Plotting Against Waste

YEAR 5, 6, 7
CHEMICAL SCIENCES

Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business aiming to increase awareness and understanding of the value of science, technology, engineering and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

QUEENSLAND MUSEUM NETWORK   Queensland Government   THE UNIVERSITY OF QUEENSLAND AUSTRALIA

ENGAGE

Plotting Against Waste

Teacher Resource

Waste generation accompanies all human activities. It is produced by households, institutions and businesses, and through demolition and construction activities. It can occur in solid, liquid and gaseous forms and, if not disposed of appropriately, can significantly impact the environment.

Waste that is out of place, that is waste that has been deliberately or accidentally left lying in an open or public space, is litter. Litter can be moved from place to place by wind, water, traffic and animals; it pollutes the environment, can harm living things and facilitates the spread of disease and pests. Despite the many problems associated with litter, we can all play a part in reducing and preventing its presence in our communities.

This activity is designed to set the context for future learning, create interest and stimulate curiosity. During the activity, students collect litter from their local community. They sort, count and analyse the litter that is collected, calculate the percentage frequency of collected litter types and represent this data using a pie chart. Students could also plot the location of litter on a map of their chosen collection site using a grid reference system, for example by drawing a grid reference over a map of the school grounds.

If desired, data that is collected by students can be entered into the Australian Marine Debris Database. This database enables individuals to collect data on the amounts and types of marine and terrestrial debris impacting environments around the country. A substantial number of specific categories are used to sort collected litter items. If entering data into the Australian Marine Debris Database, you may wish to share these categories (see following page) with students before they begin sorting collected litter items.

Many organisations such as schools and workplaces encourage staff o regularly collect litter, for example Queensland Museum staff pick up lit er around the Cultural Centre Precinct every Thursday lunch (see *Queensland Museum: Where the Research Happens*). Students are encouraged to do the same in their local area.

> **Please note: Ensuring student safety during the litter collection is of utmost importance.**
> Explicitly discuss safety requirements with students prior to engaging in the activity, including:
>
> - Litter that is and is not acceptable to pick up (i.e. glass, broken glass, jagged tin, medical or sanitary waste, animal waste).
>
> - The wearing of personal protective equipment, including appropriate gloves, and/or use of pick up tongs throughout the litter collection.
>
> - Washing hands with soap after completing the litter collection.

Australian Marine Debris Database Item Categories

Plastic packaging items

- Bleach and cleaner bottles
- Lids and tops, pump spray, flow restrictor and similar
- Mesh bags
- Packaging accessories
- Personal care and pharmaceutical packaging
- Plastic bags
- Plastic bottles, drums, jerry cans and buckets
- Plastic containers, non-food
- Plastic drink bottles
- Plastic packaging, food (wrap, packets, containers)
- Plastic sheeting (tarpaulin, woven bags, pallet wrap)
- Plastic wrap, non-food (bubble wrap etc.)
- Strapping band scraps
- Strapping band whole
- Synthetic cardboard (corflute) signs and packaging   Plastic fishing items
- Aquaculture items
- Bait and tackle bags and packaging
- Bait containers and lids, bait savers
- Baskets, crates and trays
- Commercial fishing remnants (float, pot, crate bits)
- Commercial fishing traps, pots and intact parts
- Glow sticks
- Fishing line
- Fishing net
- Plastic buoys and floats
- Recreation fishing items (lures, floats, rods, reels)
- Rope and net scraps
- Rope

Plastic consumer items

- Childcare items
- Cigarette butts and filters
- Cigarette lighters
- Fibreglass fragments
- Pens, markers and other plastic stationary
- Plastic ceremonial and festive (wreaths, flowers)
- Plastic furniture, outdoor and camping
- Plastic gardening items, implements and fittings
- Plastic housewares, tablewares, house fittings
- Recreation and outdoor equipment
- Straws, confection sticks, cups, plates and cutlery
- Toothbrushes, brushes and combs, hair ties etc.
- Toys, party poppers, ribbons, clips and similar

Plastic industrial, commercial, shipping and miscellaneous

- Cable ties and plastic fasteners
- Carpet and lino household, boat deck and padding
- Marine safety, survival and boating equipment
- Municipal activities (tree guard, barrier fence etc.)
- Occupational health and safety items
- Plastic electrical cable, connectors and fittings
- Plastic oddments
- Plastic pipe PVC, irrigation and reticulation
- Plastic tubes and hoses
- Plastic vehicle parts
- Research items, oceanic
- Tags
- Tape adhesive, electrical, duct, hazard marker and rolls

Plastic remnants

- Plastic bits and pieces, hard and solid
- Plastic film remnants (bits of plastic bag, wrap etc.)
- Remnants burnt plastic

Foam items

- Drift net floats
- Foam buoys
- Foam cups, food packs and trays
- Foam insulation and packaging, whole and remnants
- Foam sponge and sheeting
- Weather balloon parts

Metal items

- Aerosol cans
- Aluminium cans
- Foil wrappers, packets, bladders and alfoil
- Metal fishing items (sinkers, lures, hooks, traps, pots)
- Metal bottle caps, lids and pull tabs
- Metal building and trade materials, fixings and fittings
- Metal buoys and floats
- Metal drums, cans and buckets over 4 litres
- Metal motor vehicle parts and batteries
- Metal outdoor equipment, implements and furniture
- Metal scrap and remnants
- Metal signs and sheeting
- Metal tools
- Metal unspecified
- Small machinery and electric motors
- Tins under 4 litres (food, drink tins etc.)
- Wire, metals stakes and pipes

Paper and cardboard items

- Miscellaneous paper, labels and tickets
- Newspaper, magazines and brochures
- Paper and cardboard packaging
- Tetra packs and drink cartons

Cloth items

- Binding, thread, string and cord, natural fibre
- Canvas, sailcloth and hessian materials
- Cloth, clothing, hats and towels
- Rope, natural

Rubber items

- Rubber balloons, balls and toys, elastic straps and bands
- Rubber buffers, tyres, seals and similar
- Rubber footwear and thongs
- Rubber remnants
- Rubber sheeting

Miscellaneous categories

- Unspecified non-plastic items
- Unspecified plastic items

Wood items

- Brooms, brushes and paint brushes
- Processed timber, pallets and other wood
- Wooden fishing items
- Wooden confection sticks, pencils, matches etc.
- Wooden furniture

Other materials

- Appliances, electronics and batteries
- Boat parts, wreckage and remnants
- Building and trade materials, fixings and fittings
- Food scraps
- Organic materials
- Shoes, leather and fabric
- Wax (surf wax candles, paraffin and simila)

Curriculum Links

Science

YEAR 5

Science as a Human Endeavour

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083)

Science Inquiry Skills

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS090)

Compare data with predictions and use as evidence in developing explanations (ACSIS218)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS093)

YEAR 6

Science as a Human Endeavour

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)

Science Inquiry Skills

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS107)

Compare data with predictions and use as evidence in developing explanations (ACSIS221)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS110)

YEAR 7

Science Inquiry Skills

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS129)

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130)

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

YEAR 8

Science Inquiry Skills

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS144)

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145)

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

Mathematics

YEAR 5

Number and Algebra

Use efficient men al and written strategies and apply appropriate digital technologies to solve problems (ACMNA291)

Measurement and Geometry

Calculate perimeter and area of rectangles using familiar metric units (ACMMG109)

Estimate, measure and compare angles using degrees. Construct angles using a protractor (ACMMG112)

Statistics and Probability

Pose questions and collect categorical or numerical data by observation or survey (ACMSP118)

Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)

YEAR 6

Number and Algebra

Select and apply efficient men al and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers (ACMNA123)

Measurement and Geometry

Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)

Statistics and Probability

Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)

YEAR 7

Number and Algebra

Round decimals to a specified number of decimal places (ACMNA156)

Measurement and Geometry

Establish the formulas for areas of rectangles, triangles and parallelograms, and use these in problem-solving (ACMMG159)

Statistics and Probability

Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)

Humanities and Social Sciences

YEAR 5

Knowledge and Understanding: Geography

The influence of people, including Aboriginal and Torres Strait Islander Peoples, on the environmental characteristics of Australian places (ACHASSK112)

The environmental and human influences on the location and characteristics of a place and the management of spaces within them (ACHASSK113)

Inquiry and Skills

Develop appropriate questions to guide an inquiry about people, events, developments, places, systems and challenges (ACHASSI094)

Locate and collect relevant information and data from primary sources and secondary sources (ACHASSI095)

Organise and represent data in a range of formats including tables, graphs and large- and small-scale maps, using discipline-appropriate conventions (ACHASSI096)

Interpret data and information displayed in a range of formats to identify, describe and compare distributions, patterns and trends, and to infer relationships (ACHASSI100)

Evaluate evidence to draw conclusions (ACHASSI101)

Present ideas, findings, viewpoints and conclusions in a range of texts and modes that incorporate source materials, digital and non-digital representations and discipline-specific terms and conventions (ACHASSI105)

General Capabilities

Numeracy

Estimating and calculating with whole numbers

Using fractions, decimals, percentages, ratios and rates

Using spatial reasoning

Interpreting statistical information

Using measurement

Critical and Creative Thinking

Inquiring – identifying, exploring and organising information and ideas

Reflecting on thinking and processes

Personal and Social Capability

Social management

Plotting Against Waste

Student Activity

Making Predictions

1. Before collecting litter, make predictions about the following:

    What types of litter do you think you will collect? Why?

    Which type of material do you think will be most frequently collected? Why?

   Which type of material do you think will be least frequently collected? Why?

Analysis of Litter

Location	
Date	
Time	
Duration (hrs)	
Area Covered (m²)	
Total Number of Litter Pieces Collected	

Litter Type	Tally	Total	Percentage of Total	Pie Chart Angle
Paper				
Plastic				
Metal				
Textiles				
Organic				
Composite with plastic				
Other composite				
Other				

Representing Results

1. Present the data you have collected in a pie chart.
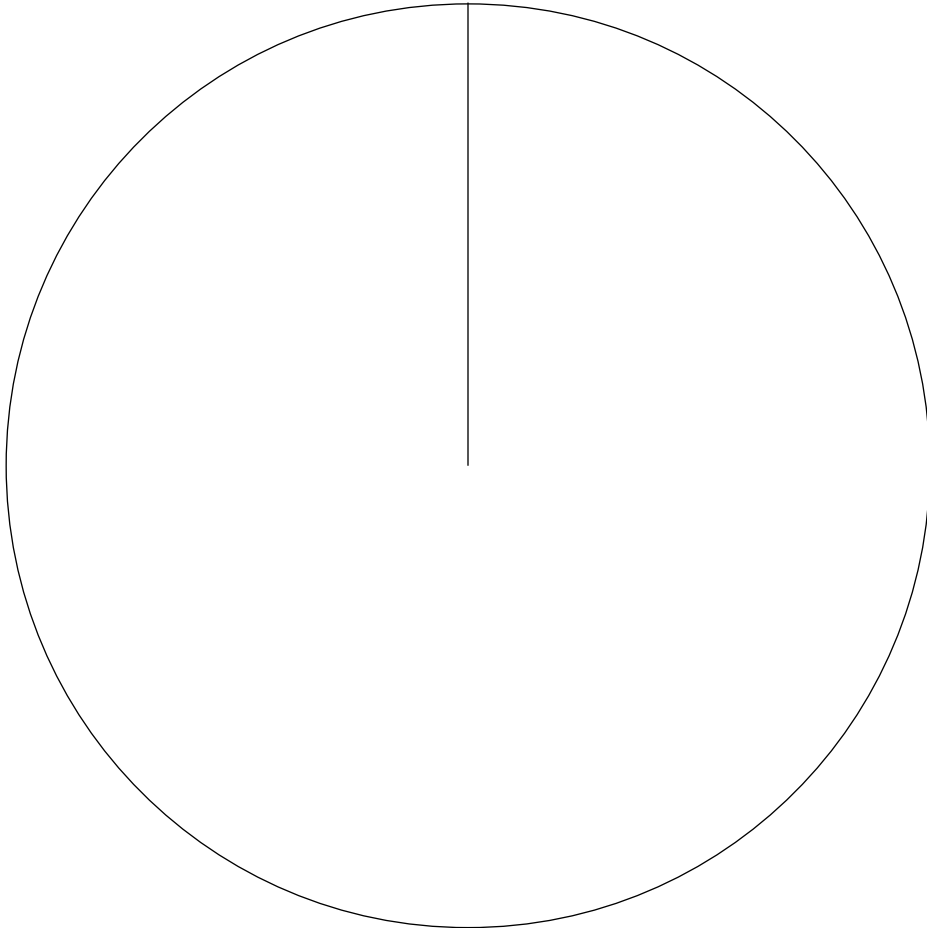
Pie Chart Tips

- Write a title.
- Organise the segments by size, from largest to smallest working in a clockwise direction.
- Label each segment with the data type and percentage value.

Discussing Results

1. Identify the most frequently collected type of litter. Why do you think this was the most common type of litter collected at your chosen site?

2. Identify the least frequently collected type of litter. Why do you think this was the least common type of litter collected at your chosen site?

3. Did your results match your prediction? Why?

4. Compare your pie chart to another group's pie chart. Describe any similarities or differences you notice between the two pie charts.

5. Discuss possible reasons for any similarities or differences you observed.

6. Would you expect to find similar results if litter was collected in the following locations? Make sure to justify your response.
   - In a paddock
   - On the beach
   - Around a sporting field

7. Brainstorm some solutions! What could be done to reduce the amount of litter in your local community?