Pre-primary – Year 2

Worms

Teacher booklet

GOVERNMENT OF WESTERN AUSTRALIA

WASTE AUTHORITY
WA...TOO GOOD TO WASTE

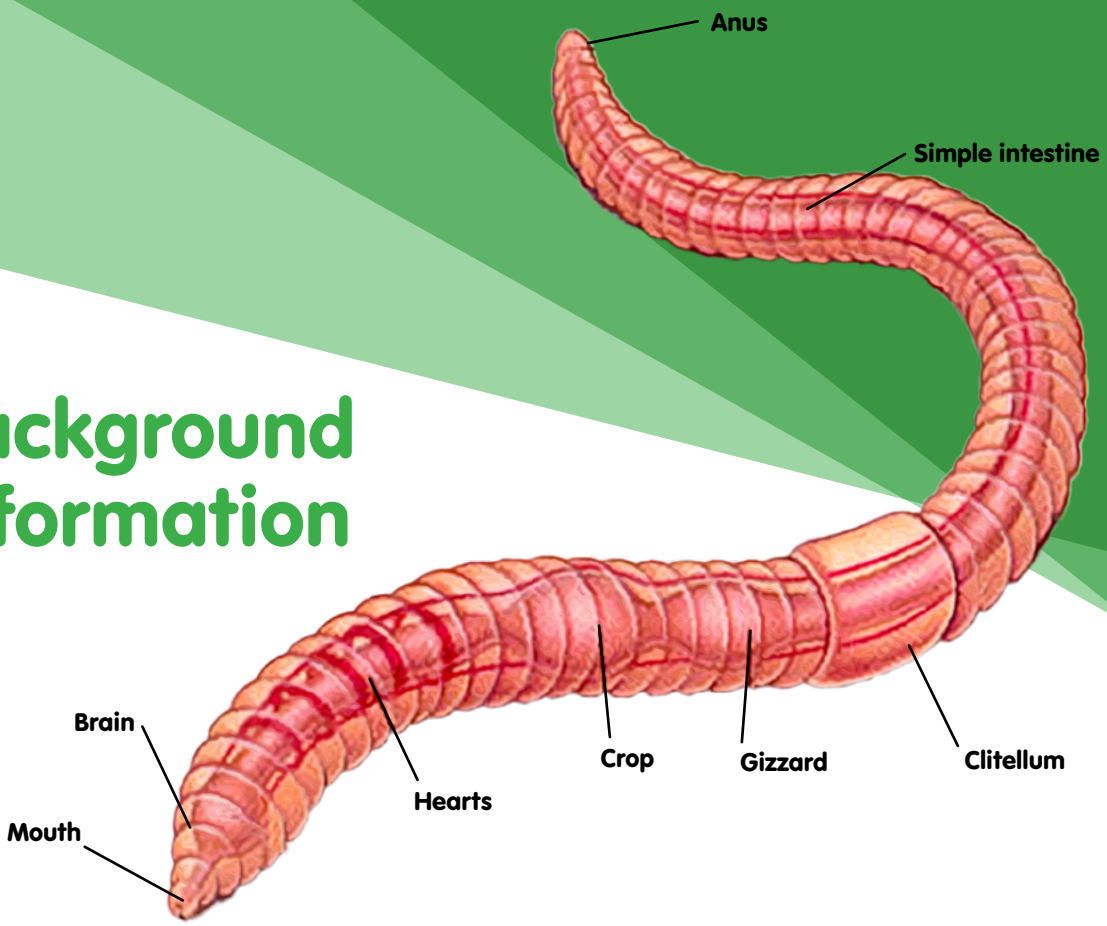
WasteSorted Schools

Contents

Worm science

Pre-primary – Year 2

Background information



Why do we have worms?

Worms are often considered to be little 'soil farmers' and by simply living, eating and reproducing they provide a wonderful service to plants and to us. Worms eat a wide variety of items including old plant material and food scraps. Their castings are expelled into the soil and provide nutrients for plants. As the worms move through the soil, their tunnels enable air and water to filter into the ground and loosen up the soil for plant roots, allowing easier absorption of oxygen and water by the plants.

The earthworms that we use in worm farms are a different species to those we find in our gardens. The best worms for worm farming are European worms such as the Red Wriggler (Lumbricus rubellus) and the Tiger Worm (Eisenia fetida). Another good composting worm is the Indian Blue (Perionyx excavatus) that comes from Asia. These species are accustomed to soils high in nutrients. They are used in worm farming because they eat and breed much faster than other earthworms and can quickly transform our waste scraps into worm castings.

Description and characteristics of worms

Earthworms are invertebrates, which means they have no backbone. They belong to the phylum Annelida, which also includes leeches and marine worms. Annelids are different from most other invertebrates because they have long cylindrical bodies made up of many similar segments, and lack appendages, antennae, and an obvious head.

The earthworm is blind, but sensitive to light. Its instinct is to move away from light due to its two 'photoreceptors' which are sensitive nerve endings located near the saddle at the anterior (Murphy 2005).

It has three to five hearts depending on the species and breathes through its skin which is a mucous membrane.

We can identify its 'head' (anterior) as it is the end closest to the clitellum, a band around the worm near the centre and commonly referred to as the saddle. It feeds by using its mouth or prostomium.

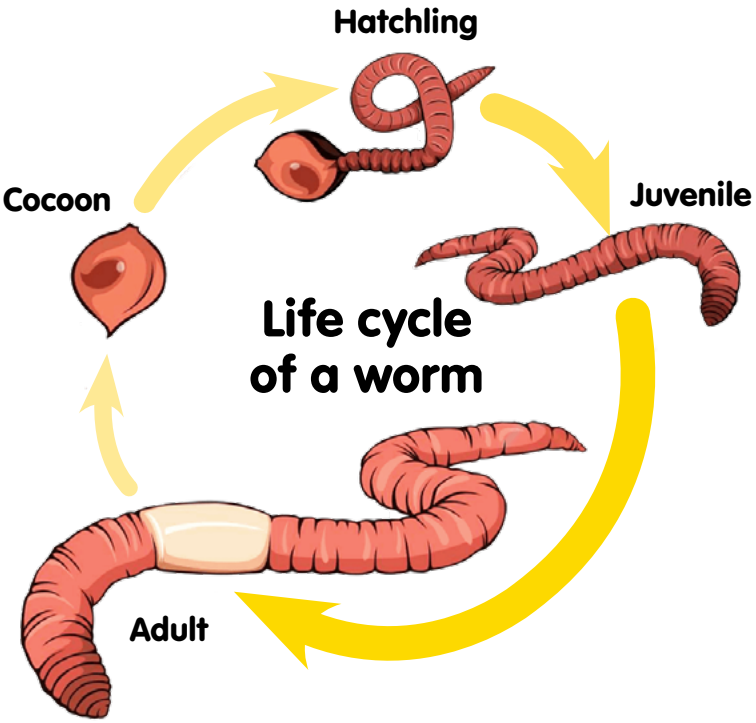
It moves through the soil by contracting and expanding its muscles and using its setae (bristles) to grip the soil.

Life cycle of a worm

Earthworms are hermaphrodites, which means they have both male and female sexual organs.

The method of reproduction varies between the different species. For tiger worms (common composting worms), two worms are needed for reproduction. During mating, the two worms align their clitellums, cover themselves in sticky mucous and exchange sperm. The worms separate and each worm's clitellum produces a thick mucous ring. As the worms wiggle backwards out of this ring, the eggs are picked up and then fertilised by the stored sperm.

Ultimately, the mucous ring forms a capsule around the fertilised eggs which is deposited in the soil. Each capsule contains four to ten infant worms, which hatch after about two weeks under the right conditions.



Worm key words

Adaptations: Any behavioural or physical characteristics of an animal that help it to survive in its environment.

Annelida: A large phylum of segmented worms including earthworms and leeches. They are also less-formally known as annelids, the name coming from the Latin 'annelus', meaning 'little ring'.

Cocoon: Formed from a mucous ring and containing the fertilised egg to be deposited in the soil. The Cocoon on average will produce four baby worms and these can hatch after about two weeks in the right conditions.

Clitellum: A clitellum is part of the reproductive system of an annelid (a worm with small rings or segments). The clitellum is a thick, saddle-like ring found in the epidermis (skin) of the worm.

Hermaphrodites: Organisms having both male and female reproductive organs.

Invertebrates: Animals without a backbone.

Photoreceptors: Nerve endings that are extremely sensitive to light.

Saddle: See clitellum.

Segmented: The body is divided into successive segments, as in earthworms or lobsters.

Seta (plural-setae): Stiff hair made of solid keratin that worms have on each segment of their bodies and use for grip and as sensors.

Worm science

Curriculum links

Learning area: Science

Science understanding

Pre-primary

- Plants and animals have basic needs that are met by the places they live (WAPSSUB1)

Year 1

- Plants and animals have external features that serve a purpose and by which they can be grouped (WA1SSUB1)

Year 2

- Plants and animals have life cycles through which they grow, change and have offspring (WA2SSUB1)

Science inquiry skills

Pre-primary

- Pose questions and make predictions based on prior knowledge and shared experiences (WAPSSIQ1)
- Participate in guided and self-initiated investigations safely (WAPSSIPL1)
- Make observations using comparisons (WAPSSIPL2)
- Represent and discuss observations and identify patterns (WAPSSIPR1)
- Discuss similarities and differences between predictions and observations (WAPSSIE1)
- Share questions, predictions, observations and ideas with others (WAPSSICM1)
- Use the senses to learn about the natural and physical world and develop scientific ideas (WAPSSICL1)

Years 1 – 2

- Pose questions and make predictions based on knowledge and experiences (WA1SSIQ1)
- Engage in guided investigations to answer questions, test predictions and assess risks (WA1SSIPL1)
- Make and record observations, including informal measurements (WA1SSIPL2)
- Sort and order data using provided tables and represent data using visual or physical models (WA1SSIPR1)
- Compare observations to predictions and identify further questions for investigation (WA1SSIE1)
- Communicate observations, ideas, and findings using everyday and scientific vocabulary (WA1SSICM1)
- Use science knowledge and understandings to make decisions and choices in their environment (WA1SSICL1)

Learning area: Maths

Measurement and geometry

Pre-primary

- Explore and directly compare the length of everyday items to say which is longer and explain reasoning (WAPMMGTW3)

Year 1

- Directly and indirectly compare lengths, including by counting uniform informal units (WA1MMGTW3)

Year 2

- Estimate, measure and compare lengths by choosing appropriate uniform informal units and placing end to end without gaps or overlaps (WA2MMGTW3)

Timing

These activities should take about four 60-minute lessons to complete, although some lessons could be combined if needed. The first lesson will elicit prior knowledge and introduce the topic of worms. The following three lessons involve hands-on activities where students will examine worms and record their findings. These lessons can be modelled by the teacher with students observing or they can be completed as paired/group activities.

Learning objectives

Students will:

- ✓ discuss where worms live and why they live there
- ✓ learn the parts of a worm's body
- ✓ explore the different stages of the worm lifecycle
- ✓ draw a labelled diagram of a worm
- ✓ describe how a worm looks, feels and moves
- ✓ draw a labelled diagram of the lifecycle of a worm (Year 2)
- ✓ use uniform, informal units to measure the length of a worm
- ✓ investigate how a worm responds to light.

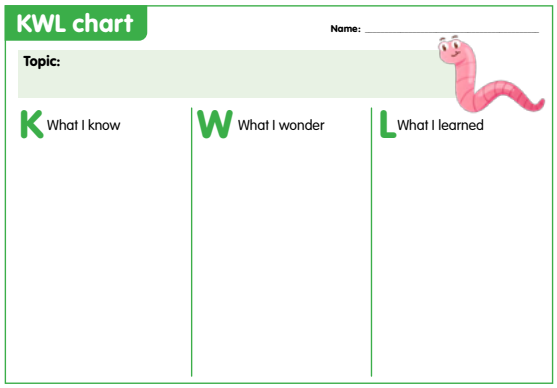
Resources required

- Worm science PowerPoint presentation
- Screen to share with class
- Internet access for YouTube video
- Worms
- Worm castings
- Large plastic sheet
- Light coloured container lids – one per student/pair/group
- Magnifying glass – one per student/pair/group
- Non-standard measurement tools
- Large tray – one per class/group
- Exercise book or piece of paper – one per class/group
- Science journals or worksheets

Lesson 1
All about worms

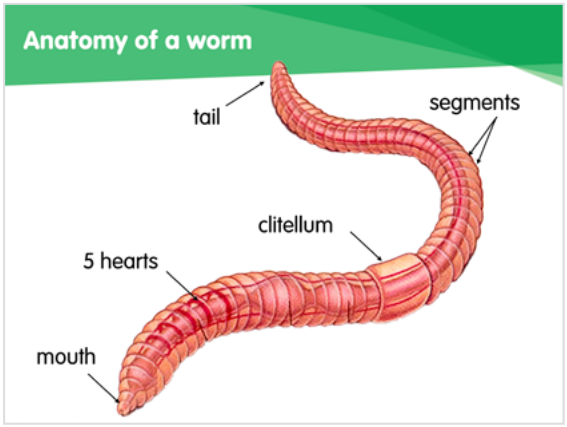
Activities

1. Complete a *KWL chart* to find out what students already know about worms.



2. Watch the video Miss Mac reads Yucky Worms! - YouTube (6:45 minutes).

3. Discuss where worms live and why they live there.
4. Introduce the anatomy vocabulary and label the diagram of a worm on the PowerPoint.



Lesson 2
Looking at worms

To prepare

- Spread some worms and castings out on a plastic sheet. If possible, locate a cocoon and juvenile worm to show the students.
- Students will also need their own worm to examine with a magnifying glass. It is best to place the worms on a light-coloured plastic surface, such as a container lid, and add a small drop of water to stop them from drying out.

Activities

1. As a class, look at a cocoon and discuss what it is.
2. Look at juvenile and adult worms and discuss how they are similar and different.

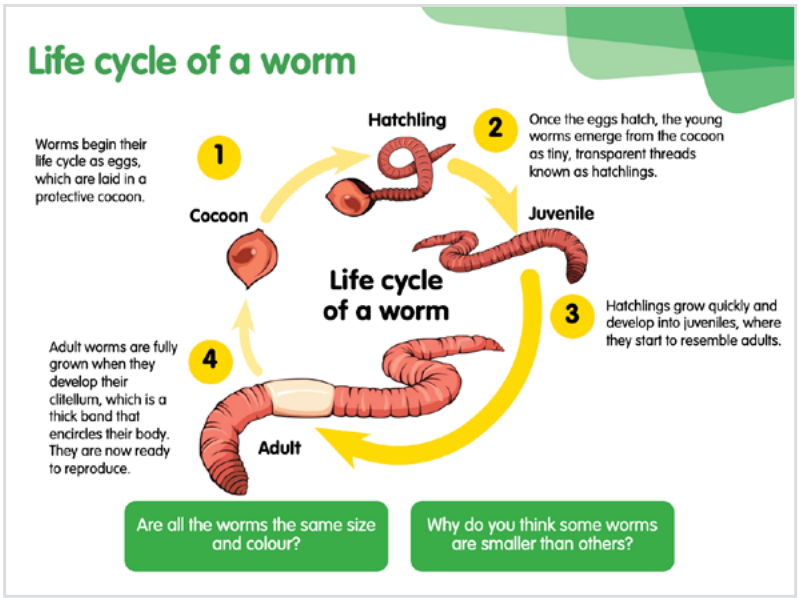
3. Give each student/pair their own worm to look at using a magnifying glass. **Before handing out the worms, remind students that worms are living creatures that must be treated with care.** Place each worm on a plastic container lid with a drop of water to keep it moist. Using a magnifying glass, students observe a live worm, focusing on some of the features discussed in the last lesson.
4. While examining the worms, ask students about the smell, colour and feel of the worm.
5. After examining the worms, students can draw a labelled diagram or complete the *Parts of a worm* worksheet.

Lesson 3
Life cycle of a worm

Activities

This lesson meets the Year 2 curriculum Science Understanding of lifecycles and is optional for P-1 students.

1. Provide the students with castings containing worms.
2. Ask them to locate a cocoon, hatchling, juvenile and adult worm.
3. Discuss how a worm grows and changes during the various stages of its lifecycle.
4. Using the PowerPoint slide to help them, have the students draw a labelled diagram of the life cycle of a worm or complete the *Life cycle of a worm* worksheet.



Lesson 4
Measuring worms

To prepare

> For this activity, students will need worms to measure and items for measuring in non-standard units such as popsticks or cubes.

Activities

1. As a class, brainstorm how the length of the worms could be measured using uniform, non-standard units.

2. Decide on a method to measure the length of the worms. Remember the method chosen, when used by each student, needs to give the same or similar result.
3. Create a table, either individual or whole class, for recording the measurements of the worms or use the *Measuring worms* worksheet.
4. Using the agreed method, students measure their worm and record its length in the table.
5. Calculate the average length of your class set of worms and add it to the table.

Lesson 5

Observing how worms respond to light

To prepare

> Place a thin layer of worm castings and roughly ten worms onto a tray. Have exercise book or piece of paper ready to cover half of the tray.

Activities

1. Observe the worms moving on the tray.
2. Predict what the worms will do once half of the tray has been covered.
3. Cover half of the tray with an exercise book or piece of paper and leave in a brightly lit location for approximately 15 to 20 minutes.
4. While waiting to observe changes in the movement of the worms, watch the Diary of a Worm video Diary of a Worm - YouTube (4:37 minutes).

5. After watching the video, discuss with the class how we know that worms are living things. Use discussion points on the PowerPoint.
6. After sufficient time has passed, examine the tray of worms, noting the difference between the covered and exposed sides, and record your observations on the *Science investigation* worksheet.
7. Discuss what was observed and explain why it happened.
8. Complete the *KWL chart* to show what we have learned about worms during these lessons.

KWL chart

Name: _____

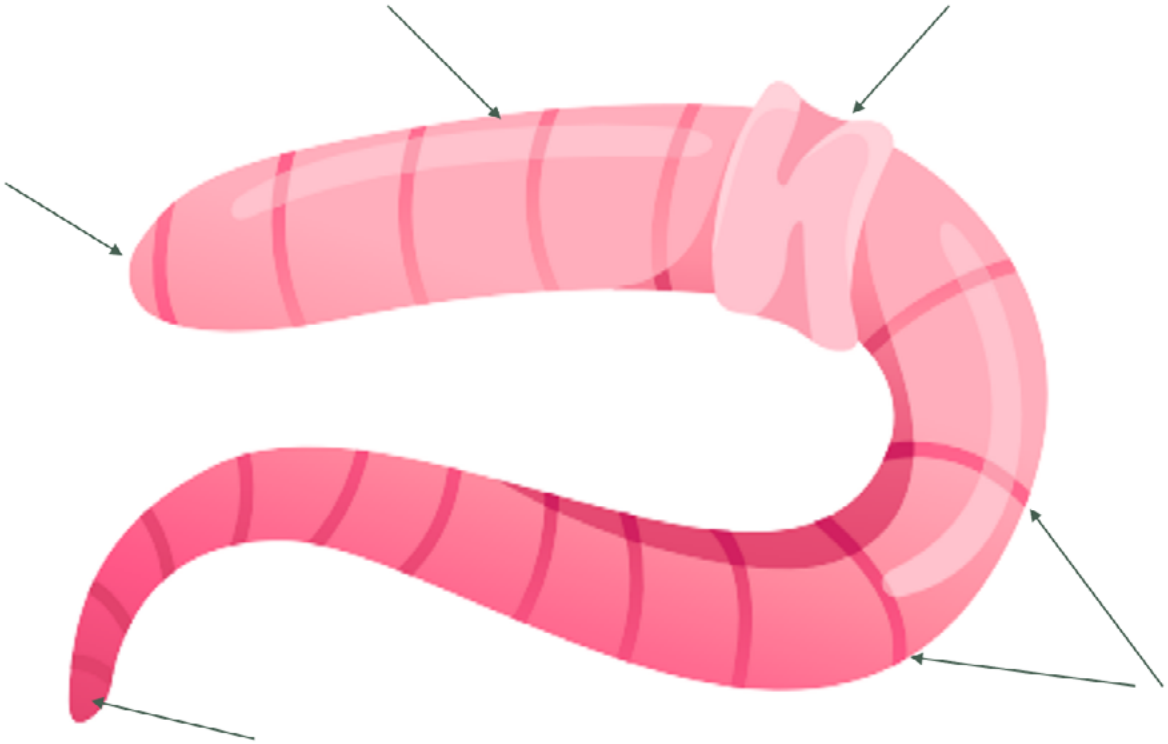
Topic:

K What I know	W What I wonder	L What I learned

Name: _____

Parts of a worm

Match the parts of the worm to its body.



segments

clitellum

mouth

hearts

tail

Name: _____

Life cycle of a worm

1

2

3

4

Name: _____

Measuring worms

Unit of measurement	Number used

Name: _____

Science investigation

Investigation question:

How will worms react when exposed to sunlight?

Materials

- worms
- worm castings
- tray
- exercise book/piece of paper
- stopwatches/student watches
- magnifying glasses
- recording sheet

Safety conditions

Worms are living creatures and must be treated with care and consideration. Carefully watch the worms during the experiment to make sure they aren't drying out. If this is the case, return them immediately to the worm farm.

Method

1. Cover half a tray with a thin layer of worm castings.
2. Place an exercise book (or piece of paper) over half of the tray to cover the castings.
3. Take the tray outside into sunlight (or place under lamp).
4. Gently place 10 worms on the side of the tray that is uncovered and give the worms some time to settle down.
5. Observe the worms for 15 to 20 minutes and record what happens.
6. Count and tally how many worms there are on each side of the tray every three to five minutes and record in a table.
7. After the experiment is finished, graph the results of your investigation (number of worms exposed or undercover versus time).
8. What conclusion can we draw about worms from this experiment?

Name: _____

Science investigation

Investigation question:

How will worms react when exposed to sunlight?

Prediction:

I predict

Observations:

Time	No. of worms exposed	No. of worms under cover
Start		
After ___ mins		
After ___ mins		
End		

Findings:

Worm food

Pre-primary – Year 2

Background information

Worm farms

Worm farms contain composting worms that eat food scraps and turn those scraps into a natural liquid (worm leachate) and compost (castings) that can be used in the garden. Composting worms thrive in a moist, high-nutrient environment. We can create this environment in a worm farm.

Worm farms:

- decrease the amount of organic waste sent to landfill
- close the recycling loop by changing food waste back into organic fertiliser for growing food
- reduce greenhouse gases. In a well-maintained worm farm, the decomposition process is aerobic (with oxygen), rather than anaerobic (without oxygen).

The earthworms used in worm farms are a different species to those we find in our gardens. The best worms for worm farming are European worms such as the Red Wriggler (Lumbricus rubellus) and the Tiger Worm (Eisenia fetida). These species are accustomed to soils high in nutrients. They eat and breed much faster than other earthworms and can quickly transform food scraps into worm castings. They do this in a small amount of space, while other earthworms are better equipped for burrowing and searching for food in our drier, nutrient-poor soils.

Living conditions in a worm farm

Worm farms should be situated in a cool, shady spot. Worms need cool, moist conditions and a temperature of 25–26 degrees Celsius. They need a layer of bedding to live in, which can include castings, shredded paper, newspaper, cardboard, brown leaves, and straw. As food scraps decompose, they will make the worm bedding more and more acidic, therefore it is a good idea to occasionally add some garden lime to maintain the pH as worms prefer a neutral environment.

School worm farms

A worm farm is made from a container that has a drainage hole for water and a lid that keeps out vermin but allows air in.

You can buy worm farm containers, make your own, or have one custom made. Some schools use old bathtubs but most use old fridges that have been safely degassed. Look at the 'How to make a fridge worm farm' fact sheet to find out more. For most schools, at least one large worm farm (such as a fridge or bathtub) is needed.

For more information on setting up a worm farm at school, see the fact sheets or watch the instructional videos.

Food to put in your worm farm

Materials you can put in your worm farm include:

- shredded, moist cardboard, newspaper and paper scraps (avoid shiny magazines)
- coffee grounds and tea bags (with staples removed)
- fruit and vegetable scraps
- leaves
- straw (but not hay with seeds in it)
- coconut fibre
- egg shells (pulverised) or other sources of grit (good to add when the worm farm gets a bit smelly or acidic).

The smaller the pieces of food, the easier it is for the worms to get through. Some schools blend food scraps or chop them up with a metal spade in a bucket or wheelbarrow.

Food to keep out of your worm farm

Anything organic will eventually be broken down in a worm farm. However, in a small worm farm it is a good idea to omit certain foods such as:

- citrus fruits, pineapple, onions and garlic – can make the worm farm too acidic (pH less than 7) and the worms may even try to move out because of the acidic conditions
- meat and fish – can become smelly as they decompose and attract mice, rats and wasps
- dairy – can become smelly and cause anaerobic conditions
- bread – tends to clump up and worm farms can't cope with the amount of bread that schools produce
- oils – smother worms (as they breathe through their skin)
- weeds – as weed seeds are not destroyed in a worm farm.

A good rule of thumb is: If in doubt, leave it out!

A composting system such as heap, bin or tumbler can also help to manage your organic waste and is perfect for composting citrus, onion and garlic scraps that should be left out of your worm farm.

Worm farm key words

Aerobic decomposition: Organic matter being broken down in the presence of oxygen.

Anaerobic decomposition: Organic matter being broken down without the presence of oxygen.

Carbon dioxide (CO_2): An odourless, colourless gas produced during respiration. It is a greenhouse gas.

Castings/vermicast: See worm castings.

Decomposition: The process of organic matter being broken down physically and chemically by bacterial or fungal action; the rotting process; decomposition can be aerobic (with oxygen) or anaerobic (without oxygen).

Inorganic: Not organic. That is, matter that has not come from a living thing (e.g. plastic, glass, metal, synthetic fertilisers).

Leachate: See worm leachate.

Microbes: Micro-organisms such as bacteria and actinomycetes. In the case of worm leachate and castings, these are the beneficial micro-organisms that accelerate decomposition (Murphy 2009).

Organic: Matter that has come from a once-living organism and is capable of decay or is the product of decay (e.g. plants, leaves, food scraps, paper, straw etc.).

Worm castings/vermicast: Organic material that has been digested by worms and passed through their digestive system (i.e. faeces). Both worm leachate and castings contain a wide variety of nutrients and beneficial microbes necessary for plant growth. Castings also assist in improving the water retention of soil.

Worm farm: A bought or constructed home for worms put in place to convert organic matter into worm castings and 'worm wiz'.

Worm leachate ('worm wiz'): A highly nutritious organic liquid plant food produced by the worms and collected from a worm farm.

Vermiculture: The raising and production of earthworms and their byproducts.

Worm food

Curriculum links

Learning area: Science	
Science understanding	**Pre-primary** • Plants and animals have basic needs that are met by the places they live (WAPSSUB1)
Science inquiry skills	**Pre-primary** • Pose questions and make predictions based on prior knowledge and shared experiences (WAPSSIQ1) • Participate in guided and self-initiated investigations safely (WAPSSIPL1) • Make observations using comparisons (WAPSSIPL2) • Represent and discuss observations and identify patterns (WAPSSIPR1) • Discuss similarities and differences between predictions and observations (WAPSSIE1) • Share questions, predictions, observations and ideas with others (WAPSSICM1) • Use the senses to learn about the natural and physical world and develop scientific ideas (WAPSSICL1)
	Years 1 – 2 • Pose questions and make predictions based on knowledge and experiences (WA1SSIQ1) • Engage in guided investigations to answer questions, test predictions and assess risks (WA1SSIPL1) • Make and record observations, including informal measurements (WA1SSIPL2) • Sort and order data using provided tables and represent data using visual or physical models (WA1SSIPR1) • Compare observations to predictions and identify further questions for investigation (WA1SSIE1) • Communicate observations, ideas, and findings using everyday and scientific vocabulary (WA1SSICM1) • Use science knowledge and understandings to make decisions and choices in their environment (WA1SSICL1)

Timing

The set-up for this activity should take one 60-minute lesson to complete. The students will need a short time to observe their worm farms and record their observations on an ongoing basis over several weeks. This activity will also require one 60-minute lesson at the end of the experiment for students to compile their data and discuss their results.

This activity can be modelled by the teacher with students observing or completed as a paired/group activity.

Learning objectives

Students will:

- ✓ build a mini worm farm
- ✓ investigate factors that affect the rate at which worms consume food
- ✓ observe and record changes
- ✓ discuss their findings.

Resources required

- Worm science PowerPoint presentation and screen to share with class
- Two-litre clear plastic drink bottle (with the top cut off, see infographic)
- Moist worm castings
- Water
- Compost worms
- Newspaper
- Large and small vegetable and fruit scraps
- Hard and soft vegetable and fruit scraps (i.e. carrots versus banana)
- Labels
- Science journals, worksheets or digital device to record observations

Lesson 1
Setting up a mini worm farm

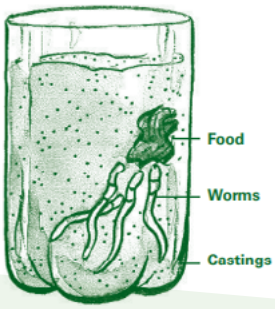
To prepare

> Decide if you will make a class mini worm farm or allow students to create their own in pairs/groups. Have equipment ready as well as a selection of large and small, hard and soft fruit and vegetable scraps.

Activities

1. Explain to the class that they will be conducting an experiment to discover which type of food worms will eat fastest in a worm farm.
2. Discuss what foods can and cannot be placed in a worm farm.
3. Examine the different food scraps that have been collected and categorise them into different groups of hard, soft, large and small.
4. Model how to set up a mini worm farm using the steps outlined in the *infographic*.
5. If doing so, allow students time to make their own mini worm farms in pairs/groups.

6. Dig a small hole along the side of each mini worm farm and place a different type of food into each one. Make sure that you can see the food through the side of the bottle and that the food is completely covered with castings.
7. Clearly label each container.
8. Predict what we think will happen.



Observations

Check the mini worm farms every few days and add a little water if required. Observations should continue until there are noticeable differences to record.

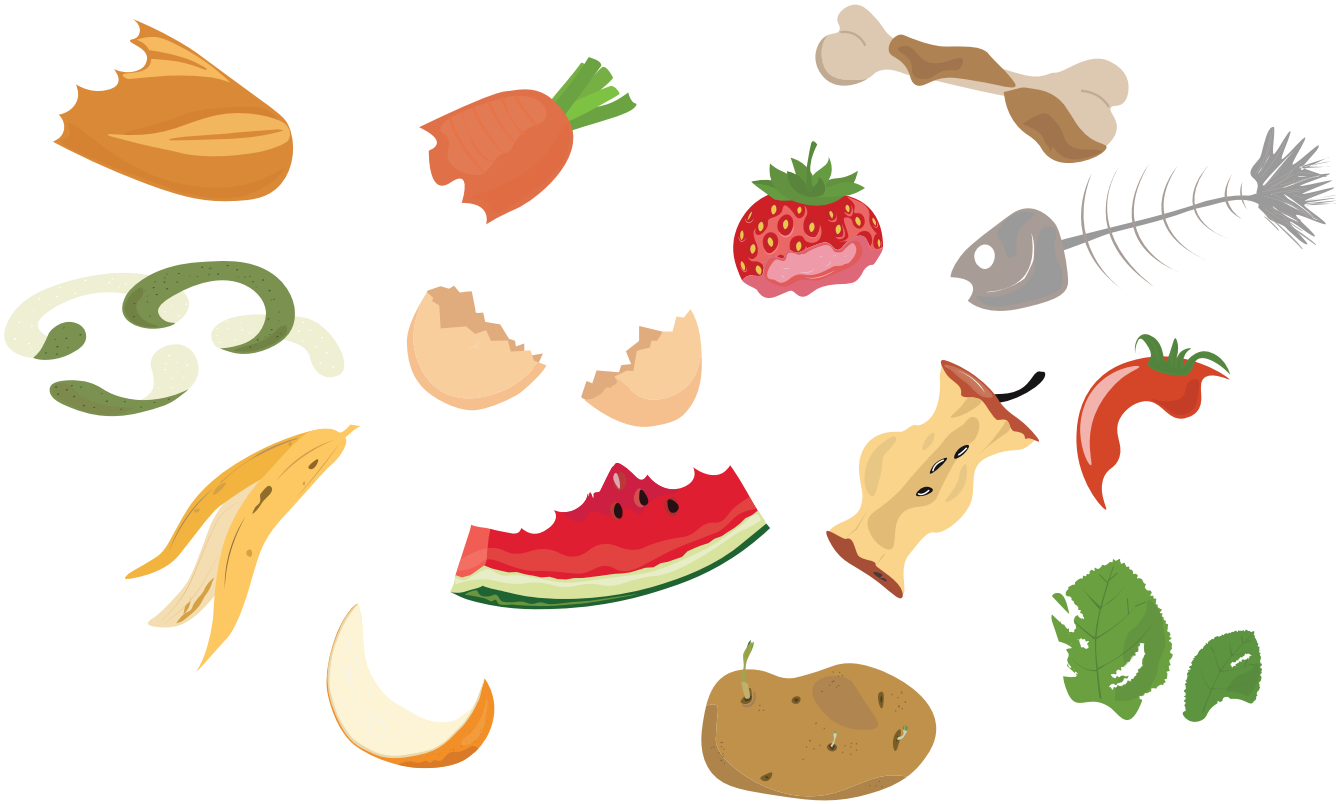
Represent and communicate observations in some of the following ways:

- Orally compare observations of their worm farm with other students.
- Record observations on a chart as a class, and students write in their science journals. Use the *Worm food experiment* worksheet as a guide or to record observations (e.g. fruit is smaller, many worms around the fruit, fruit is gone etc.).
- Draw a picture of their worm farm on the first day and then again at the end.
- Take photos to create a digital record of the changes they observe.

Lesson 2
Findings and discussion

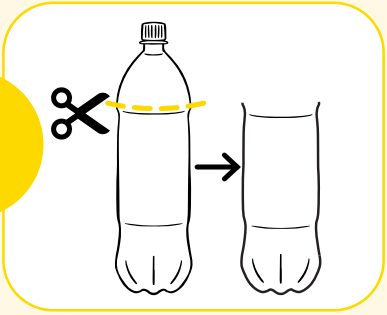
Activities

1. At the end of the experiment allow students time to share their observations and findings with each other.
2. Compare the data and see if there are any similarities or differences. Discuss why different groups may have recorded different results.
3. Discuss:
    - which food was eaten the fastest and the slowest
    - if their findings matched their predictions
    - what happens to food scraps when they go into a worm farm
    - how worms turn food into organic matter
    - what living conditions worms like
    - why worm farms are suitable places for worms to live.



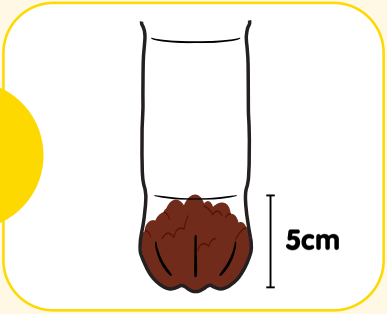
How to make a mini worm farm

1



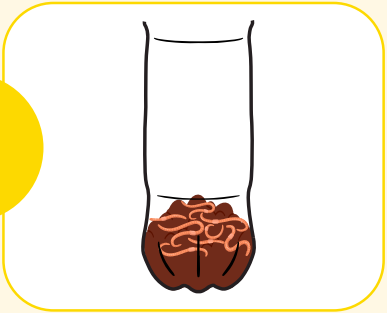
Cut the top off a two litre clear plastic drink bottle.

2



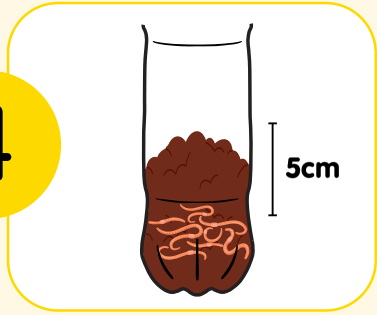
Place roughly 5cm of worm castings at the bottom of the bottle.

3



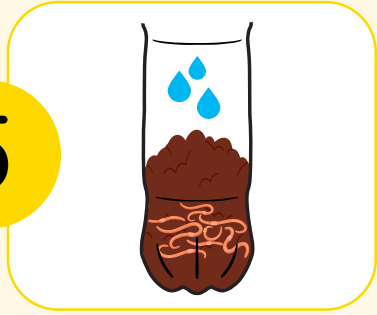
Add a small handful of worms.

4



Add another 5cm of the castings.

5



Add a small amount of water to moisten the farm.

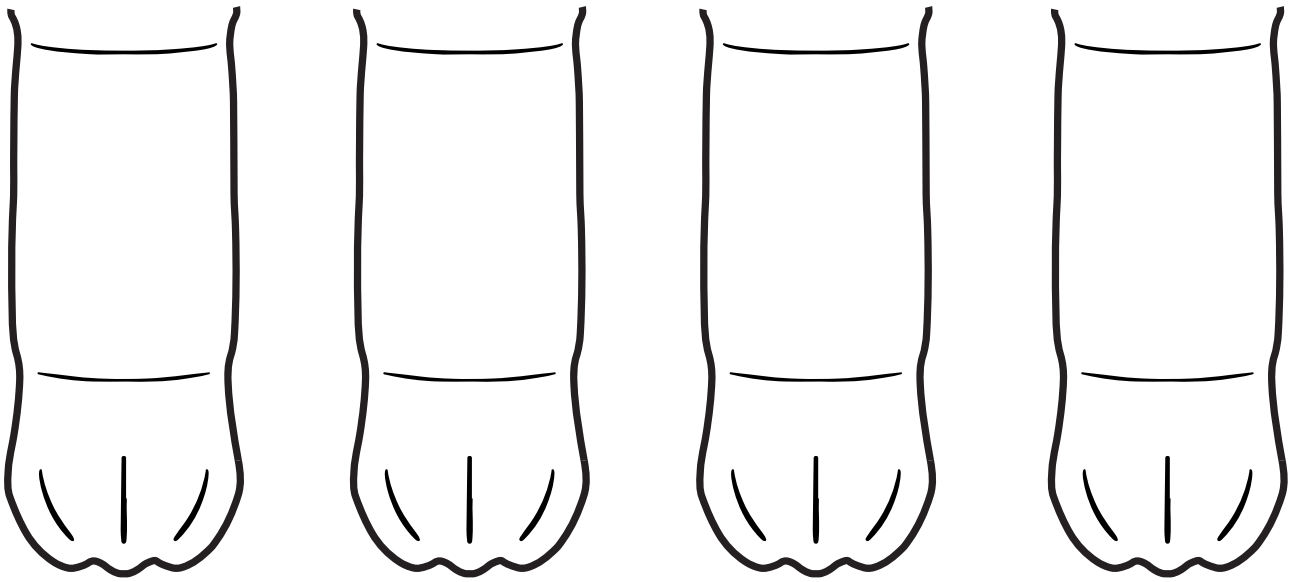
6

Wrap the outside with a piece of newspaper and place a damp newspaper ‘plug’ on top.

Name: _____

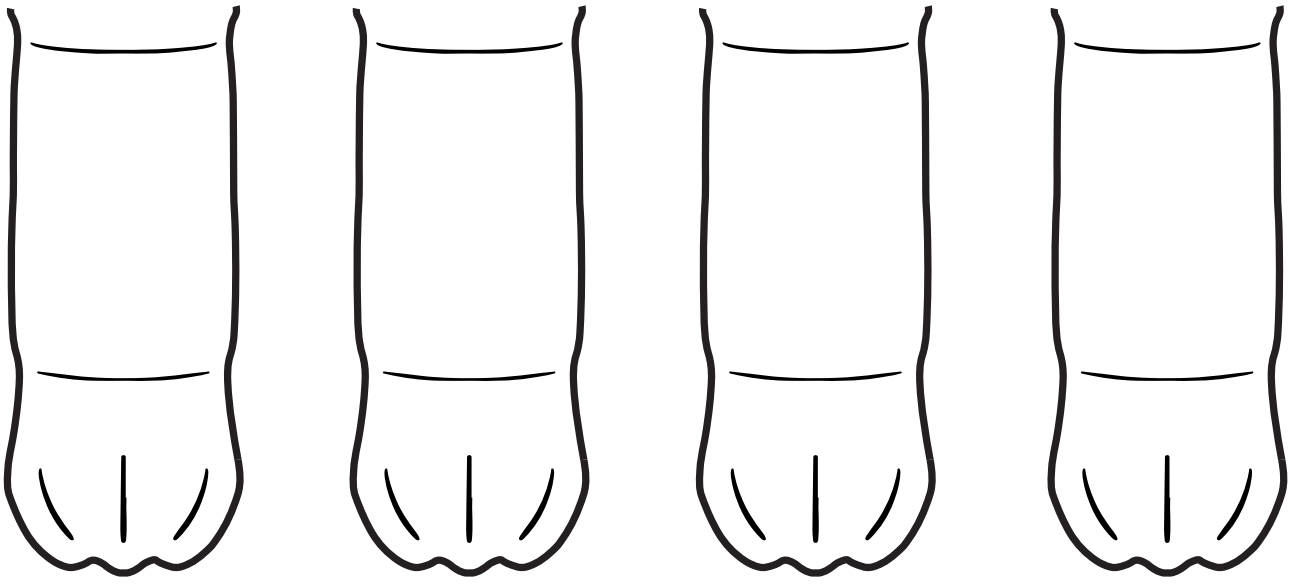
Worm food experiment

Start of the experiment



Small pieces | Big pieces | Soft food | Hard food

End of the experiment



Small pieces | Big pieces | Soft food | Hard food

Worm food experiment

Name: _____

Food type	Day 1	Day ___	Day ___	Day ___	Day ___	Day ___	Day ___
Small pieces							
Big pieces							
Soft food							
Hard food							

Important worms

Pre-primary – Year 2

Background information

Beneficial products of a worm farm

Worm castings and leachate are highly nutritious organic foods for plants that can be added to your school garden. They contain a wide variety of nutrients and beneficial microbes necessary for plant growth while improving the water retention of soil.

Environmental impact of a worm farm

When organic waste decomposes in landfill, it is usually through anaerobic decomposition which produces methane gas. Methane is a harmful greenhouse gas with a global warming potential of 25 times that of carbon dioxide and is therefore a significant contributor to the warming of the Earth's climate. Currently, the waste sector produces about 13.6 million tonnes of greenhouse gas emissions (or 'carbon pollution') each year, equivalent to almost 3 per cent of Australia's emissions (Australian Government 2023). Aerobic composting (in a worm farm or another compost system) which is done at home, school or on an industrial scale is therefore a more desirable way to process organic waste as it reduces greenhouse gas emissions.

Worm farms contribute to environmental sustainability in several ways, some of which are:

- decreasing the amount of organic waste that is normally put in your school/home rubbish bins and sent to landfill
- 'closing the recycling loop' because our organic waste is changed into organic fertiliser for our plants which then produce food for us to eat
- reducing greenhouse gases, because in a well-maintained worm farm the decomposition process is aerobic (with oxygen) rather than anaerobic (without oxygen)
- improving and building the soil with castings and leachate by enriching it with micro-organisms; improving water holding capacity; enhancing germination, improving plant growth, and crop yield; and improving root growth and structure.

Worm farm key words

Aerobic decomposition: Organic matter being broken down in the presence of oxygen.

Anaerobic decomposition: Organic matter being broken down without the presence of oxygen.

Carbon dioxide (CO_2): An odourless, colourless gas produced during respiration. It is a greenhouse gas.

Castings/vermicast: See worm castings.

Decomposition: The process of organic matter being broken down physically and chemically by bacterial or fungal action; the rotting process; decomposition can be aerobic (with oxygen) or anaerobic (without oxygen).

Inorganic: Not organic. That is, matter that has not come from a living thing (e.g. plastic, glass, metal, synthetic fertilisers).

Leachate: See worm leachate.

Microbes: Micro-organisms such as bacteria and actinomycetes. In the case of worm leachate and castings, these are the beneficial micro-organisms that accelerate decomposition (Murphy 2009).

Organic: Matter that has come from a once-living organism and is capable of decay or is the product of decay (e.g. plants, leaves, food scraps, paper, straw etc.).

Worm castings/vermicast: Organic material that has been digested by worms and passed through their digestive system (i.e. faeces). Both worm leachate and castings contain a wide variety of nutrients and beneficial microbes necessary for plant growth. Castings also assist in improving the water retention of soil.

Worm farm: A bought or constructed home for worms put in place to convert organic matter into worm castings and 'worm wiz'.

Worm leachate ('worm wiz'): A highly nutritious organic liquid plant food produced by the worms and collected from a worm farm.

Vermiculture: The raising and production of earthworms and their byproducts.

Important worms

Curriculum links

Learning area: Science

Science understanding

Pre-primary

- Plants and animals have basic needs that are met by the places they live (WAPSSUB1)

Year 1

- Plants and animals have external features that serve a purpose and by which they can be grouped (WA1SSUB1)

Year 2

- Plants and animals have life cycles through which they grow, change and have offspring (WA2SSUB1)

Science inquiry skills

Pre-primary

- Pose questions and make predictions based on prior knowledge and shared experiences (WAPSSIQ1)
- Participate in guided and self-initiated investigations safely (WAPSSIPL1)
- Make observations using comparisons (WAPSSIPL2)
- Represent and discuss observations and identify patterns (WAPSSIPR1)
- Discuss similarities and differences between predictions and observations (WAPSSIE1)
- Share questions, predictions, observations and ideas with others (WAPSSICM1)
- Use the senses to learn about the natural and physical world and develop scientific ideas (WAPSSICL1)

Years 1 – 2

- Pose questions and make predictions based on knowledge and experiences (WA1SSIQ1)
- Engage in guided investigations to answer questions, test predictions and assess risks (WA1SSIPL1)
- Make and record observations, including informal measurements (WA1SSIPL2)
- Sort and order data using provided tables and represent data using visual or physical models (WA1SSIPR1)
- Compare observations to predictions and identify further questions for investigation (WA1SSIE1)
- Communicate observations, ideas, and findings using everyday and scientific vocabulary (WA1SSICM1)
- Use science knowledge and understandings to make decisions and choices in their environment (WA1SSICL1)

Learning area: Maths

Measurement and geometry

Pre-primary

- Explore and directly compare the length of everyday items to say which is longer and explain reasoning (WAPMMGTW3)

Year 1

- Directly and indirectly compare lengths, including by counting uniform informal units (WA1MMGTW3)

Year 2

- Estimate, measure and compare lengths by choosing appropriate uniform informal units and placing end to end without gaps or overlaps (WA2MMGTW3)

Timing

The set-up for this activity should take one 60-minute lesson to complete. The students will need a short time to observe their grassy heads and record their observations on an ongoing basis over several weeks. This activity will also require one 60-minute lesson at the end of the experiment for students to compile their data and discuss their results.

This activity can be modelled by the teacher with students observing or completed as a paired/group activity.

Learning objectives

Students will:

- ✓ discuss the importance of worms
- ✓ explore the relationship between worms and plant growth
- ✓ conduct a grassy heads experiment to test the benefits of worm castings on plant growth
- ✓ record their observations
- ✓ discuss their findings.

Resources required

- Important worms PowerPoint presentation and screen to share with class
- Old stockings/knee highs – two sections per pair/group

  *Note: Long stockings can be cut into multiple sections and tied in a knot at one end to get more use out of each one.
- Grass seeds or other fast-growing varieties such as wheat grass
- Glass jars – two per pair/group
- Water
- Worm castings
- Plain soil from the garden (do not use potting mix as this contains additives which may skew the results)
- Newspaper
- Measuring tools
- Elastic bands (optional)
- Decorations: buttons or googly eyes (optional)
- Labels
- Science journals, worksheet or digital device to record observations

Lesson 1
Grassy heads experiment

To prepare

> Decide if you will do this experiment as a class or allow students to create their own grassy heads in pairs/ groups. Have equipment ready.

Activities

1. Watch the video Why do we need worms on Earth? - YouTube (1:44 minutes).

2. Discuss some of the benefits we gain from having worms present in our soil.
3. Demonstrate how to make a grassy head using the steps outlined in the *infographic* and on the *Science investigation* worksheet.

4. If doing so, allow students time to make their own grassy heads in pairs/ groups.
5. Instruct students to make one grassy head using only soil and one using a 50/50 mixture of soil and castings.
6. Label each jar clearly.
7. Place jars in a sunny location and check regularly to ensure they do not dry out.
8. Predict what you think will happen.
9. Observe and record what happens over the next few weeks.

Observations

Check the grassy heads regularly and record observations.

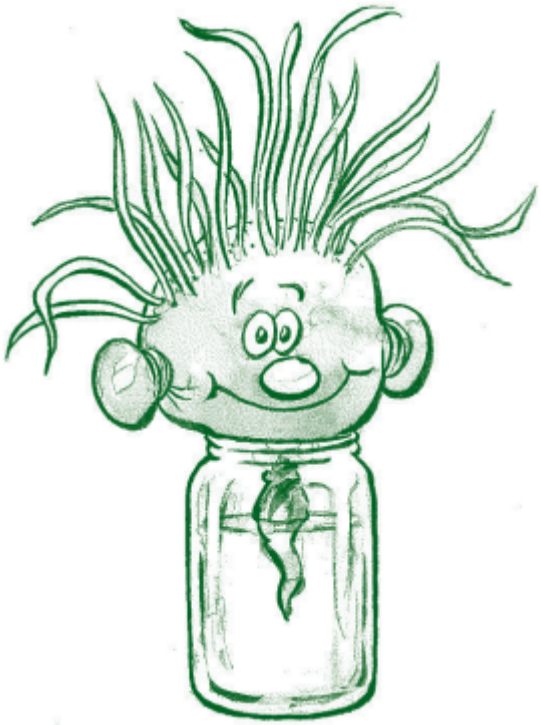
Observations can be represented and communicated in the following ways:

- Orally compare observations of their grass growth with other students.
- Create a table, such as the one in the *Science investigation* worksheet, for students to complete in their science journals or use the worksheet provided.
- Take photos to create a digital record of the changes they observe.

Lesson 2
Findings and discussion

Activities

1. At the end of the experiment, allow students time to share their observations and findings with each other.
2. Compare the data and see if there are any similarities or differences. Discuss why different groups may have different results.
3. Ask the following questions and discuss:
    - Which head grew 'hair' the fastest?
    - Why do you think this is?
    - Did your findings match your predictions? Why/why not?
    - What does this tell us about the effect of worm castings on plants?
    - Why would it be good to have worms in your garden?
    - What could we do with worm castings at school?
    - If you had your own garden, would you use worm castings on it? Why/why not?

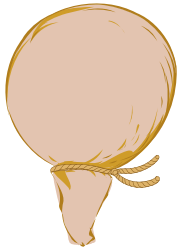


How to make a grassy head

1. **Add** one tablespoon of grass seeds to the end of a stocking.

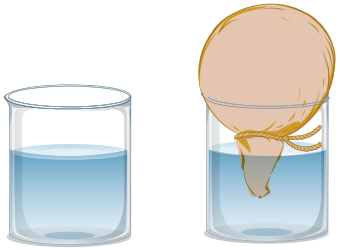
2. **Place** a handful of soil into the stocking, on top of the grass seeds.

3. **Tie** a knot in the end of the stocking, leaving a tail piece hanging down.

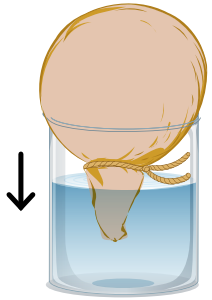


4. **Water** the grassy head so that it is wet through.

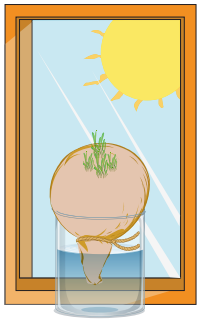
5. **Place** the grassy head on top of a jar filled with water.



6. **Make** sure the tail is submerged in the water.



7. **Place** the jar in a sunny location.



8. **Water** regularly to make sure the head doesn't dry out.

Name: _____

Science investigation

Investigation question:

Does grass grow better in plain soil or in a mixture of soil and worm castings?

Materials

- old stockings
- grass seeds
- measuring spoons and cups
- glass jars
- water
- worm castings
- plain soil from the garden
- measuring tools
- labels

Method

1. Add one tablespoon of grass seeds to the end of a stocking.
2. Place a cup of soil or soil/casting mix into the stocking, on top of the grass seeds.
3. Tie a knot in the end of the stocking, leaving a tail piece hanging down.
4. Water the grassy head so that it is wet through.
5. Place the grassy head on top of a jar filled with water, ensuring the tail is hanging down into the water.
6. Label the jar.
7. Water the grassy head regularly to make sure it doesn't dry out.
8. Record your observations.

Variables

What we will change:

- plain soil
- mixture of soil and castings

What we will keep the same:

- amount of grass seeds
- amount of soil/castings mix in stocking
- amount of water

What we will measure:

- how many seeds start to grow
- how tall the grass grows
- what colour the grass turns as it grows

Science investigation

Name: _____

Prediction:

I predict

Observations:

Soil only	Day ___	Day ___	Day ___	Day ___	Day ___
Seeds germinated					
Height					
Colour					

Soil and castings	Day ___	Day ___	Day ___	Day ___	Day ___
Seeds germinated					
Height					
Colour					

Findings:

Cross-curricular activities and picture books

Pre-primary – Year 2

Maths activities

Completing and creating patterns

Pattern worms & chenille chicks
Herding Kats in Kindergarten

Preschool worms
Laurel Bartling (Pinterest)

Measuring and comparing length

Measure the worms
Happy Tot Shelf

Measuring the earthworm
Montessori from the heart

Longer and shorter worm mats
Twinkl

Worm lab recording booklet
Practically Pre-K
(Teachers pay teachers)

Counting

Silly worm count to 10
Preschool Play and Learn

Problem solving

2nd and 3rd grade problem solving
Positively Literacy (Teachers pay teachers)

English activities

Writing

Worm day
Blue Skies with Jennifer White
(Teachers pay teachers)

Worm lab recording booklet
Practically Pre-K
(Teachers pay teachers)

Visual arts activities

Painting with worms
Creative Family Fun

Rainy day story time with worm weather craft
Homebound but Hopeful

Earthworm stick puppet
MyCrafts

No-sew sock worms
One Little Project

Worm puppet
Craftbits.com

Fine motor activities

Making worms with play dough or clay
Color the Moon

Making and decorating worms
Learn with play at home

Picking up pipe cleaner worms with clothes pegs
Gabby's Classrooms

Make a worm using circle stickers
Heba (Pinterest)

Making spaghetti worms
Table and Spoon

Play investigations

Superworm tuff tray ideas
My Teaching Cupboard (Pinterest)

Worm play tuff tray
Mouse and Roos Adventures (Pinterest)

Dirt and worms sensory play
Growing a Jeweled Rose

How to make a worm tower
The Empowered Educator

Guided drawings

How to draw a cartoon apple and worm
Art for Kids Hub

How to draw a worm step-by-step
Cutest Drawings

How to draw a worm
Sherry Drawings

How to turn the word worm into a worm drawing
Let's Draw

Activity booklets

All about worms printable pack
Stacey Jones

Worm printable pack
Beth Gorden

Picture books

Title and author

Diary of a Worm
by Doreen Cronin

Yucky Worms
by Vivian French

Worm Weather
by Jean Taft

Carl and the Meaning of Life
by Deborah Freedman

Wonderful Worms
by Linda Glasers

An Earthworm's Life
by John Himmelman

Up in the Garden and Down in the Dirt
by Kate Messner

Superworm
by Julia Donaldson

Winnie Finn, Worm Farmer
by Carol Brendler

Wiggle and Waggle
by Caroline Arnold

Garden Wrigglers: Earthworms in your backyard
by Nancy Loewen

Wriggling Worms at Work
by Wendy Pfeffer

WasteSorted Schools

www.wastesortedschools.wa.gov.au

GOVERNMENT OF WESTERN AUSTRALIA

WASTE AUTHORITY
WA...TOO GOOD TO WASTE

WasteSorted Schools