providing non-biodegradable lightweight plastic shopping bags.

SAY HELLO TO REUSABLE BAGS.

- Remember your reusable shopping bags when you shop
- Keep your reusable bags clean
- Biodegradable plastic bags, heavier plastic bags and fruit and vegetable bags are not banned

BRING YOUR BAGS
Say Goodbye to Plastic Shopping Bags

www.plasticbags.tas.gov.au

Tasmanian Government

In response to the large amounts of plastic bags used in Tasmania, the Tasmanian Government introduced the *Plastic Shopping Bags Ban Act 2013*. This Act prohibits retailers in Tasmania from supplying shoppers with lightweight (less than 35 micron thickness) plastic shopping bags for the purpose of enabling goods sold, or to be sold, by the retailer, to be carried from the retailer's premises.

The supply of other plastic bags is not restricted. These include compostable biodegradable plastic bags that meet Australian Standard 4736, re-sealable zipper storage bags, heavier plastic bags (typically used by clothing and department stores) and plastic bags that are an integral part of the packaging (such as bread, frozen foods or ice bags and fruit and vegetable 'barrier' bags).



LESSON 5 EXTENSION 1

Paper bags vs. Plastic bags

In this activity, students will be asked to debate whether paper bags are better than plastic bags.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things depend on each other and the environment to survive

Sustainability OI.1-OI.9 In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments

Method

Guide a discussion or debate on whether paper bags are better than plastic bags.

Points could include:

- *Trees are used to make paper, unless the paper is being 100% recycled, which is rare*
- *Trees are habitat for birds and animals*
- *A lot of energy is used to make paper, less than for plastic*
- *Paper cannot be re-used if it gets wet*
- *Paper can decompose*
- *Plastic bags do not readily decompose*
- *Plastic bags can be re-used*
- *But are plastic bags being re-used? In your family?*

Actually, do we need paper or plastic bags – rather, could we find an alternative such as cloth?



VERSUS





LESSON 6

Bottled Water I

In this activity, students consider the environmental impacts of bottled water, and ways they can reduce their use of bottled water.

Meets Geography ACHGK025 The sustainable management of waste from production and consumption

Sustainability OI.1-OI-9 In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments



Teacher Preparation

Bring in an example of a disposable water bottle, two large (but not too tall) cardboard boxes and a marker pen to write on boxes.

Teachers Notes

Using plastic water bottles has a massive environmental impact and in Australia is, arguably, unnecessary where potable (drinkable) water is available. Producing, transporting and cooling **bottled water** uses *2000 times* the energy of producing tap water, producing carbon emission and depleting fossil fuels.

ENGAGE

Discuss how many plastic water bottles we use in the home, at school, on outings and at sport.

EXPLORE

See if the children can estimate the number of water bottles used per week in their individual homes. There are 7.6 million households in Australia. Imagine how many bottles this is per week/per year! Estimate on the whiteboard (e.g. 4 bottles \times 7.6million households \times 52 weeks = 1,580,800,000 bottles/year).

EXPLAIN

Suggested Teachers Script

Drinking clean water is good for us and having a bottle of water handy helps us to drink enough water. However, buying bottled water is not necessary and is not good for the environment. Most towns and cities in Australia have potable drinking water, which means that it is safe to drink. When we drink water that has been packaged in a plastic bottle, this uses new or recycled plastic and energy is used to make this bottle. Then we transport this to a shop. Then we put the drink in the fridge, and usually these fridges are operated day and night. The energy and electricity we use is often from coal, although Tasmania at some times has a significant supply of energy from renewable sources. When we do burn coal to make electricity, it affects the air. This affects our climate and our weather.

Producing, transporting and refrigerating bottled water uses *2000 times* the energy of producing tap water.

We use and waste a lot of plastic bottles every year. More than 550 million litres of bottled water is sold in Australia every year (Bonnin and McKay, 2008). More than half of these end up in the tip, or landfill. Some end up in the sea, affecting wildlife.

ELABORATE

Method

One cardboard box represents bottled water, one represents tap water. Write 'bottled water' on one and 'tap water' on the other.

Choose one child to stand in each box: accordingly each child is either 'bottled water' or 'tap water'.

Choose another child to be 'energy to manufacture the bottle' and this child joins in the box with the bottled water. Add more children **ONLY** to the box with 'bottled water', a child named 'resources to make this bottle', one named 'energy used in transport', one named 'energy to refrigerate bottled water' and one named 'energy to bring the bottle home', one named 'energy to recycle the bottle', one named 'air pollution from power stations to provide the energy to make and sell the bottle'.



LESSON 6

Bottled Water I

continued

Suggested Teachers Script

As you can see, it is hard to squeeze all of those elements (resources and energy to make, transport and refrigerate the bottle) into the 'bottled water' box. None of the elements (people) needed to be attached to the 'tap water'. Now you can see the environmental impact of bottled water – all the energy involved with producing the bottles and transporting involved and the refrigeration. And when we generate energy, we make air pollution if we are burning coal to make electricity.

That is a visual of how it takes a lot more resources and 2000 times the energy make bottled water compared to making tap water.

EVALUATE

Ask: Do we need to drink water from disposable bottles in Australia? (*no - most drinking water is potable*)

Ask: Why do you think there was a move away from glass bottles to plastic? (*plastic is lightweight, fuel efficient to transport, energy efficient to produce*)

Ask: What can I do to reduce the use of plastic bottles? (*do not buy them! Bring a refillable bottle, filled with water from your tap, when you are away from home. Encourage others to do the same*).

Activity

Watch the youtube video of the song "[The Court Of King Caractacus](#)"

Adapt the lyrics of Court of King Caractacus to write a song about the environmental impact of bottled water. Or learn the following song.

Maybe make some actions to go with it! Maybe play percussion instruments with it!

*Now, the bottle of that water from your favourite super-mar-
ket, uses lots of en-ergy, (repeat 3 times)*

*Now, the place that makes the bottle of that water from your
favourite super-market, uses lots of en-ergy, (repeat 3 times)*

*Now, the effort to refrigerate the physical state of the bottle
of that water from your favourite super-market, uses lots of
en-ergy, (repeat 3 times)*

*Well, if you want to estimate the refrigerated state
of the bottle of that water from your favourite super-
market,..... - it's too late, coz it takes lots – of
– time!*

(then shout) USE TAP WATER INSTEAD !

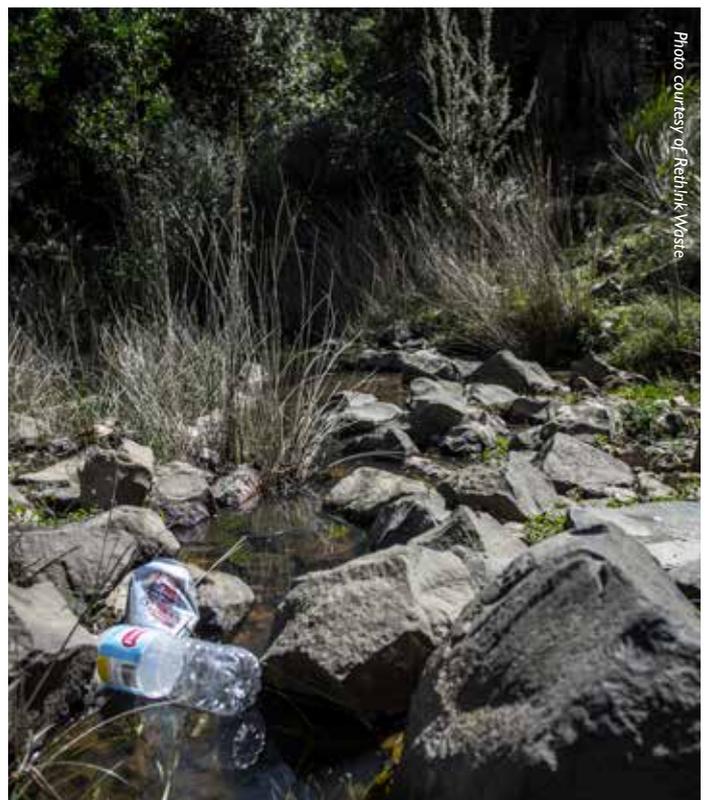
References

Bonnin J and McKay K 2008, True Green Kids – 100 things you can do to save the planet, ABC Books, Sydney, Australia.

Brett M 2007 The Court of King Caractacus, viewed 1 March 2022, https://www.youtube.com/watch?v=qyFO3_OIWRs&list=RDqyFO3_OIWRs#t=6

Zyga 2009 How Much Energy Goes Into Making a Bottle of Water, viewed 2 March 2022, www.phys.org/news/2009-03-energy-bottle.html

Tarremah Steiner School south of Hobart does not sell bottled water at their school. They also have a drinking fountain. Students can refill their own refillable bottles.





LESSON 6 EXTENSION 1

Windmills from PET bottles

As a novel way to re-use a plastic bottle, the children could make a windmill, with real spinning blades. This could be a way of promoting re-use, hence align with sustainability goals, and study the physical sciences.

Meets Science ACSSU076 Forces can be exerted by object on another through direct contact or from a distance

Design and Technologies ACTDEP016 Select and use materials, components, tools, equipment and techniques and use safe work practices to make designed solutions

Sustainability OI.8 Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts



You will need

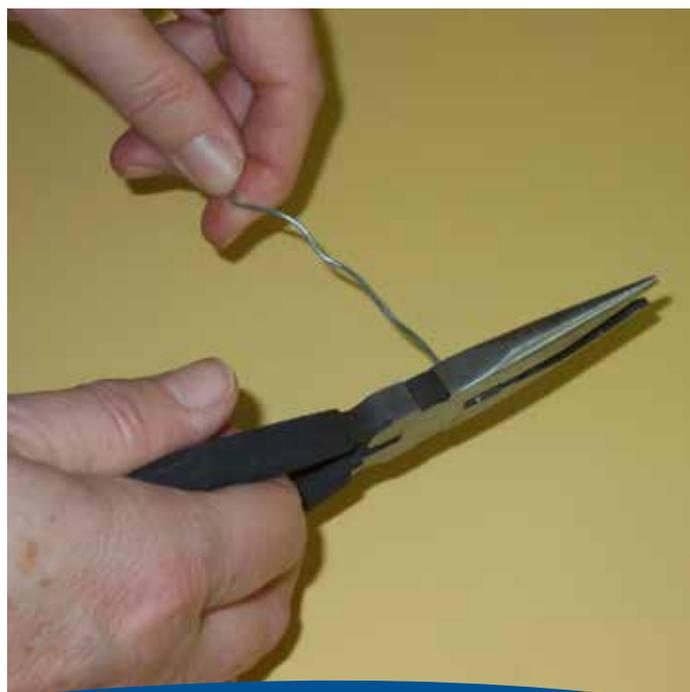
- A plastic PET bottle with cap, preferably 600ml variety FOR EACH CHILD OR PAIR
- Hammer and small nail, or drill with small drill bit
- Wooden board to hammer or drill upon
- Wire, approx. 1 mm diameter, to be cut to 15cm lengths
- Pliers, preferably long nosed
- Stanley knife/sharp awl
- Thin dowel or bracken sticks, approx. 40cm long, one for each child
- Scissors

Method

Take the 600ml PET soft drink bottle, drill/punch a hole in the centre of cap with a hammer and nail or small drill bit.



Cut wire to a 15cm length.





LESSON 6 EXTENSION I

Windmills from PET bottles

continued

Poke the 15cm long piece of wire through the cap. Bend a loop at the end of the wire, with long-nosed pliers, **ON THE INSIDE OF THE CAP** so it cannot fall out through to the back of the cap.



Use a Stanley knife or sharp tool to pierce the bottle, about 5 cm up from the base.



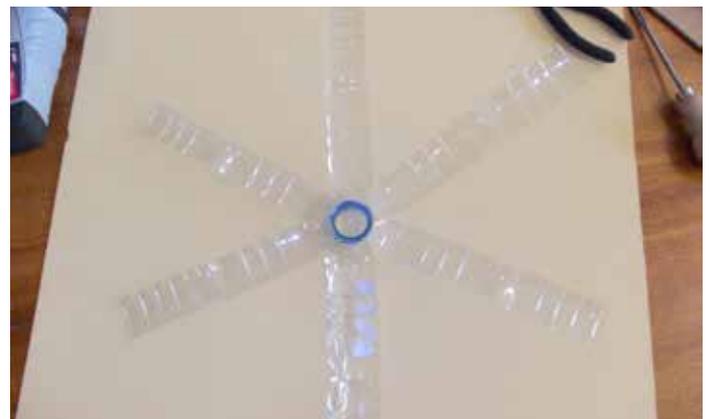
Then use scissors to cut around the bottle to release the bottom. (Put aside the bottoms for recycling).



Cut 6-8 blades on the bottle, starting from the 'new' bottle base, almost to the neck of the bottle, all blades cut to the same width and length.



Fan these out by pushing down on the blades or the base.



Round off the blades at the tips so they aren't sharp.





LESSON 6 EXTENSION 1

Windmills from PET bottles

continued

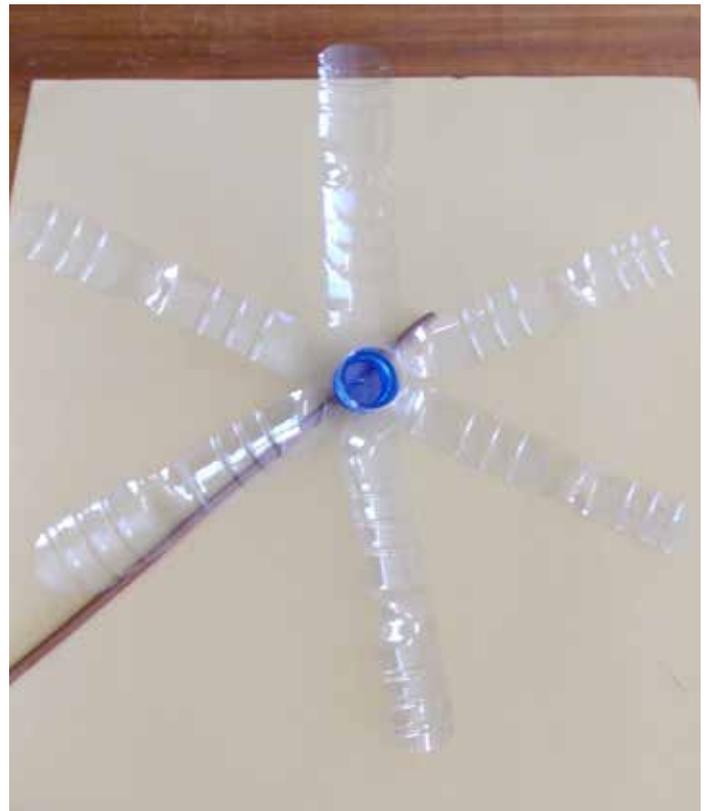
Drill a hole into the stick, about 5cm from the top of the stick.



Pierce the wire (with attached lid) through the hole in the stick, wind the wire around the stick for strength (but not so tight that the bottle top cannot spin), bend the end of the wire so it is not sharp, or impale the sharp end into the stick.



Using a bit of force, hold the bottle top and twist each blade firmly near the neck of the bottle: twist all blades the same way – note that on a fan or wind farm, the blades aren't straight; they have a tilt. Screw the bottle/fan onto the cap.



Run along with your windmill in the air, or stand in one place with your windmill almost horizontal and spin in a circle with the windmill – the blades should rotate like a fan. Twist the blades some more if it does not work the first time. Try to fix any fans that do not work. Share this problem-solving with the class. Think about the energy that can be created by an invisible force (the air), how this can be used to generate energy, and how we can re-use things for another purpose.



LESSON 6 EXTENSION 2

Bottle for Botol

In this activity, students consider the **Bottle for Botol Program**, which offers a partnership between Australian and Indonesian schools to promote the use of re-usable drink bottles in both countries, as an alternative to single use plastics.

Meets Arts ACAVAM 1.1.1 Use materials, techniques and processes to explore visual conventions when making artworks

Arts ACAVAM 1.1.2 Present artworks and describe how they have used visual conventions to represent their ideas

Geography ACHGK025 The sustainable management of waste from production and consumption

Sustainability OI.1, OI.2, OI.4, OI.5, OI.6, OI.8, OI.9

In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments

Asian Engagement OI.5 Collaboration and engagement with the peoples of Asia to support effective regional and global citizenship



Photos courtesy of Bottle for Botol Program

Method

The class can participate in the **Bottle for Botol Program**. This charity partners students in Australia and Indonesia to reduce the use of single use plastics, with the aim of reducing plastic pollution in our oceans. Each year, there is a design competition for students in both countries to design a label for a stainless steel water bottle. Two winning designs will be printed on the stainless steel water bottles. Stainless steel water bottles purchased here in Australia will help to fund the purchase of stainless steel water bottles for Indonesian students. Students in Indonesia participate in an eight lesson environmental education program before receiving their bottles, potentially reducing the need for thousands of single-use plastic cups used in schools in that country every week. Potable water will instead be available at Indonesian schools in larger dispensers.

References

Bottle for Botol Program (2016) viewed 2 March 2022, <http://www.bottleforbotol.org/>



Photo courtesy of Ninna Millikin



LESSON 7

Beach Cleanup

A trip to the beach can offer an opportunity to address Science, Maths and Sustainability aspects of the curriculum. In this lesson, students and teachers go for a walk on a beach – surveying and collecting marine debris, or marine litter. They bring it back to the classroom, discuss the amounts, the types and sources of the litter and the impacts this could have on marine life. The results of the beach clean-up could also be part of an Australia-wide survey of marine litter.

Students can also note the habitat, life cycles and diet of any animals they find. This will prepare them for Lessons 8 and 9.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Maths ACMNA072 Recognise, represent and order numbers to at least tens of thousands

Sustainability OI.1 - OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.



Photo courtesy of Derwent Estuary Program

Teachers Notes

Resources on how to conduct a beach cleanup can be found at www.tangaroablue.org/resources/education-kit-and-fact-sheets/marine-debris-education-kit/. Considerations include personal safety and possible impacts on bird life at the allocated beach.

Gloves and bags could be accessible free of charge from Clean Up Australia.

Ask your local bird life expert, council, coast care group or Parks and Wildlife Service if there are any bird life considerations on your chosen beach e.g. nesting sites to avoid.

Tides for the chosen beach need to be checked with the Bureau of Meteorology with a low tide being preferable.

All participants should avoid touching syringes, and the teacher can either bring a sharps container or contact the Environmental Health Officer of their local Council to correctly dispose of any.

Using the Tangaroa Blue datasheets offers convenience and a way to collect data on beach litter for the Australian Marine Debris Initiative.

A marine debris survey is an ideal way to make students realise that even in Tasmania, with our 'clean green' image, there are beaches with litter which can become dangerous to marine life.

Some Tasmanian schools that have participated in a Scientist in Schools program, doing beach cleanups, include Mackillop Catholic College, Sorell High School, Dodges Ferry Primary School, Triabunna Primary School and Dunalley Primary School.

You will need

- gloves for everyone in the class (or a pair shared between two people)
- several large 'rubbish' bags such as stock feed bags
- hand sanitizer
- sturdy footwear
- hats, sunscreen
- water for every person
- first aid kit/measures required by the school for outings
- rain jackets/warm clothing as appropriate
- tarpaulin



LESSON 7

Beach Cleanup

continued

Method

ENGAGE

Ask the children what they might expect to find at the beach.

Explain that they are to collect litter, which will include plastics, metals etc. Explain how the students will stay safe, considering rocks, tides, sharps, and how to handle heavy things if they are found.

Leave any animals and plants where they are found.

Show where the toilets are, and when they will have the opportunity to use them.

EXPLORE

Divide beach into areas, allocating one group to each area.

Students pick up the rubbish from their area of the beach and either (a) bring it back in bags to the classroom, or (b) spread the rubbish out on the tarp on the beach at the end of the session and use the Australian Marine Debris Initiative datasheets to record their findings, then bring the litter back to the classroom.

Store this litter for the next lesson and lessons 9,10,11 and 12.

Discuss any marine creatures that were observed, including habitat, life cycles and diet.

EXPLAIN, ELABORATE AND EVALUATE in the next lesson.

Between 2011 and 2013, Hobart-based staff of the CSIRO led a three year Australian survey of marine debris, in partnership with Earthwatch Australia and Shell. It was the world's largest study of its kind. The goal of the study was to develop a national risk assessment for wildlife species affected by marine debris.

The project engaged with 5,500 students, teachers and Shell employees, promoting science education by providing them with the opportunity to survey sites at approximately every 100 kilometres around the whole coast of Australia, including Tasmania. This included flights to remote areas such as the South-West of Tasmania.

The study found that approximately three quarters of the rubbish on the coast is plastic.

Most is derived from sources near to the particular beach, with some likely to be from overseas. In the water, most floating debris is plastic, with a density of between a few thousand pieces per km² to 40,000 pieces per km².

The Tasmanian South West Marine Debris Cleanup is a non-profit 100% volunteer-run event that has been cleaning up some of Australia's wildest beaches annually since 1999. In 2013 alone, the clean-up team picked up over 35,000 pieces of rubbish from beaches located in Tasmania's World Heritage Area on the wild west coast.

So, how does this litter get to these remote areas? Use Adrift to work out prevailing currents around the world and where this waste might have come from e.g. Africa or maybe India or anywhere in between, but similarly, click on where we live in Tasmania to work out where our litter might go!

References

South West Marine Debris Cleanup, viewed 28 February 2022, <http://wha-marinedebris.blogspot.com.au/>

Tangaroa Blue 2016, Protect Our Oceans, viewed 1 March 2022, <http://www.tangaroablue.org/>



LESSON 8

Plastic in the Sea

In this activity, students consider the items found on the beach in Lesson 7, and learn of the potential impacts of many of those littered items. Students propose personal actions that people can do to reduce this impact.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Maths ACSMP095 Select and trial methods for data collection, including survey questions and recording sheets

Maths ACSMP096 Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values

Sustainability OI.1-OI.9 In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments



Photo courtesy of Derwent Estuary Program

Method

ENGAGE

Back in the classroom, surmise about how the litter from your clean-up came to be on the beach. (It could be from the land via stormwater drains, from beach-goers, from merchant ships or cruise ships, from fishing boats, from recreational fishers). Have a discussion about any of the litter that seems to be from overseas countries. Follow the fate of 28,000 **rubber duckies** lost at sea and the amazing story of where they ended up around the world, due to ocean currents.

Discuss how the litter might affect a person's enjoyment of the beach. Was the beach 'clean' after the collection? If so, how did it make you feel after the collection? Was there a storm-water drain nearby? Could it have been *your* litter?

EXPLORE

If you haven't already done this on the beach, sort through the litter and divide waste into categories, such as plastic (containers/rope/strapping/bags), aluminium, cloth etc. Record according to the datasheets at <http://www.tangaroablue.org/resources/data-sheet.html>. Count the number of items in each category and graph them. What was the most common type of rubbish on the beach?

Explain that this data could be used as part of a national dataset, useful for organisations who want to help deal with the litter problem.

Gather one of each of the following items, if possible: aluminium can, cardboard, fishing line, leather, nylon fabric, plastic bag, plastic bottle, polystyrene, steel can, woollen item. Add an apple or a piece of fruit.

If you have, say 6 items, choose 6 children and give each of them one item collected. Ask the children to arrange themselves in front of the class in order of the rate that these items take to decompose. For example, 'quickly decompose' on the left and 'slowly decompose' on the right.

Share the following tabulated information, and rearrange the children (above) accordingly.



LESSON 8

Plastic in the Sea

continued

ITEM	HOW LONG TO DECOMPOSE AT SEA
Paper	2-4 weeks
Cotton shirt	1-6 months
Orange/banana peel	Up to 2 years
Wool socks	1-5 years
Plastic coated paper	5 years
Plastic Bag	10-20 years
Nylon fabric	30-40 years
Leather	up to 50 years
Tin can	50 years
Aluminium can	80-100 years
Plastic bottle	Indefinitely
Fishing line	600 years
Glass Bottle	1,000,000 years

EXPLAIN

Lead a class discussion on the different types of rubbish and the timeline each takes to degrade. Were students shocked by how long some everyday objects take to degrade? If so which ones?

ELABORATE

Ask the students what they know about the dangers to marine life of **plastic** in the sea. Answers could include:

LONGEVITY: plastic lasts a long time at sea. It is robust and strong.

ENTANGLEMENT: Animals/birds can become entangled in plastic such as rope, fishing line. This can

- cause the animals to drown
- disrupt their feeding
- restrict movement or ability to swim
- increase vulnerability to predators
- cause a restriction that results in infection or loss of limb/s
- decrease their hunting and movement efficiency

INGESTION: Animals and birds can ingest plastic, thinking is it food.

- plastic can block the oesophagus and intestinal tract of birds and animals
- sharp objects can cause injuries and infections
- toxins can accumulate in an animal's tissues affecting the health of the animal
- birds mistakenly eat plastic, then feed their chicks via regurgitation, then the stomachs of the chicks get filled with plastic and they effectively starve
- plastic breaks down into miniscule particles, which are consumed by zooplankton, which are eaten by bigger fish then this goes up the food chain, affecting the health of each predator

Show video <http://aries.mq.edu.au/videos/kill-plastic-not-wildlife/> . Discuss.

Estimates are that many thousands of sea birds and animals are killed every year from ingesting marine litter, especially plastic, at sea.

EVALUATE

What *personal* actions can we take to reduce beach litter? (reduce disposable packaging, take care at the beach not to leave litter behind, bring rubbish home from fishing or boating, do not let litter get into stormwater, pick up litter at the beach).

(Save and store the remainder of the litter for the next lesson and/or for making marine animals from marine litter in Lesson 12. If you are not doing the activities below, sort the waste into two categories, recyclable and non-recyclable. Discuss the importance of reducing, re-using and recycling. Discuss what is recyclable and non-recyclable. Organise for the recyclable items to be recycled).

References

Australian Research Institute for Environment and Sustainability (ARIES) 2016, Kill Plastic not Wildlife, viewed 2 March 2022, <http://aries.mq.edu.au/videos/kill-plastic-not-wildlife/>

Mother Nature Network (2011) What can 28,000 rubber duckies lost at sea teach us about our oceans?, viewed on 16 January 2018, <http://www.mnn.com/earth-matters/wilderness-resources/stories/what-can-28000-rubber-duckies-lost-at-sea-teach-us-about>

National Parks Service 2015 How Long Will Litter Last?, viewed 2 March 2022,

www.nps.gov/olym/learn/kidsyouth/how-long-will-litter-last.htm

Tangaroa Blue 2018, *Protect Our Oceans*, viewed 28 February 2022, <http://www.tangaroablue.org/>



LESSON 8 EXTENSION 1

Garbage Guts

Students discuss the issues regarding plastic ingestion after hearing the story Garbage Guts, by Tasmanian Author Dr Heidi Auman.

Meets ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Sustainability OI.1- OI.9 In summary, sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments

Method

Read 'Garbage Guts' by Tasmanian author Heidi Auman (2015). Discuss the book. Invite Dr Auman to your school to speak about plastic ingestion and herbook.

References

Auman, H (2015) Garbage Guts, Dog Ear Publishing, Indianapolis, USA.

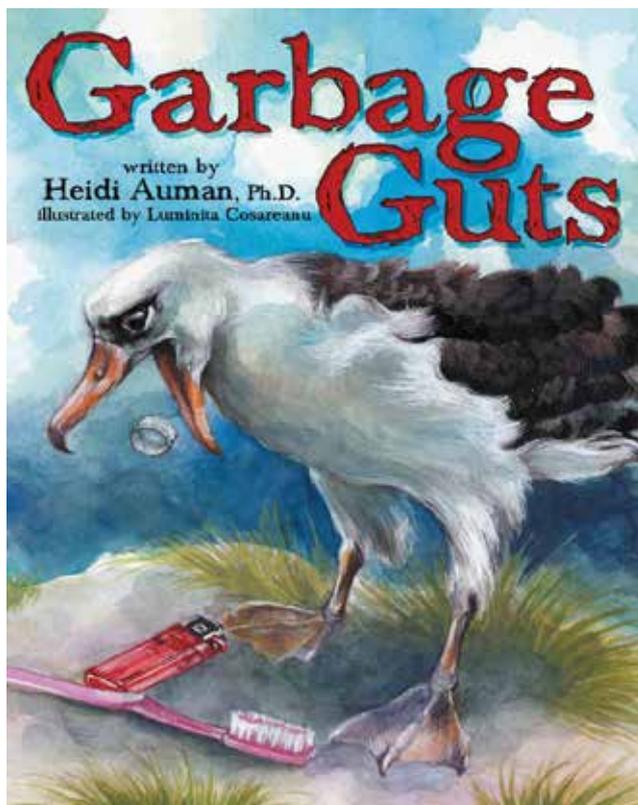


Image provided courtesy of Dr Heidi Auman



LESSON 9

Microplastics

In this activity, students learn about the problem of microplastics at sea, then create a skit to describe how plastic is ingested 'up the food chain'.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Science ACSHE061 Science involves making predictions and describing patterns and relationships

Science ACSIS064 With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Sustainability OI.1 - OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.



Preparation before the activity

Ask the students to collect odd and/or worn out clean socks, ranging in size from tiny baby socks to large adult socks. You could also ask at your local 'op-shop' to start collecting any single socks from donations, or damaged socks that they cannot on-sell. Download the Parks and Wildlife links in the blue box below in preparation for this activity.

You will need

- Tiny pieces of plastic, preferably from the beach
- Clean sock of various sizes, ranging from tiny to large
- Small pieces of left-over felt for eyes and tails, teeth
- Yarn
- Scissors
- Glue and/or glue gun

Method

ENGAGE

Describe the problem with microplastics in the sea, as follows. Research indicates that there are tiny pieces of plastic (about 4000 per square kilometre) found in Australian waters, and these are less than 5mm in size, arising from the breakdown of plastic rubbish in the sea.

Show the students this amazing footage where scientists have recently tagged these microplastics with a special fluorescent dye, to show that even **plankton** eat plastic.

Explain how plankton is, in turn, eaten by small fish, which are, in turn, eaten by larger fish, and these could end up in larger fish, which we might eat. Ask the children what they think might happen to the plastic in the gut of every fish in this 'chain' (e.g. *the plastic persists*)

EXPLORE

Play the Marine Food Web Game to provide the students with ideas about animals at the 'bottom' of the food chain, and how plastic might be consumed 'up' the food chain.



LESSON 9

Microplastics

continued

THE MARINE FOOD WEB GAME

The Tasmanian Parks and Wildlife Service have developed a **Marine Food Web game**, a game to assist people to learn about food webs in the Tasmanian marine environment. Accompanying that game is a **Food Web Diagram**

Have a look at the answer sheet and you'll realise that the food web is not just a linear thing! Note that humans are at or near the 'top' of the food web.

EXPLAIN

Then in groups of four, ask the children to devise a skit for the rest of the class. Each group will be given with some tiny pieces of plastic and a selection of four socks in incremental sizes. They must use all the socks and plastic pieces, to explain how plastic is consumed up the food chain. For example, the tiny sock (krill) could consume a few pieces of plastic, then that sock is 'eaten' by the next sized sock (Gould's squid), then a fur seal eats the squid, then an Orca eats the fur seal.

ELABORATE

Ask the class what would happen if the plankton or krill got so sick from the plastic that they died? (*disrupt the food chain, affecting those 'up' the chain*)



Photo: EPA Tasmania



EVALUATE

At the end of the skits, the children could stuff the four socks into the 'last'/carnivorous fish, which has consumed the other socks. It could sit on the table like a blobfish (*Psychrolutes microporos*), or be suspended like a swimming carnivore, such as an orca. Every child could write a description of what their fish had eaten.

Explain that some of these 'last' fish may be eaten by humans. For example, tiny plastic pieces were found in the stomachs of some Southern Bluefin tuna which were caught off the coast of Tasmania, destined for human consumption.

Explain why we chose old socks (e.g. to re-use something that was otherwise going to be thrown away).

References

Eide, B (2104) Plankton munching microplastics, viewed 16 January 2014, <https://www.youtube.com/watch?v=2oQeXhURTgY>

State of Tasmania (2016) Marine Game: Food Web Game, viewed 28 February 2022, <https://www.csiro.au/-/media/Education-media/Files/EducatorOnBoard/Resources/TAS-NPWS-Supplementary-resources-for-Lesson-1.pdf>



LESSON 10

Marine animal entanglement experiment

In this activity, students undertake an experiment to determine the impacts of entanglement by litter on marine creatures. Students draw a poster and write on it some personal actions that people can do to reduce this impact.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Science ACSHE061 Science involves making predictions and describing patterns and relationships

Science ACSIS064 With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge

Arts ACAVAM 111 Use materials, techniques and processes to explore visual conventions when making artworks

English ACELY1694 Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features

Sustainability OI.1-OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems, requiring actions to achieve this goal



Photo courtesy of Marine Conservation Program, DPIPWV

You will need

- a sink or large tub of water
- marine litter including a disposable plastic drinking bottle, rope and a plastic bag
- mesh netting
- strapping band
- fishing line
- A3 paper
- coloured pencils

Method

ENGAGE

Ask the students what they know about marine animal entanglement- how marine animals become entangled in marine litter and the likely impacts on the animal.

EXPLORE

Create a simulation of the entanglement of a marine animal in different types of marine debris by doing the following.

1. Fill a sink or large tub with water
2. Attach a piece of lightweight rope to a drink bottle
3. Fill the drink bottle $\frac{1}{4}$ full with water so that it partially sinks. The bottle represents the marine animal such as a dolphin, seal or penguin.
4. Wrap the first piece of rubbish around the bottle using the rope, so that it will not come off the bottle easily
5. Using the rope slowly drag the bottle through the water
6. Continually add new pieces of litter around the bottle and drag through the water

EXPLAIN

Discuss how the bottle is getting heavier, and harder to drag through the water, simulating a drowning sea animal.

ELABORATE

Make sure that you attempt to bring the bottle to the surface now and then throughout the demonstration, so students can get an idea of how problematic it will be for surface breathing animals, such as seals, dolphins or penguins. Students are to observe what happens with each of the pieces of rubbish and record on the Student Work Sheet on page 36.



LESSON 10

Marine animal entanglement experiment

continued

EVALUATE

Then the students can do a drawing on the back to represent a drawing of a marine animal entangled with marine litter. They will write something on the worksheet, or on their drawing, to encourage people to stop littering the oceans e.g. a slogan.

Discuss the answers that the children gave to the worksheet. The answer to Question 1 was (g).





STUDENT WORK SHEET
MARINE ANIMAL ENTANGLEMENT EXPERIMENT

1. How do you think that entangled rubbish can affect a marine animal? (Circle correct answer)

- a) It can cause the animal to drown
- b) It can disrupt their feeding
- c) It can restrict movement or ability to swim
- d) It can make them more exposed to predators
- e) It can get increasingly tight, which results in infection or loss of limb/s
- f) It can decrease their ability to hunt and move
- g) All of the above

2. What happened when more pieces of rubbish were added to the bottle?

.....

.....

3. List some animals that may be affected by being entangled.

.....

.....

4. Choosing an animal from your list, explain what would happen to that animal if it was entangled in marine debris?

.....

.....

.....

.....

5. On the back of this piece of paper, create a drawing of a marine animal entangled with marine litter.
Write something here, or on your drawing, to make people stop littering the oceans.

.....

.....



LESSON 11

Make marine animals from marine litter

In this activity, students observe pictures of marine life, then construct marine creatures from marine litter, noting how much of the litter is plastic. A place could be organised to exhibit the work e.g. in the office foyer, hallway, hall. Each child could make an artists statement to attach to their work, relating to the motivation behind each work. There could be an official opening, like in an art gallery. Invite parents and friends.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Arts ACAVAMI11 Use materials, techniques and processes to explore visual conventions when making artworks

English ACELY1694 Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features

Sustainability OI.1-OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.



You will need

- Books, posters, internet images of marine creatures/plant life
- marine litter
- lids
- beads
- wire
- construction tools such as glue gun, scissors, hand-held battery drill, hammer, nails, pliers.
- It is a good idea to have extra adult/parent help with this exercise.

Method

ENGAGE

Study forms of marine life, including fish, mammals, birds and plant life, via posters, books and/or the internet. Supply the children with the collected marine litter.

EXPLORE

Ask the children to construct a marine creature (or plant) from the litter, as close as possible to anatomically correct. Children can work in pairs if they like. Examples are shown below.



Photo courtesy of Cradle Coast NRM



LESSON 11

Make marine animals from marine litter

continued



EXPLAIN

Near the end of the session, discuss how much of the litter is plastic, and how long this would take to break down, based on Lesson 8.

ELABORATE

Discuss each student's art work/marine creature and the motivation behind each work.

EVALUATE

Organise a place to exhibit the work e.g. in the office foyer, hallway, hall. Each child should make a written statement to attach to their work, relating to their animal and plastic pollution. Have an exhibition of the work, with an official opening, like in an art gallery. Invite parents and friends. Consider inviting a marine scientist or a notable person to launch the exhibition.

After the marine creatures have been made, recycle the remaining waste that is recyclable. After the exhibition, each child should take their work home, or make some a fixture in the classroom.



LESSON 12

Art from Ghost Nets

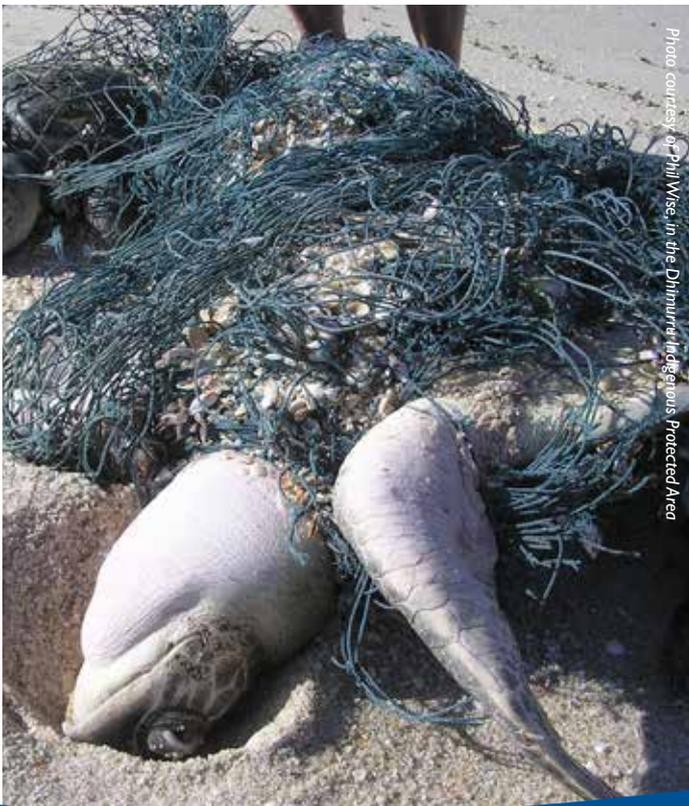
In this lesson, students learn about the problems associated with discarded rope and nets in the marine environment and that such ropes and nets can be used to make baskets, weavings, sculptural fish, shadow puppet plays and even carpet!

Meets Science ACSSU072 Living things have life cycles

Arts ACAVAM111 Use materials, techniques and processes to explore visual conventions when making artworks

Arts ACAVAR113 Identify intended purposes and meanings of artworks using visual and arts terminology to compare artworks, starting with visual artworks in Australia including visual artworks or Aboriginal and Torres Strait Islander Peoples

Sustainability OI.1 - OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility



You will need

- Discarded marine rope and/or nets
- Large darning needles
- Scissors
- Fishing line or similar thin, strong nylon string

Suggested Teachers Script

ENGAGE

(Have the children sit on the carpet on the floor). Ask them if they know what the carpet is made from?

A long time ago, all carpets were made with woollen fibres, which meant rearing and shearing sheep, dyeing fleece, spinning yarn, weaving on huge looms. Nowadays, most carpet is made from nylon, a type of plastic.

Imagine how much carpet is used in the world, in houses and offices? And when it gets old and worn, it gets thrown out. In Australia and New Zealand, 5000 garbage trucks of commercial carpet make their way to landfill each year (Australian Ethical Investments 2015)

Interface Carpets have been working with a yarn supplier company called Aquafil, who can convert used nylon product, such as used fishing net, to a yarn that can be used for carpet. Interface buy old discarded nets from developing countries such as the Philippines for use by Interface in carpet tiles. Carpet tiles (or squares) are good – why do you think they are good? (Because if you get a worn or stained square, you can just replace that one). To date, 41,400 kg of nets have been collected. Stretched end to end, that would be the distance around the planet! (Australian Ethical Investments 2015)

It is good that carpet can be made from used fishing nets, because discarded or escaped nylon fishing nets ('ghost nets') are having a devastating impact on marine wildlife, which gets caught in it.

Possibly the greatest Australian 'hotspot' for these is in northwest Western Australia, stretching to the Northern Territory coast, but a lot of marine debris also ends up on the coast of Tasmania, including rope.

Method

Show the students the following website about ghost nets. See <http://www.ghostnets.com.au/resources/videos/>

Watch the videos "The Young Man and the Ghost Net", from Moa Island in the Torres Strait, and the Blackmores Ghost Nets



LESSON 12

Art from Ghost Nets

continued

Art Project. Explain where the Torres Strait Islands are, and that the islanders are also Australians.

Suggest that we can also re-use old fishing nets or rope to make art works, which can stimulate discussion and action about marine pollution.

Activity

EXPLORE

Choose which activity you would like to undertake with your children. To make coiled coasters or baskets, have a look at the web page <https://au.pinterest.com/pin/567523990522872089/>

Or maybe use “The Young Man and the Ghost Net” shadow puppet play as an inspiration to do your own play.

Marine rope can also be woven into an existing wire frame/ washing basket/wire basket/chicken wire/refrigerator shelves or gutter guard – any lattice/perforated frame.

In response to community concerns about the buildup of marine debris along the shoreline in Tasmania’s D’Entrecasteaux Channel and Huon River areas, marine farming operators and local community members have ‘adopted’ areas of the shoreline, and regularly conduct marine debris clean-ups. Staff and volunteers have been trained to reduce disturbance to shorebirds when conducting these shoreline clean-ups.

Another initiative includes the adoption of a unique rope design for use in aquaculture (‘fish farms’). One salmon producer is supplied with rope uniquely identifiable to that company only. In addition to greater accountability, the unique rope design helps them to manage their waste reduction processes.

EXPLAIN/ ELABORATE/ EVALUATE

Ask the children to write a statement about their woven basket or piece. If they put on a shadow puppet play, ensure that the children do the text for the play with a message about the problems related to plastic in the sea.



References

Australian Ethical Investments 2015, Good Money magazine, Issue 5, Australian Ethical Investment, Sydney.

Ghost Nets Australia 2016, viewed 28 February 2022, <http://www.ghostnets.com.au/resources/videos/>

Pinterest, viewed 28 February 2022, <https://au.pinterest.com/pin/567523990522872089/>



LESSON 13

Whales, Whale Rescue and Plastic

Students learn the biology of whales including size, feeding strategies and whale communication. The history of whaling in Tasmania is also covered in this activity. More whales beach themselves in Tasmania than any other Australian State – students learn what to do if they find a stranded whale and learn some possible contributing factors, including beach geomorphology, family connections and plastic ingestion.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Maths ACMMG084 Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (ACMMG084)

Sustainability OI.1-OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems

All photos courtesy of Marine Conservation Program, DPIPWVE



Teachers Notes

It is best to conduct this exercise at the beach, but it can otherwise be conducted at school. At school, choose an outdoor area or hall if possible, because the exercise will involve 'stepping out' the length of whales.

Allow 1 hour for this exercise, or 1.5 hours for this exercise if at the beach.

You will need

The following materials are recommended and can be borrowed from the Parks and Wildlife Service Tasmania (Hobart).

- a sample of baleen
- buckets and spades
- mini-models of whales
- various whale photos and posters
- a small tarpaulin
- sample of krill embedded in resin

As well, you will need a map of the world (preferably showing sea currents), a 'builders' tape measure, a blindfold and some old towels or sheets.

You can source a downloadable information sheet about [whales](#) from the Tasmanian Parks and Wildlife Service.

Method

ENGAGE

Ask the students what they know about whales.

Suggested answers/content–

- *Mammals – they are warm blooded, breathe air, bear live young, have a long gestation (9-18 months), suckle their young on milk*
- *Often large – blue whale is the largest animal that ever lived (bigger than dinosaurs)*
- *Whales communicate – by 'songs' and clicking sounds, breaching, tail slapping*
- *Each whale species makes a different shape of water spouting out of its blowhole*
- *Each individual has individual markings on its tail flukes*
- *Whales are believed to be very intelligent*

There are 2 types of whales –

1. *Toothed whales e.g. dolphins, Orca/killer whales, uses teeth for feeding*
2. *Baleen whales e.g. the humpback. Baleen is keratin, like our fingernails, which hangs in vertical strips from the upper jaw and sifts out tiny crustaceans (krill). The humpback can consume*



LESSON 13

Whales, Whale Rescue and Plastic

continued

over two tonnes of krill each day. The humpback displays bubble-netting behaviour, expels a stream of bubbles from the blowhole while ascending in a spiral to the surface. These bubbles form a cylindrical wall which surrounds and traps the krill, the whale swims upwards with its mouth open.

Adaptations

1. Size
2. Blubber – regulates the temperature despite the cold
3. A big heart - whales such as the sperm whale can submerge for 1.5 hours and dive to a depth of 2 kilometres!
4. Echolocation – high frequency sound which strikes objects and returns as echoes

Show whale posters if you have them, indicating relative size.

Activity

EXPLORE

Select 8 children. Choose 7 children to be 'whales' and choose one to be the 'school bus'. From a starting point, the teacher takes one child with him/her and uses the tape measure to step out 18 metres, the length of a sperm whale. Invite the first child (the sperm whale) to stand at that 18m point. Tell that class that this child is the sperm whale. Then place a child at the 17 metre mark and explain that this is the size of the southern right whale. Place a child at the 16m mark: that is the humpback, at 12m : the school bus, at 10m: the killer whale, at 8m: the minke whale, at 7m, the long finned pilot whale 7m, common dolphin 2.3 metres from the starting point.

Go back to the starting point. Call out, by name, each of the 'whales' and the 'school bus' and ask them to respond in turn, waving their arms! Explain that this is the length of each of the whales.

Compare the size of the whales to the 'school bus'.

Suggested Teachers Script

There are 43 species of whales in Australia, 28 of these in Tasmanian waters.

The most common whales in Tasmania are the **common** and **bottle-nosed dolphins** (yes, dolphins!). Our baleen whales include the **southern right** and **humpback**, which come close to land and people can see them from the beach on our East Coast.

Humpbacks breed in Queensland and WA May-July, then they feed in Antarctic waters between Sept-Nov. (show map of the world), so they travel via Tasmania.

Southern Right whales breed in the southern mainland June-Sept, then come south Sept-late October. Some give birth in Tasmanian waters – sometimes in the Derwent near Hobart.





LESSON 13

Whales, Whale Rescue and Plastic

continued

History of Whaling in Tasmania

In 1804 a man named Knopwood claimed that when crossing the River Derwent near Hobart ‘we passed so many whales that it was dangerous for the boat to go up the river unless you kept very near the shore’. It was also reported that residents were kept awake at night from the noise of the whales’ blowholes.

In 1805 the first whaling station was set up in Ralphs Bay near Hobart by early European settlers. Southern Right Whales (so called because they were the ‘right’ whales to kill!) were killed because they came close to shore, were slow swimmers, were rich in oil and floated when dead. Whale oil was prized because it was used for lighting, heating, cosmetics and crayons. Ambergris, from the intestine, was used in the perfume industry. Their baleen was used for corsets and their bones and teeth were carved. More than 26,000 whales were killed in Australia and NZ, leaving as few as 300 by the early 1900s. The Southern Right whale is endangered, but numbers are very slowly increasing.

Whale Strandings

Sometimes, toothed whales are found stranded on beaches. Whales beach themselves in Tasmania more than any other State. Common dolphins and pygmy right whales are the most likely to be found stranded (*show posters/photos*). Sometimes, hundreds of whales beach themselves. For example, 198 whales were found on a beach in Bicheno in 1992.

Why do they strand?

EXPLAIN

Ask the students to guess why whales strand/beach themselves. Humans don't really know why whales beach themselves. Some people say that when the military uses SONAR to navigate, this disturbs whales and dolphins. Another theory is that they cannot navigate using their echolocation on a flat sandy beach e.g

their high pitched sound waves do not bounce off the beach and back to them, compared to if they bounce the sound off a sea cliff. Whales live with very strong family connection, so if one whale is stranded, the others in their pod hear their distress calls and come to rescue them: then the pod also get beached. With small whales and dolphins it is possible that killer whales have panicked the herd, forcing them towards the shore. Sometimes individual beached whales have been found with large amounts of plastic in them.

Activities

Imagine you have echolocation - Try this with your class— each child can make a noise into their own hand, which is close to their mouth. They make a noise, then they outstretch their arm with their palm facing them, and make a noise into their palm, and imagine the sound taking a longer time to ‘bounce’ back. That might tell them the size, shape and distance of their hand. Lay the hand relatively flat, make a sound – imagine that the sound does not ‘bounce’ back. That represents the difficulty of echolocation on a sandy beach.

Play the Echolocation Game - (like the game Marco Polo) Get the class in a circle holding hands. Choose three volunteers to come in the middle. Put a blindfold on one designated as a ‘whale’. The other two kids are not blind-folded; they are the ‘fish’. The blind whale calls out “whale” and the fish have to respond by calling out the word “fish”. The whale tries to catch the fish, using its echolocation to hunt. If you have time, let other children play the game.

Suggested Teachers Script

How can we help a stranded whale?

ELABORATE

Ask the students to imagine they have found a beached whale. In groups of three students, spend a couple of minutes discussing what a person could do if they come across a beached whale, and how they could ensure that the people involved are safe. Re-group as a whole class.

The toothed whales which strand themselves are the smaller whales. They can be returned to sea, if they are in good health. Usually only adults are allowed to help stranded whales, but you will become adults, and until then, if you are first on the scene, you can help the adults in many ways from what you learn here today. These are the tips for a whale rescue:

- Text Parks and Wildlife on 0427 WHALES, tell them where you are, and how many whales.
- Keep calm around the whales – be quiet and keep dogs away.
- Stranded whales, if they are still alive, can be dangerous – they may not deliberately hurt a human but may thrash their tails. Keep away from the tail.
- People who help whales in the water need make sure they



LESSON 13

Whales, Whale Rescue and Plastic

continued

do not get too cold. They need thick wetsuits and booties, and dry clothes to change into afterwards. It can be cold in Tasmanian water.

- Whales are very heavy, so can crush under their own weight when they are not in water.
- Roll them onto their stomach if possible, so they can breathe through their blowhole – do not let water get into the blowhole. Dig a hole to free their pectoral (side) fin when they are rolled, otherwise the fin might break.
- Whales have a lot of blubber, which helps them keep warm, but in the hot sun, it can 'cook' them. They need to be kept cool – e.g. with wet towels or blankets.
- If possible, face them towards the water.
- Whales should be released all at once, otherwise, if one is released, the others will hear the distress calls of the beached ones, then swim back to save them.



EVALUATE

Activity

Do a mock 'whale rescue' – ask a volunteer to be a whale, lying on his/her back on the sand or in the shallows in hot weather, with fins (hands) sticking out to the side. Pretend the human helpers have wetsuits on. Dig the sand to make room for the pectoral fin. Roll the 'whale' onto his/her stomach, onto the tarpaulin. Face the whale out to sea. Using the buckets, have the other children run to the shallows to collect (pretend) water. Cover the whale, except for the head/blowhole, with a towel. Keep 'wetting' the towel. Pretend that you are able to release the whale to sea when all other whales are ready. Watch for the flapping tail.

Suggested Teachers Script

Marine litter and whales

Marine litter can have extreme consequences for many forms of marine life. As we have learnt from previous lessons, plastic ingestion is a risk for all marine wildlife, even small invertebrates that may filter tiny microplastics/nanoplastics from the water. Does anyone know what marine litter does to sea animals and birds? (e.g. seals get caught up in rope netting, seabirds/turtles ingest plastic). Dolphins and whales can also be caught in plastic, even the large baleen whales. In Tasmania, most of the whales that become entangled are baleen whales which get caught in commercial fishing gear.



Top order predators such as whales and dolphins are all at risk of ingesting plastics, including large plastic items that obstruct the gut, which they mistake for prey. Baleen whales may also ingest tiny microplastics (or prey that have already ingested microplastics) and these plastics may have chemicals attached to them, affecting the health of the whale over time. There is some new research identifying this as a threat to baleen whales, but more research needs to be done to work out how much of a problem it is.



LESSON 13

Whales, Whale Rescue and Plastic

continued



This photo shows the stomach contents of a deceased Risso's dolphin found in northern Tasmania. The photo shows plastic film and inshore seaweed. Seaweed is not a typical dietary item, but is common in stranded animals that have spent some time compromised in shallow water. Risso's dolphins commonly prey on tunicates, salps and cephalopods, which can be superficially similar to a plastic bag in appearance, hence this may be why plastic was found in the stomach of this dolphin.

Let's have a brainstorm about what we can do about this problem of litter in the sea affecting whales.

Ideas could include:

- *After having a picnic at the beach, clean up your rubbish*
- *On a beach-walk, pick up rubbish if it is safe to do so*
- *Do not litter. Litter can enter the stormwater drain via wind or rain, then that drain leads to the sea.*
- *Reduce, re-use, recycle plastic so less plastic is used*
- *When fishing from a jetty or rocks, take all waste home*
- *Do not let rubbish fall or blow off a fishing boat*
- *Fish farms could try to reduce loss of ropes etc.*



LESSON 13 EXTENSION 1

Build a Whale Sandcastle

Building a whale sand castle can give children a sense of scale of a whale, and its anatomy.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive



Photo courtesy of PWS, photographer Joe Shemish

Method

Build a whale sized sandcastle, or make a human outline of a whale on the ground, with children lying with outstretched arms above their heads, touching the next classmate's toe. Decide which whale to make, depending on how many children there are.

Include the features of the whale, including the fins and tail, blowhole and mouth.

The Tasmanian Marine Conservation Program has a Tasmanian Cetaceans Identification Guide at <https://nre.tas.gov.au/wildlife-management/marine-conservation-program/whales-and-dolphins-in-tasmania> where features and sizes of whales are depicted.



LESSON 14

Wrapping up: Reducing, Re-using and Recycling Plastic

In the past 13 lessons, students have looked at waste in society and the changing role of plastic in our lives. They looked at the impacts of plastic packaging, plastic bags and plastic bottles and asked themselves if they can *reduce* our use these things. The students have seen the devastating impact of discarded plastic in the marine environment and learnt to *re-use* plastic in artistic ways. In this final lesson, students investigate how to *recycle* plastic, completing the 3Rs for plastic – reduce, re-use, recycle. In this final lesson students also recollect what they have learnt about the role and prevalence of plastic, how it can affect our environment, and what they can do to change the impact of plastics.

Meets Science ACSSU072 Living things have life cycles

Science ACSSU073 Living things, including plants and animals, depend on each other and the environment to survive

Science ACSSU074 Natural and processed materials have a range of physical properties; these properties can influence their use

Sustainability OI.1- OI.9 In summary, all life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival. Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems. Actions for a more sustainable future reflect values of care, respect and responsibility

Photo courtesy of Alasdair Dermer, in the Dhimurru Indigenous Protected Area



Teachers Notes

If you have kerbside collection of recyclables in your town/city, investigate the things that are recycled in your kerbside collection. Note the types of plastic containers that can be recycled. Show the students websites and/or brochures of the types of recyclables collected in your town/city.

Suggested Teachers script

ENGAGE

Throughout the previous lessons on the theme of plastic, we have learnt about the role of plastic in our lives.

Can anyone remember what we looked at? (*allow feedback*)

- The many uses of plastic in the home - *discuss*
- The role of packaging and how we could reduce it- *discuss*
- How to host a packaging-free lunch- *discuss*
- How lightweight plastic bags can have an environment impact - *discuss*
- How we can reduce plastic bags - *discuss*
- The environmental impact of disposable plastic bottles and whether we need to drink from them - *discuss*
- The devastating impacts of marine litter in the sea, through ingestion and entanglement - *discuss*

Tell me some ways that we can

- 1) reduce plastic
- 2) re-use plastic; and
- 3) recycle plastic

Can you recall some of the environmental issues relating to the incorrect disposal of plastics? (*allow feedback*)

Many plastic can be recycled. You may have noticed that most plastic containers display the PIC (Plastic Identification Code) triangle – the symbol most of us call the 'recycling triangle'. The triangle and corresponding number are used to indicate what plastic was used to make the container.

Activity

EXPLORE/EXPLAIN

Conduct a 'Recycling Relay'.

You will need:

- brochures/websites of the types of recyclables collected in your town/city
- 4 buckets or crates, each marked either as 1) compost 2) plastic bags 3) recyclable 4) rubbish



LESSON 14

Wrapping up: Reducing, Re-using and Recycling Plastic

continued

- 5 different plastic bags
- 5 different pieces of rubbish (not recyclable)
- 5 different pieces of food waste such as waste fruit/peelings
- An assortment of **many** e.g. 20 different recyclable items/containers such as paper/cardboard, plastic bottles, steel cans, glass
- An open area such as the playground/ a grassy area or in the event of bad weather, a hall.

Method

Show the children the brochures/websites about what can and cannot be recycled in your local area. Discuss. Explain that containers such as juice bottles need to have their lids removed, otherwise they cannot be crushed in the recycling depot.

In the playground, grassy area or hall, set up a row of the buckets, crates or bins. Then split the class into 5 even teams. Any remaining children can act as monitors, (maybe those kids who cannot run on the day) and situate these monitors near the bins. Arrange the 5 teams in five columns (as per below) with the waste bins and containers at the end of the 30 metre relay course.

Compost bin	Plastic bags	Containers	Recyclable bin	Rubbish bin	30 metres
Team 1	Team 2	Team 3	Team 4	Team 5	

Allocate a starting line e.g. 30 metres from the bins. Give each team an equal number of an assortment of *different* plastic bags, rubbish, food waste and recyclable items/containers. After a starting call, have one competing member from each relay team take turns running to the bins, depositing one item in the correct container at a time, then racing back and tagging a teammate, who then picks up the next item and runs to the bins. The relay ends once all the teams have disposed of their articles, but notice

is made of which team finished first, second, third, fourth and fifth.

Then the bins are checked to ensure that the correct items are placed in each. If there is a team which placed an item in the wrong bin, they are disqualified! (The teams will have to remember which items they had). The first team to place their items in the correct bin wins. If there are any ways this game can be improved, discuss improvements and host the game again. For example, colour coding each 'waste'/recyclable according to teams.

ELABORATE

Scrutinize the contents of the bins, as a class, after the game. Were there any items that people were unsure of e.g. wrappers? Compare this to the information/brochures from the Council re what can and cannot be recycled.

EVALUATE

To recap this module, host a discussion on *why* we should reduce, reuse and recycle plastic? (e.g. *to harness the energy and resources in the plastic, to avoid using new materials, to avoid filling up tipsites/landfill, to prevent plastic litter on land or in the sea, to reduce the threat to wildlife and to human health*)

Envorinex™ is a Tasmanian company based in George Town, currently the only Tasmanian company specialising in retrieving industrial plastic waste, recycling it into pellets and re-manufacturing it into innovative products such as sanitation chambers for developing countries, fence posts, road way grids and webbing. As well as recycling other people's waste, Envorinex™ have a commitment to recycle their own products, ultimately reducing waste going to landfill.

If you are in the George Town area and wish to host a visit from Envorinex at your school, contact Jenny Brown on 0428591672 or jenny.brown@envorinex.com.



Photo courtesy of Rethink Waste

