SOIL

Lesson 2 ◇ Compost

Grades 6th-8th

Key Words

Aerobic, Anaerobic, Vermiculture, Organic Matter, Mesophilic, Thermophilic, Regenerative Process

Key Concepts

- Basic composting intro:
  - Ingredients
  - Compost ecosystem
- Types of composting (aerobic, vermicompost, anaerobic bokashi)
- 3 thermal stages of composting (mesophilic, thermophilic, mesophilic)
- Compost chemistry (nitrogen, phosphorus, potassium, carbon)

Lesson Outline

What is compost? How does this happen in nature? In a forest, the leaves and sticks on the ground are returned to the soil by means of a process called decomposition. In a garden, we can mimic this, and when we do we call the product of this process “compost.”

What can be composted? If it grows from the ground (or is primarily made from something that grows from the ground- for example, brown bags are made of trees and bread is made of wheat), it can be composted. Items such as meat, dairy and oil should not be composted in most gardens, as they may smell bad and attract unwanted critters. The only exception to this rule is egg shells (they are good for the garden).

There are three main types of compost systems: aerobic (requires oxygen), anaerobic (does not require oxygen, such as bokashi) and vermiculture (worm composting). For this lesson, we will be focusing on aerobic composting.

A healthy compost system will have four main ingredients: Nitrogen (“greens”), carbon (“browns”), water and air. All organic matter is composed of some nitrogen and some carbon. Therefore, when we add organic matter to our compost, we are always adding nitrogen and carbon. It is important to have a good balance of both, so the compost ecosystem can thrive.

When we speak of the “compost ecosystem,” what living organisms do you think are living and playing essential roles in our compost pile? This is where the Compost FBI, our essential group of decomposers, comes in. Fungi, bacteria and invertebrates all live in our

compost system, processing and breaking down organic matter into smaller pieces. Because these are living organisms, if we want them to thrive in our compost, we need to make sure we give them the environment they need to be successful; a balanced compost makes for happy decomposers.

Like all ecosystems, the conditions within the compost pile change over time; these changes depend on the ingredients in the compost as well what stage in the decomposition process our compost is in. Throughout the decomposition process, we depend on natural cycles and FBI to do their jobs.

Explain the three stages of composting:

1. Mesophilic phase: In this stage, mesophilic bacteria (an aerobic bacteria) thrives when the compost is between seventy to ninety degrees Fahrenheit. The bacteria will do the majority of the breaking down of organic matter, and the temperature of the compost will begin to rise.
2. Thermophilic phase: Thermophilic bacteria take over. They break down organic matter into smaller pieces. In this maturation phase, the temperature decreases.
3. FBI returns: The new conditions allow the FBI to come back to finish the decomposition process.

This process of composting, or using waste to feed the plants, is a regenerative process. Discuss how this benefits the ecosystem.

Compost in a Jar activity.

Video Lesson

Soil Lesson 2 Video - Compost

Activities

- ACTIVITY: Compost in a Jar! : Fun activity where students observe compost being made over 12 weeks. *Courtesy of Grow Some Good w/original credit to Tom's of Maine*
- HANDOUT: Compost Student Worksheet : Student resource worksheet for Soil Lesson 2: Compost.

Additional Resources

- VIDEO LINK_The Compost Story: Find out what would happen if we diverted the 60 billion pounds of mineral-rich food materials that go to landfills each year in the U.S. alone and turned them into compost. This 7 minute video on compost on the role of compost in our ecosystem. There are other videos by *Kiss the Ground* that focus on composting in order to regenerate soil and capture more carbon dioxide, thus helping slow or reverse climate change.

- ACTIVITY_Compost in a Bag: This is a full lesson, complete with vocabulary, materials list, discussion questions and additional project ideas *Courtesy of Adapted from SF Environment lesson. A department of the City and County of San Francisco.*
- STUDENT HANDOUT_Compost Weight Change Observation Chart: Simple chart with only two empty columns to evaluate weight
- STUDENT HANDOUT_Grow Your Own Compost: Instructions for students to make their own compost pile or bin *Courtesy of University of Hawai'i at Manoa, College of Tropical Agriculture & Human Resources*
- BACKGROUND INFO_Composting Methods: Website that summarizes 3 composting methods (Cold, Hot, Worms) *Courtesy of University of Florida/IFAS Extension*

NGSS

- 6-8-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- 6-8-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- 6-8-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

KAP Curriculum

KAP_2:LS_6-8_1.2 Describe characteristics and components of living soil

KAP_2:LS_6-8_1.5 Understand how different soil mixtures serve different functions

KAP_2:LS_6-8_1.6 Know and describe the roles of oxygen, carbon, and nutrient cycling in the soil

KAP_2:LS_6-8_4.1 Understand, build, maintain, and use compost systems