**ACTIVITY: Observing earthworms**

**Activity idea**

In this activity, students use observation to explore earthworm anatomy and the nature of science.

By the end of this activity, students should be able to:

* identify various physical characteristics (such as segments and clitellum)
* describe how an earthworm uses its circular and longitudinal muscles to move
* discuss how their observations and experiences in the classroom mirror those of real scientists.

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**Introduction/background**

Observation is a critical part of being a scientist. Every New Zealand Research story on this site shows scientists making some sort of observation. Observation is more than just using one’s eyes to look at something. It may involve multiple senses and the use of instruments to go beyond human capabilities.

This activity is designed to encourage students to take their time and observe the ways in which earthworms move and identify some of their physical attributes. Along the way, students are encouraged to think about how real scientists use observation to extend or modify their existing knowledge. Students then choose how they will record and communicate their observations.

The first part of the activity (steps 1–6) illustrates that students (like scientists):

* add to their scientific knowledge through careful observation
* modify their scientific knowledge as new evidence or new information becomes available.

This second part (steps 7–9) illustrates that students (like scientists):

* observe in many ways – with their own senses or with instruments that extend their vision or hearing and with instruments that provide better precision and accuracy
* record and communicate their observations in many ways – scientific knowledge is communicated through text, diagrams, graphs and/or various forms of media.

**What you need**

* Earthworms – ideally, a variety of species (see [Hints for finding, housing and handling earthworms](#hints))
* Small jars with lids
* Plastic forceps or tongs (optional)
* Newsprint
* Magnifying glasses
* Digital camera
* Digital microscope (optional)
* Paper towels
* Copies of the PDF brochure from AgResearch, [The Great Kiwi Earthworm Survey](https://www.agresearch.co.nz/our-research/the-great-kiwi-earthworm-survey/)
* Access to the article [The role of observation in science](https://www.sciencelearn.org.nz/resources/8-the-role-of-observation-in-science)
* Access to the 2 linked interactives: [Inside of an earthworm](https://www.sciencelearn.org.nz/image_maps/24-inside-of-an-earthworm) and [Outside of an earthworm](https://www.sciencelearn.org.nz/image_maps/27-outside-of-an-earthworm)
* Access to the video [Physical adaptations for life underground](https://www.sciencelearn.org.nz/videos/3-physical-adaptations-for-life-underground)

**What to do**

1. In pairs, students observe earthworms for a few minutes, jotting down notes about what they’ve observed. Groups feed back to make a class list.
2. As a class, watch the video clip [Physical adaptations for life underground](https://www.sciencelearn.org.nz/videos/3-physical-adaptations-for-life-underground), use the 2 linked interactives: [Inside of an earthworm](https://www.sciencelearn.org.nz/image_maps/24-inside-of-an-earthworm) and [Outside of an earthworm](https://www.sciencelearn.org.nz/image_maps/27-outside-of-an-earthworm), and read brochure from AgResearch, [The Great Kiwi Earthworm Survey](https://www.agresearch.co.nz/our-research/the-great-kiwi-earthworm-survey/).
3. Discuss any scientific terminology that may be new or unknown.
4. Have students observe the earthworms a second time, adding to their initial observation notes.
5. As a class, discuss any changes students made to their initial observations. Did having additional information from the video or interactive change the way they made their observations or recorded their information?
6. Explain that this is how scientists work. They build their science knowledge through observation, with information from books or journals and discussions with the scientific community. When new evidence becomes available, scientists test it and, with time, may modify existing science knowledge. These changes are often very small.
7. Once students have observed earthworms with the naked eye and have had the opportunity to feel for setae (see [Hints for finding, housing and handling earthworms](#hints)), ask them to brainstorm other methods of observation. Some options include:
* hand lenses
* digital cameras
* digital microscopes
* video cameras
* student/class handheld devices with photo or video capability.
1. Discuss how students can use these methods to record or report their observations and findings. Some options include:
* placing magnified images on an IWB or tablet device and using annotation tools to label anatomy or describe anatomical functions
* video with a written or spoken voiceover
* PowerPoint or similar presentation tool with photos and text
* traditional observational drawings
* two-word poems to describe visual and touch sensations, accompanied by a photo or detailed drawing (see [Extension ideas](#extension)).
1. Refer to the article [The role of observation in science](https://www.sciencelearn.org.nz/resources/8-the-role-of-observation-in-science).
* Discuss the techniques Dr Nicole Schon and Dr Trish Fraser use while observing earthworms. (Hand sorting and counting, CAT scanning.)
* Discuss how this compares to techniques students have used. (Nicole uses visual identification; Trish uses technology.)
* Discuss how Nicole and Trish have reported their findings. (Nicole produced the The Great Kiwi Earthworm Survey brochure to help farmers and others identify earthworm species. Both scientists publish in scientific journals.)

**Extension ideas**

Two-word poems use two words per line to describe an object or situation. Although scientists rarely publish their findings via poetry, science is a very creative field! Remind students the poem is to communicate their scientific findings. Encourage them to use scientific language.

For example, the following poem could accompany a close-up photo of a tiger worm clitellum.

Tiger worm

*Eisenia fetida*

Epigeic wiggler

Compost habitat

Red clitellum

Mature adult

Drops cocoon

Eggs hatch

Cycle continues

Students can write a ‘non-scientific’ two-word poem describing their feelings about handling or working with earthworms. Discuss the differences between the two. Both use the same technique and have the same audience – what makes one poem ‘scientific writing’ and the other ‘creative writing’?

Dr Robert Hoare is a scientist who was inspired to write a poem, [Fred the Thread](https://www.sciencelearn.org.nz/videos/1858-fred-the-thread-a-poem) about a new genus and species of *Batrachedridae* (*Lepidoptera*).

**Hints for finding, housing and handling earthworms**

Tiger worms (*Eisenia fetida*) from the compost bin are often plentiful year round. Their dark and varied skin colour makes it easy for students to identify body segments. Other species may be sourced in cooler times of the year by digging under areas of grass or other vegetation. Alternatively, garden centres may be able to recommend a supplier. Use the PDF from AgResearch, [The Great Kiwi Earthworm Survey](https://www.agresearch.co.nz/our-research/the-great-kiwi-earthworm-survey/) to aid in earthworm identification if you are able to find earthworms in the field.

Keep the earthworms in their usual medium (soil or compost) until needed.

Some earthworm species can be stored and observed in jars of cool clean water. Earthworms breathe through their skin so they do not drown, but they will die once they deplete the oxygen in the water. Change or aerate the water daily. Earthworms lose condition after a few days, so limit the time they are kept in the jars. The introduced soil-dwelling species grey worm (*A.* *calignosa*)*,* dung worm (*L. rubellus*)*,* nightcrawl*er* (*L. terrestris*)*,* blackhead worm *(A. longa*) and yellow tail worm (*O.* *cyaneum*) will readily survive in water. However, tiger worms (*Eisenia fetida*) and native species like *O. multiporus* should not be kept in water for longer than it takes to clean them. Earthworms move quite differently in water, so make sure that students also have a chance to observe earthworms on a dry, flat surface.

Label the containers with the species’ names if more than one type is available. This will help ensure earthworms are returned to the correct containers. Label the jars as well if observing earthworms in water.

Just before the observation begins, use flat tongs or your fingers to remove earthworms from the soil and dip them in water to remove soil or compost. Dry on a paper towel if you wish. Lay the earthworms on newsprint.

Keep the earthworms out of direct sunlight. Their skin needs to be kept moist so only have them out for short periods at a time.

Earthworms can be gently handled. If students run their fingers on the underside of some earthworms (nightcrawlers, in particular), they may be able to feel the setae even if they cannot see them.