

Lesson 1: Introduction to Soil and Compost

Time: 1hr

Common Core Standards

NGSS.K.LS1.1

Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Objectives:

To learn about the process and importance of decomposition

Assessment: Ability to draw table; quality of predictions.

Key words: Vocab Tree

Decomposition; Detritivores; Detritus; Carbon; Nitrogen

(Using Key words: Students can create a glossary, in books or on a wall in classroom. Students are encouraged to practice using vocab in written or verbal sentences - perhaps writing example sentences and displaying them. Students could earn points for using the vocab in novel sentences each week.)

Resources:

- Soil and Compost Powerpoint (Use As Needed)
- Compost Chart

Resources per group or person:

- 2-gallon empty bottle
- A bag of soil
- Some grapes
- Pieces of plastic cup
- A handful of grass clippings
- Some lettuce leaves
- A few nails
- Some white bread
- Some orange peel
- Some pieces of paper
- Some pieces of cotton
- Some pieces of nylon
- Walnut shell
- Apple
- Any other materials that might be interesting to investigate
- Duct Tape
- Scissors

Activities:

Introduction

Class Discussion

Q: Why is the earth not covered with the dead bodies of all the animals that have died over millions of years? (Because of decomposers like worms, bacteria, and other detritivores.)

Q: What happens to the nutrients in these dead bodies? (They are recycled and growing plants use them. There are various kinds of decomposers, which differ based on the way they decompose matter. Detritivores consume non-living organic matter, dead animals, plants, etc. also known as DETRITUS (i.e earthworms, slugs, millipedes). Other decomposers, like bacteria or fungus, absorb on a molecular scale. Both aid in the recycling of nutrients for the plants to use.)

Q: How do nutrients get into a plant? (They are absorbed through roots after the decomposers have passed them.)

Decomposition can be thought of as a parade of many very tiny creatures.

How the decomposition happens in your compost depends on which bacteria and/or fungi inhabit it, what ingredients you have put inside, and environmental factors such as light, temperature and moisture.

The first decomposing organisms that go to work attack the most available food molecules, such as sugars, carbohydrates and proteins. As they grow, these first bacteria and fungi also change the environment. For example, they produce heat, change the pH and consume oxygen. Later, as the compost cools down, you may see larger organisms or detritivores, such as millipedes, sowbugs, earthworms and others. Compost is teeming with living things! You will see these changes in your compost bottle as plant parts become dark and slimy.

(Advanced discussion- explain the roles of each decomposer)

- *Scavengers eat and leave scraps or decaying matter. I.e. raccoons, people, birds, etc.*
- *Detritivores are small creatures that feed on decaying organic matter. They usually eat things that are too big for bacteria to feed on, but small enough that scavengers overlook (i.e. earthworms, slugs, sowbugs, etc).*
- *Bacteria and Fungi further break down ingredients molecularly.*

Q: What makes up compost? Use Powerpoint if needed. (Air + Water + Brown stuff + Green stuff. Brown stuff is dead, dried plant parts like leaves and pine needles. Brown stuff is high in the element *carbon*. Green stuff is fresh, living parts like grass clippings, kitchen vegetable scraps, weeds and other plants. Green stuff is high in the element *nitrogen*.) If the compost smells bad, that means there isn't a good balance of green stuff and brown stuff.

Q. What is compost used for? (organic fertilizer AKA fertilizer without synthetic chemicals)

Q. What are reasons to compost? (reduces waste, good nutrients for plants which means healthy plants for us to eat)

Healthy Growing Session (if participating):

Setting Up A Decomposition Experiment

Prepare the Compost Bottle (Adults can prep ahead of time if students are not advanced enough)

Remove the label from the 2-gallon bottle if it's covering too much of the bottle.

Cut three sides of the top of the bottle, but leave one side attached to provide a "hinge." This "door hinge" is for adding material to your compost bin and removing compost.

A piece of duct tape will secure the "door" closed once you have filled the bottle with compost materials.

Punch the Holes

With a nail, screwdriver, or something sharp, punch holes in the bottle in all directions. (*further discussion - ask students why this is necessary - Answer: Oxygen for detritivores. These holes provide aeration for your compost. Without enough oxygen, the microbes that break the organic matter down into compost will not survive.*)

Decorate compost bottles [if time permits]

Making the Compost

Lay out all of the materials to be put into the compost. Photograph them, ready to be compared to photos a month later. Students can use the Compost Chart (more advanced students can draw their own chart/table) to track observations and predict what will happen to each of the items every 2 weeks for 6 weeks.

Add the ingredients by layers - put the browns into the bottle, followed by the greens and all remaining materials. Put the soil into the bottle, mix it up well, so all materials are well distributed throughout the soil. Add water until it is damp but not soggy, and secure the door shut with duct tape. Attach a sign on the bottles that says 'What's going on in here?.'

Place the compost bottle on a sunny windowsill. Check the compost every day for the first few days to make sure you have the correct amount of moisture. If the contents get too dry, simply add some water. If they are too wet, add dry material and remove the cap from the bottle. If the contents become soggy, leave the door open until it dries.

All that is needed now is to mix the compost once a week. Students can take turns rolling the compost bottles across the floor or on a table.

Do not add any additional ingredients to the compost after the first week, in order for it to form in 30 days.

One Week Later:

Have students create individual tables for tracking four variables; appearance, temperature, smell, and texture. Allow students to view the contents once a week and record any changes they see in their table. Challenge them to observe carefully and note even subtle changes in

appearance, temperature (compost heats up as it begins to break down), smell and texture.

Discussion:

Hold up the walnut shell and the apple. Ask students how the walnut shell could have become the apple, and then become you? (Walnut shell drops under an apple tree, decompose and then add nutrients to the soil. The roots of the apple tree absorb nutrients, some of which go into the fruit of the tree. You then pick and eat the apple.)

Recap

Why do we need fertilizer on plants?

What is happening to the population of the earth? (Increasing)

What is happening to the amount of waste we are producing? (Increasing)

So we need to reduce waste, while organically fertilizing the plants we do have. Composting helps us do both these things.

How? (Diverting waste from landfill to compost bin and providing nutrients for the growing plants)