



SCIENTIST IN RESIDENCE PROGRAM™

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Science Unit: *Ecologists Grow a Garden*
Lesson 9: *Garden Soil - Earthworm Census*

Summary: In this lesson, students remove a 30cmx30cmx15cm section of soil from a vegetable garden plot. They then conduct an **earthworm census** in the soil section and use the **data** collected (# of worms/section) to **estimate** the general health of the soil. Students also observe the soil carefully and record their **observations**. Printable worksheets included.

School Year: 2013/2014

Developed for: Simon Fraser Elementary School, Vancouver School District

Developed by: Lea Elliott (scientist); Sean Hughes and Katrina Naples (teachers)

Grade level: Presented to grade 2 and 3; appropriate for grades K – 7 with age appropriate modifications

Duration of lesson: 1 hour and 20 minutes

Notes: Lesson pairs well with Lesson 9: Worms in Science Unit: Discovering Life in Local Habitats

Objectives

Students will be able to:

1. Understand the importance of healthy soil to grow a healthy garden.
2. Explore organic soil with their senses.
3. Learn what worms tell us about the health of our soil.

Background Information

Soil is more than dirt. It is a community, full of living organisms and non-living things. Non-living things like dead leaves, decomposing plants and animals, sand, clay and rocks. Living animals like bacteria, beetles, centipedes, millipedes and worms! Organic matter is the part of the soil that is alive or once was living. Things like roots, living animals, worm poo and plants and animals that have died. Organic matter is key to building healthy soil. Organic matter is food for plants and soil animals. Organic matter holds water to nourish the plants.

Earthworms play a very important role in the soil. They tunnel beneath the soil, in search of organic matter to eat. When they eat the organic matter they turn it into rich humus (worm poo!). While searching for food, earthworms mix up and create tunnels of air in soil. The mixing and creation of air spaces makes the soil a better place for other organisms to live too.

When there are lots of earthworms in our soil it is a sign that our soil is healthy. It lets us know there are likely many other types of animals living in our soil that we can't see. If there aren't many earthworms we need to add more organic matter for the worms to eat. Add more organic matter by digging in cover crops, adding leaves in the fall and amending our soil with compost.



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Vocabulary

<u>Census</u>	To count or survey a population.
<u>Cover crop</u>	A plant, such as crimson clover or winter rye, grown to protect and improve the soil.
<u>Decompose</u>	The breakdown of leaves and dead plant and animals into soil.
<u>Earthworm</u>	A common invertebrate found in soil. They mix, add nutrients and aerate soils by creating tunnels, digesting dead plant material and producing humus.
<u>Ecosystem</u>	A system formed by the interactions of all the living and non-living things in an area.
<u>Organic matter or humus</u>	Decomposed plant and animal matter in soil that holds moisture and provides nutrients for the soil community and plants.
<u>Topsoil</u>	The top layer of ground where plants grow. It is a mixture of living organisms: plant roots, bacteria, fungi and animals, and non-living matter: sand, clay, decomposing plants and animals.

Materials

- Earthworm census sheet
- Clear container of layered mineral and organic topsoil
- Six empty bins
- Pencils
- Sensory data sheet
- Large shovel
- Clipboards
- Magnifying glasses

Introductory Discussion

1. Opening Hook:
 - Show a clear container with layers of organic and non-organic soil.
 - Discuss what soil is.
 - Explain that the healthier our soil is the healthier our plants will be. (Healthy organic soil is full of decomposing plant matter. This is food for worms and other soil animals. Soil animals add nutrients, air and castings (aka worm poo, which holds water and is nutritious) to the soil. Organic soil has living and non-living things in it.
 - What have we added/could add to “feed” our soil? (i.e. cover crop, leaves, compost)
 - What living things are in the soil? What non-living things?
2. Science experiment/activity:
 - Describe garden activities and divide into 6 groups. Sensory soil exploration. Earthworm census to determine if our soil is healthy or if it needs more organic matter.



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Safety Note

Important animal welfare reminder: Soil is full of living animals - students must be gentle.

Science Activities

1. Activity 1: Soil study

Purpose of Activity: To explore soil with three of our senses.

Methods and Instructions:

Set-up prior to activity: shovels, six bins, sensory data sheet for each student, magnifying glasses, break into six groups.

1. Dig up 30cm (width) by 30cm (length) by 15cm (depth) of organic soil from our garden.
2. Place soil in a bin.
3. What do you see? What do you smell? How does it feel?
4. Record your observations.

2. Activity 2: Earthworm census

Purpose of Activity: To count earthworms to see if our soil is healthy!

Methods and Instructions: Set-up prior to activity: continue from Activity 1.

1. Pile soil up against one side of the bin (gathered during activity 1).
2. Two students move the soil from one side to the other counting worms as they go.
3. Another student tallies the number of worms found.
4. Fourth student gently returns the soil and worms to the garden.

Closure Discussion

- What did you see, feel and smell in our soil?
- How many worms did each group find?
- 10 or more worms means our soil is healthy!
- 5-10 worms is okay, but could be better
- Less than 5 worms means, “uh, oh we need to feed the worms food!”
- Is our soil healthy? How do we know?
- How can we keep it healthy?
- What did you observe about earthworms?

References

- Stell, Elizabeth. 1998. Secrets to Great Soil. Storey Publishing.

Extension of Lesson Plan

- Read Soil Basics by Mari Schuh, Diary of a Worm or Marty McGuire Digs Worms
- Study the anatomy of an earthworm (see Science Unit: Discovering Life in Local Habitats. Lesson 9: Worms. Activity: Close observation of a worm. SRP0222)