Analyzing Your Soil Samples

Overview:

Students will analyze their soil samples and determine if their soil does not need to be amended with compost (organic material) or other components and is ready for planting.

Objectives:

At the end of the lesson, students will be able to:

- **Identify** the kinds of components that are in their soil sample: organic matter, clay, silt, and sand.
- **Describe** the ideal percentage of each component in healthy soil.
- **Explain** why these percentages are ideal for growing healthy plants.
- **Compare** their collected soil sample to an ideal sample.

Vocabulary:

- components
- ideal
- clay
- silt
- sand
- organic matter

Materials:

- Students' soil samples
- Completed Handout: "Measuring Your Soil Samples" for each group from the previous lesson
- Compost as needed
- Empty garden bed
- Gloves
- Rakes

On the Board:

- Ideal composition of a soil sample
- Blank table for students to record their percentages of organic material by quadrant

(e.g., Quadrant 1 writes their percentages of the four components)

Learning Activities:

1. Activity: Analyzing Soil Samples (10 min.)
   A. Students should break into their groups from the previous two lessons.
   - Have students retrieve their soil samples and handout: "Measuring Your Soil Sample," that they completed in the last lesson.
   - Distribute the handout: "Analyzing Your Soil Samples," and have students work in their groups to complete it. They will compare the percentages they calculated in the last class with that of an ideal soil sample. The worksheet will help them determine if their sample has the right proportion of soil components to grow healthy plants.

   B. Bring the class back together and have them compare answers by copying a table in their garden journal and writing down the percentage of organic material in each quadrant. Have them determine, based on each groups'

results if the soil quality is different in each quadrant of the garden. Have them discuss and then write at least two reasons this might be so. Call on several students to share their ideas.

C. Tell students that if their soil is not an ideal composition, they can add different soil components to make it healthier. Ask them to take a minute to decide what they would add.

2. Garden Activity: Amending Soil (20 min.)
   A. Demonstrate how to work compost by digging it into a garden bed in order to add more organic matter/nutrients.
   - For each 8 ft x 4 ft garden bed, you will need about two cubic feet of soil amendment.
   - Using a shovel, dig straight down to mix the soil amendment with the existing soil of the garden bed about one foot below the top of the soil.
   - Use a rake to smooth over the soil so that you can plant your seeds or seedlings.

   B. Let students try this in small groups.

3. Snack: If possible, have students taste a fruit or vegetable that was grown in unhealthy soil vs. one that was grown in healthy soil. (5 min.)

4. Have students answer the Reflection Questions in their garden journals. (5 min.)

Student Reflection Questions:

1. Do you think your soil will be good for growing fruits and vegetables? Why or why not?
2. What could you add to it to make it better?

Assessment Questions:

1. What is the ideal make-up of soil for planting fruits and vegetables?
   - **Organic matter (10%), clay (20%), silt (40%), sand (30%)**

- Why is it important to have this proportion of organic matter in your soil? - **Organic matter adds nutrients and microorganisms that make the soil healthy for growing plants.**

Standards:

Next Generation Science Standards

- NGSS-CCC Cross Cutting Concept

Cause and Effect

Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

- NGSS-SEP Science and Engineering Practices

Systems and System Models
Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

- NGSS-DCI Disciplinary Core Idea

ESS3.A: Natural Resources
Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

- MS-PS1-1.

Develop models to describe the atomic composition of simple molecules and extended structures.

Common Core State Standards
ELA/Literacy
- RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). *(MS-PS1-1)*

Mathematics
- MP.2

Reason abstractly and quantitatively. (MS-PS1-1)

- MP.4

Model with mathematics. *(MS-PS1-1)*

- 6.RP.A.3

Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-PS1-1)*

- 8.EE.A.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *(MS-PS1-1)*

Analyzing Your Soil Sample

1. What is the *ideal* amount of **organic matter** in soil? .....
2. What percentage of *your sample* is **organic matter**? .....
3. What is the *ideal* amount of **clay** in soil? .....
4. What percentage of *your sample* is **clay**? .....
5. What is the *ideal* amount of **silt** in soil? .....
6. What percentage of *your sample* is **silt**? .....
7. What is the *ideal* amount of **sand** in soil? .....
8. What percentage of *your sample* is **sand**? .....
9. LOOK at your soil claim in your garden journal. What are 2 differences in the ideal sample and your claim?
    1.
    2.
10. What are 2 similarities in the ideal sample and your claim?
    1.
    2.
11. Do you think your soil is ready for planting?

---

12. If not, what could you do to it to make it ready?

---

13. Why is it important for the soil to be close to the ideal sample?

14. What was most surprising about your sample analysis results?