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Meet Earl - Lesson plan relating to Chapter 7
Raise Earthworms / Create an Earthworm Farm

Summary

Soil is basically a structure composed of rocks and minerals that have been broken down to various finely ground particles called sands, silts and clays. These names describe the size of the particles and range from the largest particles of sand to the smallest of clay. These particles provide structure for the soil and are extremely important for plant growth, but a healthy productive soil requires organic matter otherwise known as humus. Without it, plants fail to thrive. Humus helps the soil retain moisture, provide air to the root system and provide nutrients to the plant.

A major contributor to the organic matter, humus, content of the soil is the earthworm. There are more than 5,500 species of earthworms worldwide and all function help build soil.

This experiment will allow students to raise earthworms and to see firsthand how they act to break down organic matter. With careful observation, they will also be able to see how they move and how they reproduce.

Grade Level: 3 - 6

Duration:

Setup - 1 hour
Weekly feeding - 10 minutes
Observation - 15 minutes weekly

Personnel:

Teacher or other adult

Costs:

Costs will vary depending on the materials that you select. The process can be made to be very minimal if you select to use recycled materials and provide some of your own labor.

Learning Objectives:

Students will learn how earthworms function to break down organic material.

Students will learn how earthworms move without the use of legs or other appendages.

Students will learn about earthworm life and characteristics and importance to soil.

Materials:

- Clear plastic box with a lid that can easily be removed but will allow air to enter the box. You can obtain a large (14.5 x 8.5 x 9.5) 'Critter Tote' from most pet stores. A plastic shoe box with a wire mesh placed on top will also work for this as will a plastic storage box with small holes punched in the lid.
- A container of water
- Shredded newspaper
- Clean sand or potting soil
- Organic matter such as leaves, grass kitchen scraps
- Worms - You can purchase worms from a dealer (or a bait store) or you can collect your own. To collect worms, look along lawn edges after dark or after a rain, especially in the spring. If you are collecting your own, try to obtain about 25 worms to begin with.

For Observations:

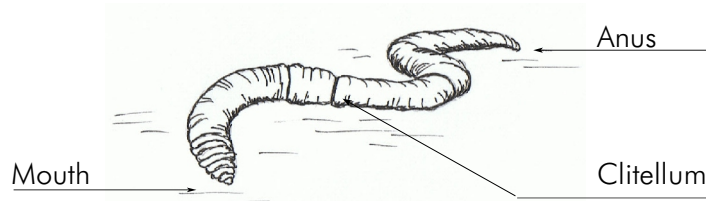
- shallow boxes
- black paper
- notebook to record observations
- magnifying glasses
- small clear plastic box such as a reused food container

Procedure:

- Place all of the materials required out in one spot so that they can easily be reached as they are needed. Make sure that your container has been washed thoroughly to ensure that no contaminating residues are left on the box.
- Place a thin - 1" - layer of shredded newspaper on the bottom of the box. Moisten the paper taking care to not place so much water that it is completely saturated
- Place a layer of sand or soil to a depth of about 4 inches on top of the paper. Moisten the soil; you want the soil to be damp but not wet.
- Add the organic matter. Make sure that you do not use meat scraps. Stir some of the organic matter into the soil. If you are using kitchen scraps only, stir all of them into the soil. If you are using some or all leaves stir in the kitchen scraps and add the leaves on top.
- Moisten but do not saturate your organic matter / soil combination.
- Add the worms. Note that for the first couple of days, worms will be disoriented and might crawl out of the box. Check the area around the box occasionally and place wandering worms back into the box.
- Check your box regularly to ensure that your soil is damp but not wet
- Once a week, add additional organic matter and stir it lightly into the soil.

Observation 1:

- Reach into the box and remove an earthworm for each student or student group. If they are to handle the worms, have them wash their hands prior to handling them so that hand oils and salts are not transferred to the worms. Otherwise, place each worm in a small open box.
- Have the students study the worm. A worm will have a mouth, a thickened area called a clitellum and an anus. Close observation with a magnifying glass will also show small bristles called setae. The worm can travel in both directions, but will generally travel with their mouth toward the front. If you are uncertain as to which end is the mouth, place the worm on a flat surface and observe the direction that it moves.



- Place the worm on a damp sheet of black paper. Watch it move forward. Earthworms move through the use of muscular contractions - alternately shortening and lengthening the body. With the shortening contraction, the setae anchor the worm in place to allow it to move forward. The students should be able to detect four pairs of setae for each segment of the worm with the aid of a magnifying glass. Observe the mucus trail left behind on the paper. Mucus is how worms lubricate their tunnels in order to be able to move more easily.
- Earthworms are blind but can detect light. Observe the activity of the worm when placed under a bright light and in contrast to its activity when placed in darkened conditions.

Observation 2:

- Measure the amount of organic matter placed into the worm farm at the beginning of the process - this does not need to be exact. Observe the texture, color and smell of the soil at the beginning of this process. Ensure that the worm farm is kept moist but not wet. Make note of the amount of organic matter at the end of a week. Observe the texture, color and smell of the soil at the end of the week. The soil should be darker in color, denser and have an earthy smell. This is due to the humus that the worms are producing as a result of breaking down the organic matter.
- Vary the type of materials used for organic matter (ie: one week use leaves, another week use kitchen scraps such as coffee grounds, another week use shredded wood, and yet another week use shredded newspaper). Observe the differences in amount of time that it takes the worms to break down the differing materials, the general size of the worms and the general number of worms within the farm. Do different materials encourage worms to grow and reproduce more rapidly than other materials.

Observation 3:

- Place two inches of sand in a clear plastic container. Pick out four to six worms from the worm farm and place in top of the sand. Moisten the sand from the top and watch the worms response. Within a couple of minutes, the worms should go under the surface of the soil. Add enough water to the top of the sand to completely saturate the sand. Observe the reaction of the worms. The worms will return to the surface when they can no longer obtain air in the sand - ie: when the soil is saturated.
- Replace the worms into the worm farm and pour out the excess water from the sand filled plastic container. Let the sand dry to moist but not saturated. Place six new worms into the sand and cover the container. Place it away from direct bright light. Observe through the sides of the container the tunnels that the worms produce. Use the magnifying glasses to see the mucus trails produced.
- It is possible, although it is not predictable, that the worms will attempt to reproduce while in the plastic container. If they make that attempt, two worms will overlap front ends from the clitellum forward. After the worms have separated, an egg case will be secreted from the clitellum and form a ring around the worm. The worm will back out of the ring and in the process will inject its own eggs and the other worm's sperm. The egg case will be a small lemon shaped cocoon.