Introduction: Thank you for visiting the Washington Youth Garden! Please use this lesson either as a pre-field trip exercise or as a follow-up for your visit to the Washington Youth Garden SPROUT program.

Background information: Soil is made of a variety of inorganic and organic components. Some inorganic components come from rocks, such as sand (larger particles), silt (medium particles), and clay (small particles). Others inorganic compounds include air, water and occasionally heavy metals. Living organisms and dead organisms in the process of decomposition are the primary sources of organic material. Healthy soil for gardening is approximately 50% air and water, 45% inorganic material and 5% organic material. The size of all the particles matters! If your soil has lots of clay, it will become water-logged and plant roots may mold or rot. Alternately, an extremely sandy soil may drain too quickly, washing away nutrients and not permitting plants sufficient time to absorb water through their roots. A soil with too little organic material may lack the nutrients necessary for plant growth and require chemical fertilizers. Decomposers, such as worms, certain insects, fungus, and micro-organisms, turn large organic waste into particles that are an appropriate size and/or chemical composition for plant use. Another interesting fact that may catch students’ attention is that there are more living organisms in a teaspoon of soil than there are humans on the planet. Dynamic, living, healthy soil is the foundation for both large agriculture (e.g. farms) and small-scale agriculture (e.g. gardens).
Other helpful resources:

Growing Healthy Habits Curriculum: Feed The Soil...and the Soil Will Feed You! (Unit 3, beginning on page 84) is another look at soil composition and includes both hands-on and writing activities designed for grades 3-5, but adaptable for a number of ages. For slower connections: http://md.nutrition-ed.org/

Build a simple worm bin: This Washington State University webpage has simple instructions accompanied by photographs to help you construct a classroom worm bin. Order worms online at redwormcomposting.com, unclejimswormfarm.com, or at a variety of other online vendors.

Soil Air – This is one of many activities that can be adapted from the curriculum developed by Utah Agriculture in the Classroom.
1. Ask each student group or pair to place 1 cup of dry soil into a 2-cup container.
2. Students should slowly pour 1 cup of water into the soil container until the soil is “saturated” or all the dry soil is “mud.” While they were pouring the water they should notice the “air bubbles” that are rising to the surface.
3. Students should measure the amount of water left and subtract it from 1 cup.
4. Lead students to infer that the amount of water in the soil sample was approximately the amount of air that was displaced. As the students added the water to the sample, they should have seen bubbles, until the sample was saturated.
5. Have students compare the amount of water that they were able to pour into their soil samples. There will be differences depending on the soil texture and organic matter.
What is the percentage of air in the soil sample? If they were able to add a 1/4 cup of water, the sample contained 25 percent air.
6. Using the components of the soil transparency, and the movable yarn, explain how air and water amounts change.

Soil crayons: Use different colors of soil to make “crayons.”

Living soil powerpoint presentation and script: This is a photograph heavy resource with a thorough exploration of basic soil science. It may be best used as an extension for older elementary and middle school students or as an introduction for high school level students.

Books about soil:

Diary of a Worm by Doreen Cronin (K-3): Learn about worm lifestyles from a worm’s comical point of view! This is a great read aloud book, although younger students may miss some of the humor. Reading level: 2.8

Compost Stew: An A to Z Recipe for the Earth by Mary McKenna Siddals (K-3): This rhyming read-aloud presents colorful collages and a creative list of items you might find add to a compost pile. Reading level: 1-3

Dirt by Steve Tomecek (3-5): Led by a star-nosed mole, students will learn about soil composition and formation. Reading level: 4.6

Poop-Eaters: Dung Beetles in the Food Chain by Deirdre A. Prischmann (3-5): The liberal use of the word “poop” will help some readers digest this book about food chains and adaptations. Reading level: 4.9

The Dirt on Dirt by Paulette Bougeois (4-8): This little reference book is packed with information and activities. Reading level: 5.6

A Handful of Dirt by Raymond Bial (4-8): Basic information about soil is illuminated by beautiful photography. Reading level: 7.0
Lesson Plan (K-2\textsuperscript{nd}): What is soil?

**Objectives:** Students will be able to identify the different components of healthy soil. Students will be able to connect healthy soil to healthy plants.

**Preparation:**

**Materials:**
A small cup of soil for every 2-4 students
Copies for every student of: Soil Recipe coloring sheet and Circle the Healthy Soil worksheet
Crayons/colored pencils

**Instructions:**

**Introduction:** Ask students to raise their hands if they think soil is dead and then if they think it is alive. After surveying the class, inform them that everyone is correct! Soil is a mix of living things and non-living things and good soil has the perfect mix to provide plants a healthy home.

**Guided instruction:**

1. Distribute a small cup of soil to every set of partners. Instruct students to touch, smell and look at the soil without taking it out of the cups. Take a few minutes to allow students to think about their observations and share with their partner. As a class, collect observations out loud (think-pair-share). Collect the samples.
2. On the board, **sketch** all of the components of soil, identifying the living and non-living parts:
   - Tiny pieces of minerals (rocks)
   - Water
   - Air
   - Things that used to be alive (leaves, vegetable peels, etc.)
   - Living things (worms, bugs, etc.)
3. Hand out the Soil Recipe coloring sheet. Together as a class, point to each component of soil and identify it out loud. Give students time to color the pictures.
4. Repeat together that healthy soil is important for growing healthy plants.

**Independent practice:**

1. Hand out the Soil Ingredients worksheet. Students should circle the items that are part of healthy soil and draw one thing that is part of healthy soil that is not on the worksheet in the empty box provided (e.g. worms).
2. Go over answers together as a class and correct.
3. Repeat together that healthy soil is important for growing healthy plants.
Take home extensions:

1. At home with parents: Using a spoon or trowel, dig up soil with parents. Student should explain what the soil is made of and why it is important. Have parents sign that their student found and talked to them about soil.

2. At school follow up: When students come to class the next day, have them draw where they dug up their soil and write a sentence or two about it.

Standards

K –

K.1.1 Describe objects accurately by drawing pictures.

K.1.3 Gather information about objects through the use of one or more of the senses, such as sight, smell, touch, and (under supervision) taste.

K.3.2 Investigate and compare physical properties of objects (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, ability to float and sink).

1st –

1.1.1 Observe, describe, draw, and sort objects as a way of isolating and categorizing some of their properties.

1.1.7 Describe and compare objects in terms of number, shape, texture, size, mass, color, and motion.

1.2.1 Recognize and explain that water, rocks, soil, and living organisms are found on the Earth's surface.

2nd –

2.1.1 Describe objects as accurately as possible and compare observations with those made and reported by others.

2.1.6 Draw pictures and write brief, coherent descriptions that correctly portray key features of an object.

2.7.4 Recognize and explain that materials in nature, such as grass, twigs, sticks, and leaves, can be recycled and used again, sometimes in different forms, as birds do in making their nests.

2.7.7 Recognize that there is a vast world of living things, called microorganisms, too small to see with the unaided eye.

2.7.8 Recognize that most microorganisms do not cause disease and many are beneficial (e.g., yeasts, bacteria of the soil).

2.8.4 Describe that plants and animals in our city have habitats that are essential to their survival. For instance, the schoolyard is a habitat that provides the basic needs for a variety of plants and animals.
Circle the Healthy Soil

Color and circle all of the objects that are part of healthy soil:

Draw a creature that lives in healthy soil:
Science Program Reaching OUT (SPROUT)
Enrichment Lesson for Soils and Compost

WASHING rON YOUTH GARDEN

NAME __________________________

SOIL

TINY PIECES OF MINERALS (ROCKS)

WATER

RECIPES

THINGS THAT USED TO BE ALIVE

LIVING THINGS

HEALTHY SOIL