Lesson Extension

Earth Science 14: Soil Properties

Today we investigated different soils in order to determine which soil was best for a tomato plant. We examined color and texture, and also measured how much water each soil could hold (field capacity). In this activity, we will look at another important thing that soils can do: soils can act as a filter, removing impurities from the water that seeps through them. Healthy soils are important for good drinking water!

This activity was developed by Dr. Clay Richardson, who has kindly allowed us to adapt it for this lesson.

Filtering with Soil

Using simple materials and Kool-Aid or food coloring, you'll set up soil filters and pour different liquids through them to see soil's purifying abilities in action!

Materials:

- 3 oz. and 5 oz. paper or plastic cups (different sizes can work: it is important for the bottom of the big cup to be able to into the small one). The 5 oz. cup fits inside the 3 oz. cup.
- toothpick
- fine soil (unused soil needed for each liquid test)
- water
- grape Kool-Aid
- other Kool-Aid flavors
- other colors, e.g., green, red, blue, and/or yellow food coloring

Procedure:

1. If you are mixing up the Kool-Aid yourself, don't bother with the sugar. The colors are the interesting part!
2. Use a toothpick to poke 3-5 holes in the bottom of the larger (5 oz.) cup
3. Fill the larger cup half-full with soil.
4. Set the larger cup in the smaller cup, with the toothpick along the inside wall, between the cups. The toothpick will let air escape from the bottom cup.

   Your **hypothesis**: "When I pour the purple grape Kool-Aid through the soil, I think the color of the liquid that comes out will be_____."
5. Slowly pour some of the grape Kool-Aid onto the soil in the cup.
6. Wait for the filtered liquid to drain out into the smaller cup.
7. Record your observations in the data table.
8. Try the experiment again using different kinds of soil or a different-colored liquid. You could try other flavors/colors of Kool-Aid, other drinks, or just put a few drops of food coloring in a cup of water.
   Note: Each liquid test should be done with a fresh unused soil sample.

Analysis:

What color is the liquid that goes into the cup? What color is the liquid that comes out of the cup? What dye molecules are getting filtered out by the soil?

For the grape Kool-Aid, you can read on the back of the package that the two food dyes in it are red and blue. So if the liquid that comes out of the soil filter looks more like one of those colors, then you know that the other one is being absorbed by the soil!

Use the table below to record your observations for your different experimental conditions.

Soil Filtering of Food Dyes

		Liquids Used, Starting colors				
		Grape Kool-Aid, purple				
Soil Sample #1 **Taken from:** _____	Color of liquid that comes out	Fill in your observations here…				
	Dye color absorbed by soil					
Soil Sample #2 **Taken from:** _____	Color of liquid that comes out					
	Dye color absorbed by soil					
Soil Sample #3 **Taken from:** _____	Color of liquid that comes out					
	Dye color absorbed by soil					

Why does this matter?

In the real world, we're not too worried about filtering the food coloring out of drinks. But we do care that soil filters many other chemicals out of rain water before it flows into lakes and rivers. Some of those chemicals are not healthy for us. The same processes that allow soil to filter out chemicals are used to purify wastewater from houses, cities, industry, and large animal-feeding operations.

Go Further:

- You can see a longer version of this activity, and other activities and information as well, on Dr. Clay Richardson's website: http://www.doctordirt.org
- The Soil Science Society of America maintains a site with information, games, and experiments to explore soil science, designed for kids: http://www.soils4kids.org/