

TTCD Lesson Plan (1): What is Soil?

Unit: Soil Science	Grade(s): All	Class Size: 1-30	Lesson Duration: 30 minutes and 15 minutes	Location(s): Classroom
Topic(s):	Soil science			
Student Prerequisites:	N/A			
Essential Questions:	What is soil made of? What needs to be in the soil in order for plants to grow? How might farmers use the results of this experiment?			
Student Objectives:	Students will conduct an experiment to see that soil is made up of lots of different materials. Students will understand the difference between soil and dirt. Students will learn why some soils are better for growing food than others.			
Standards:	Supports NGS Standards: 5-PS1-3. Make observations and measurements to identify materials based on their properties. Relevant NGS Crosscutting Concepts: Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. Cultural Standards E.2: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: understand[ing] the ecology and geography of the bioregion they inhabit.			
Local Context:	Use a local soil sample. Ask: What role does soil play in our local watershed?			
Vocabulary:	soil, component, sand, silt, clay, organic material, minerals, prediction, observation			
Dena'ina language words:				
Materials:	One medium to large glass jar or clear plastic jar with a wide mouth and a lid for each group. <i>Remove labels so you can see into the container easily. ***If using glass jars, remind students that glass can be dangerous. What are some rules we should have in place before we begin? (no running, horseplay, holding jar above head, etc.)</i>			

	• About 1 cup of soil per group - Use a local sample from the school yard, garden, or greenhouse • Enough water to fill each group's jar. It is nice to have a larger pitcher or milk jug for distributing water to each group. • Coffee stirrers or popsicle sticks • Student's TTCD journal or binder to record observations and predictions • Colored pencils, crayons, writing utensils • Indoor shelf space or student desks where jars can sit for up to a day. • A sample jar with soil and water that you have let sit for a longer amount of time so that students can see the clean layers and compare this to their results.
Instructor Prep:	Prepare a sample jar. Let it sit for a longer amount of time (24 hours works great) so that students can see the clean layers and compare this to their results.
Introduction:	Review previous lesson on snowpack and watershed. Ask the class: What job do you think soil might have in the watershed? Explain that today we will be conducting an experiment to find out the four main components of soil. A component is one part of a larger whole. Ask the class: Do you think soil is important for humans? Why or why not? Jot down some answers on the board. Play video/song for K-5: The Banana Slug String Band- Dirt Made My Lunch
Part 1 Directions:	1. Divide students into groups of 2 or 3. Distribute one jar, lid, and cup of soil to each group. 2. Fill about half of each group's jar with water. 3. Have students carefully pour their soil into the container with water. One team member can stir while the other adds the soil. Here's a tip: Only add enough soil so that your mixture is still a liquid – we are trying to make dirty water, not mud. <i>Note: If students are making a mess, show them how to create a funnel using a piece of paper to help them pour their soil.</i> 4. Tightly screw the lid on your jar and shake your container until well mixed. Get those arm muscles moving - shake up your jar for about 3 minutes (play a fun music video while kids shake their jars). Make sure you take turns with your teammates! 5. You should end up with some cloudy, brown water in your container - perfect! 6. Now we have to let our experiment sit, without moving or touching it, for at



a

	least 3 hours. What do you think will happen? 7. Give each group a chance to make a prediction. (I predict that in my container I will see... I think that the soil and water will...). You can write each prediction on the board, have a volunteer from each group come up to write, or have students write their predictions in their notebooks. 8. We will come together later in the school day to check our results! <i>If you aren't able to see the group twice in one day, you can use your example jar for the wrap up. Students can draw the results of their experiments in their notebooks with their teacher.</i>
Part 2 Directions:	After 3 or more hours, check the results of the soil jar experiment! 24 hours works best. Students should see multiple separate layers in their jars. Ask students: Why does the soil and water mixture separate into layers? Take a moment to think: when you throw a rock into a pond, what happens to the rock? (sinks, because it is more dense than water). When you throw a leaf into a pond, what happens to the leaf? (floats, because it is less dense than water). Now, let's try to figure out what these layers are made of! Draw a large outline of a jar on the board. Explain that the layers are formed by the different components of soil, which all have different densities. Bottom Layer: Minerals All the layers below the water are called minerals. Minerals are mostly made from rocks that have been broken down into much smaller pieces. You may see up to four layers of minerals in your container. The bottom would be any gravel or rocks you scooped up. These are the heaviest, or densest, components! The next layer is sand, then silt, and then clay.

	Middle Layer: Water We added water to conduct our experiment, but do you think our soil had some water in it to begin with? It did! When you pour water onto the ground outside, it seems to disappear – the soil is absorbing water (you can tell students that this is a hint for our next soil experiment!). This is a good time to mention another component of soil: air. We don't really see air as a layer (except maybe at the top, depending on how full your container is). However, just like water, air is in soil in tiny pockets. Top Layer: Organic Material The stuff floating on top of the water is called organic material, which is made up of parts of living things. Organic material can be plants and animals that are alive, like fungi. It also includes plants and animals that are dead, like wood chips or leaves. Have students draw their observations in their TTCD journal or binder, starting with an outline similar to the one you drew on the board (younger students will need to be shown how their jar sketch should take up an entire page). Have students label the four components of soil on their page: 1. Minerals - including sand, silt and clay 2. Water – in tiny pockets 3. Air – you can't see it, but it is also in tiny pockets 4. Organic Material – plants, animals and their by-products, both living and dead.
Wrap-Up:	Classroom museum walk: Have students leave their jars and drawings at their tables, then walk carefully around the room to visit other student's soil science experiments. After everyone is seated again, check for understanding by answering the following questions as a group: 1. What is soil made up of? 2. Which of these things are important to plants? (water, minerals, organic material, air) <i>Evidence of learning:</i> Ask students to respond verbally or in writing to one (or both) of these scenarios: 1. Imagine you are going to be planting vegetables or flowers in this soil. How would you use the results of this experiment to decide what to plant or what changes to make to the soil? 2. Think of soil from another part of your community. Draw a prediction of what the layers in the jar would look like if you conducted the experiment using soil from that location. Explain why you think the layers would be that way.

Lesson Adaptations:	Have advanced students practice using the soil textural triangle using the Soil Triangle Practice worksheet. Then, use a ruler to measure the height of each soil layer in your jar, and use the triangle to analyze your jar (math, 20 minutes).
Extensions:	1. Have students write a sentence about their observations in their journal or binder. (In my container I see... My container looks like...) 2. After the experiment, have students create their own soil mixture by combining sand/silt/clay, organic matter, water, and air. Instruct them to write the recipe for their soil and include a note about why they think this soil would be great for plants. They can leave the soil mixture and recipe at their station as they rotate through the museum walk. <i>Note: This also serves as great evidence of learning.</i> 3. Before the experiment, have students create their own soil mixture and write the recipe for this soil. Do the experiment with both their local soil sample and their home-made soil. Make comparisons of these two jars after the experiment. 4. Build upon question #2 in the “evidence of learning” outlined above by having students collect a soil sample from that location, run the experiment, and compare their results to their prediction. 5. Squeeze Test: Take a field trip to the greenhouse or garden. Have each student collect a handful of soil, and squeeze it firmly with one hand. What does it feel like? When you open your hand, what happens? From this test, we can make an estimate about what type of soil we have! ● Loam: It will hold its shape, and when you give it a light poke, it crumbles. ● Clay/Silt: It will hold its shape, and, when poked, sits stubbornly in your hand. ● Sand: It will crumble apart as soon as you open your hand.
Reflections:	How did it go? What did students understand most/least? What could change about instruction or lesson plan?
Resources Used:	OSU Extension Service: Soil Lessons Soil Triangle Practice Use the Triangle to Analyze your Jar Utah State University Cooperative Extension: https://www.soils4kids.org/files/s4k/perkin.pdf