



## **Lesson: Soil Under the Lens**

Duration: *Two (2) 40-minute sessions*

**Note:** *This lesson involves activity segments that may be implemented in an outdoor setting. Where relevant, the title of the activity will be followed by “(outdoors)”. In this particular lesson, students will need access to soil, optimally from a raised bed or garden.*

### **Section 1: Framework**

#### **Essential Questions**

- What do plants need to grow and thrive?
- How do different organisms interact to support plant life?
- What role does healthy soil have in supporting plant life?
- How are the health of plants and the health of humans interconnected?
- How might the destruction of organisms impact the health of other organisms and whole ecosystems?

#### **Lesson Objectives**

- Students will know key vocabulary associated with plant and soil health: organism, microscope, microorganism, bacteria, viruses, fungi, soil food web, food web, dirt.
- Students will understand that bacteria, viruses, and fungi are examples of microorganisms that are essential to the health of other organisms and entire ecosystems.
- Students will be able to evaluate an illustration of the soil food web and articulate the relationship between various organisms in the soil food web.
- Students will predict what the presence of worms in a garden suggests about soil health.
- Students will be able to evaluate their learning as they identify changes to their conception of soil.
- Students will be able to provide one example of a relationship between organisms that is crucial for the survival of entire ecosystems.
- Students will apply their skills of observation to evaluate the health of soil.
- Students will evaluate, depict, and describe various soil samples in support of their ability to draw informed conclusions about soil health.

## **Context**

Bacteria, viruses, and fungi - tiny living things - are everywhere. Whether or not we like to admit it, we need them. The world beneath our feet, in our soils, is vast and complex; and this life-giving world is sustained in no small part by the infinite number of microorganisms that reside there. In “Soil Under the Lens”, students and teachers explore the interconnected web of organisms that contribute to healthy soils, evaluate the health of the soils nearest to them through hands-on exploration, and identify actions that contribute to the safe stewardship of our soils.

## **Standards**

### **PRIMARY**

**Massachusetts Science Standard 3.LS4.3:** Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive.

### **RELATED**



**Massachusetts Science Standard 3.LS4.4:** Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.



**Massachusetts Reading Standard RI.3.10:** Independently and proficiently read and comprehend informational texts, including history/social studies, science, mathematical, and technical texts, exhibiting complexity appropriate for at least grade 3.

## **Section 2: Activities**

### **PART A**

#### **Materials**

-  Google Slides: Soil Under the Lens (Part I of II)
-  Handout: Exploring the Soil Food Web

-  Writing utensil
-  Paper (lined or unlined)

#### **1. Activator (4 minutes)**

An activator is a great way to encourage students to begin thinking about soil and to aggregate prior knowledge about soil. Begin by ensuring that each student has a piece of paper and a writing utensil. Instruct students to spend one minute recording anything they already know about soil on their paper. After one minute has elapsed, spend 2-3 additional minutes recording students' thoughts in a place

within the classroom that all students will remain visible to all students throughout the lesson.

### **2. Slides: “Soil Under the Lens, Part I of II” (20 minutes)**









Read through the provided slides, “Soil Under the Lens, Part I of II”, with students. Review any unfamiliar words or phrases as you go. Several questions are asked throughout the presentation to help students engage with the terms and cultivate understanding through personal connection. Take a moment to briefly discuss students’ responses to these questions, as appropriate and beneficial.

### **3. “Exploring the Soil Food Web” Handout (16 minutes)**

Provide students with a copy of the handout “Exploring the Soil Food Web”. This handout is designed to help students work with new information to improve their content knowledge and depth of understanding. Students are asked to utilize the illustration provided to determine the relationships among organisms in the soil food web, to make a prediction and provide a content-based explanation, and to evaluate their learning. Depending on time, this handout may be assigned as independent work or form the basis of further sharing and discussion.

## **PART B**

### **Materials**

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|---|---|
|  Google Slides: Soil Under the Lens (Part II of II)                  |  Trays and/or plates                         |
|  Handout: Sensing Soil   |  Optional: crayons, markers, colored pencils |
|  Writing utensil   |  Optional: clip boards                       |
|  Soil samples (2 x student or group) and/or cups for soil collection |  Optional: Magnifying glasses/microscopes    |

### **1. Introduction (2 minutes)**

Begin by reviewing learning from Part A of the lesson with students. The “On the Back!” exercise on the “Exploring the Soil Food Web” handout is a great way to help students recall their learning along with key vocabulary. Consider spending a few minutes collecting feedback on this activity from students.

### **2. Slides: “Soil Under the Lens, Part II of II” (15 minutes)**

Read through the provided slides, “Soil Under the Lens, Part II of II”, with students. Review any unfamiliar words or phrases as you go. Several questions are asked throughout the presentation to help students engage with the terms and cultivate

understanding through personal connection. Take a moment to briefly discuss students' responses to these questions, as appropriate and beneficial.

### **3. Soil Collection (OPTIONAL; outdoors)**

In order to complete the "Sensing Soil" handout, students will need at least two soil samples to explore and evaluate.

Depending on preferences and constraints, it may be feasible to bring students outside to collect soil samples. Samples can be small but should represent variety in terms of location/type (ideally, one sample would come from a location near to plant roots while the other sample would come from some place that lacks an abundance of plant life). Students should make note of where each soil sample comes from so that they are better able to make connections between lesson content and hands-on experimentation.

It may, alternatively, may be preferable to have students work with samples that have been pre-collected for the following activity. In this case, ensure each student and/or group of students has at least two soil samples taken from different locations along with a brief description of the conditions at the sample site.

### **4. "Sensing Soil" Handout (23 minutes) (outdoors)**

Before beginning this activity, ensure that every student has two soil samples, a tray or plate to empty soil onto, a "Sensing Soil" handout, and something to write with. Optionally, students may wish to use colored markers, crayons, or pencils to illustrate their work and/or a magnifying lens or microscope to view their soil samples more closely.

Working individually or in groups, students should begin by carefully placing one soil sample on the plate or tray in front of them. Once the soil has been laid out, students are invited to begin interacting with it, using their various senses to observe and describe their soil along with the "Sensing the Soil" handout.

Once all Sample 1 information has been recorded, students should repeat the same steps for observing and describing Sample 2.

Once all observations and descriptions have been recorded, encourage students to apply their knowledge and understanding of soil as they discuss the following:

- What differences did students observe in their soil samples?
- How were the soil samples locations different from one another?
- How does location affect soil health?  
(consider nearby plantings, sun exposure, chemical exposure, etc.)
- What contributes to healthy soil?
- What causes unhealthy soil or leads soil to become dirt?
- What might students do to improve the health of soil?

### **Section 3: Lesson Extensions**

- Want to further explore the differences in soil? Consider designing additional experiments to test students' soil sense! For example, students might be curious to learn how soil type affects water drainage and retention or the growth of a seedling.