



LESSON PLAN: Earthworm Farm

Introduction:

Although many people are familiar with earthworms, people are not typically as familiar with the important roles played by earthworms in the soil. Having an earthworm farm is a fun way to bring in an educational, temporary (and non-conventional) classroom pet.

Prescribed learning outcomes (PLO) are content standards for the provincial education system; they are the prescribed curriculum. The "Earthworm Farm" lesson plan will help students to achieve the following BC PLOs¹:

- Science 10 – Life Science: Sustainability of Ecosystems (B1, B3)
- Biology 11 – Taxonomy (B1); Ecology (D1); Animal Biology (G1, G3)
- Geography 12 – Biomes (E1-E4); Resources and Environmental Sustainability (F2)
- Sustainable Resources 11 – Agriculture (A2); Forestry (C2, C3)
- Sustainable Resources 12 – Agriculture (B4, D4); Forestry (B1-B4, E2, E4)
- Processes of Science (A1-A3); Taxonomy (B1); Ecology (D1); Animal Biology (G1, G4)
- Biology 11 – Processes of Science (A2); Taxonomy (B1); Ecology (D1); Animal Biology (G1, G3)

Learning Objectives:

- Describe why earthworms are the “mixers and shredders” of the soil
- Identify earthworm biopores and casts in the soil
- Explain how biopores improve water movement, and how casts improve nutrient availability
- Identify that earthworms are indicative of a healthy soil

Materials:

- Shovel and trowel
- Earthworm farm structure (Plexiglas and grooved two-by-fours), or clear plastic/glass jars
- Towel

Activity Description:

The earthworm farm may be constructed of two sheets of Plexiglas slotted between two grooved pieces of wood (see photo below). This most effectively shows the biopore channels formed by the worms. However, it is possible to use clear plastic or glass jars instead – the biopores don't show up as well, but you can still generally see them! Once the earthworm farm structure is ready, collect the earthworms and soil to fill the earthworm farm. This can be done in one of two ways:

¹ Please consult the appropriate Integrated Resource Package (IRP) to identify the PLOs. A catalogue of the BC Curriculum Documents (including IRPs) can be found here: <http://www.bced.gov.bc.ca/irp/all.php?lang=en#>



- 1) Go outside as a class and dig the upper 10-15 cm of a productive looking soil. Sort through as you dig to collect the earthworms, and bring the soil back to class.
- 2) Dig the upper 10-15 cm of soil on your own, and bring the soil back to the classroom where you can sort through as a class inside.

Gradually put the soil in the earthworm farm(s), and place the earthworms in at varying depths (around 20 worms were put in the earthworm farm pictured below, Figure 3). Place a layer of fresh organic matter, such as grass, and a layer of dry organic matter, such as hay, on the soil surface. Keep the earthworm farm moistened and covered with a towel – earthworms don't like much light! You should see biopore formation the following day; cast formation (at the soil surface) will take longer.

Earthworm activity dramatically changes the soil in two main ways: through biopore and cast formation. Biopores are the tube-shaped, slimy paths that form as the earthworms burrow through the soil. The biopores create channels that water can flow and drain through easily. This channeling also helps to **mix** the soil.

Earthworms also “eat” the soil to get nutrients from organic matter and microorganisms. As the soil is passed through their intestines, bits of organic matter are **shredded** up and some microorganisms are added to the soil. Their excrement, or casts, contains a lot of microorganisms and microorganism food. This enables the decomposition of organic matter into nutrients that are available for uptake by plants.

To complete this activity, you may require students to write a paragraph or short essay explaining the role of the earthworms in the ecosystem, or a simple class discussion may suffice. What is important in this activity is that students are able to both discuss and explain how earthworms affect the soil.



Figure 3. Completed Earthworm Farm shown above, with towel to keep out light.



Some fun earthworm facts:

- There are over 7000 species of earthworms in the world
- A single earthworm can ingest soil up to 30 times its own weight
- “It would be difficult to deny the probability that every particle of earth...has passed through the intestines of worms.” – Charles Darwin

A great complementary activity:

...is to make “dirt cupcakes”! Following a basic cupcake recipe of your choice, make enough cupcakes for everyone in the class. In class, have students decorate their cupcake(s) with the extra toppings of green/brown icing, oreo/chocolate pieces, shredded coconut, gummy worms, etc. (Figure 4). This cupcake activity is light, enjoyable, and short, and may help to more directly engage some of the students who were reluctant to get involved in the Earthworm Farm creation.



Photo: Vegan Feast Catering

Figure 4. Dirt cupcakes, complete with worms!