The Color of Soil

Students will learn about what makes soils different colors, and practice classifying soils with a color chart. Soil art project suggestions are included at the end.

Set Up
Collect a variety of soil samples that represent a range of colors. Try to get some that are oxidized (red and orange colors), high in humics (dark brown, e.g. from a garden) and poorly drained soils (black or grey, e.g. from a wetland). Soil samples should be moist, and can be stored in a zip bag to seal in moisture.

Introduce the activity
Ask: What color is soil? [Encourage a variety of answers, they’ll likely all be right. If students are stuck on “brown” show them some reddish or grey soils you’ve collected.]
Ask: Why are soils different colors?

Explain that color is determined by two main factors:
1) Contents of the soil: minerals and organic matter from dead plants and animals
2) Environmental conditions, particularly oxygen exposure. In soils that are well-drained, water moves through quickly, and there is lots of oxygen in the soil. This means oxides will form. Iron oxide is bright red (think rust!) and will color the soil red. In poorly drained, or saturated soils, water sits there and oxygen can’t get in. This means the iron minerals will reduce. Reduced iron compounds are grey.

On the handout: Students must match the component or condition to the color it contributes. Answers:
- Iron oxide minerals —> red
- Iron sulfide minerals —> black
- Calcium minerals —> white
- Low oxygen —> grey
- Organic matter —> dark brown

Activity I: The Color of Soil

Note: Soil samples should be moist (not soaking wet). If starting with dry soils, have students moisten with some water first. Explain that dried soil is a different color, so we always compare soils while moist.

1. Hand out soil samples for the students to examine. Have them describe the soils in terms of colors (e.g. reddish brown, yellow brown). They can fill in the first column of the observation sheet.

2. Explain that terms like ‘reddish-brown’ can mean very different things to different people. Scientists need a way to quantify color so they can make sure they are describing the same thing. Soil scientists use the Munsell color charts to describe soils

3. Explain the Munsell Color Chart. Use a soil color book or the simplified version in the student handout. Colors are described in terms of:
   - Hue: color, for soils typically red (R) and/or yellow (Y)
   - Value: lightness or darkness

Materials needed:
- 4+ soil samples of a variety of colors
- Water for moistening soils
- Munsell color book OR Student handout with simplified color chart

Success Indicator:
Students can classify soil colors

Life Skills:
Observing, Reasoning, Communicating

Tags: Soil color

Related lessons:
“A recipe for soil” “Dig In”
“Life Beneath Your Feet” “The Soil Web” “What’s Soil Worth?”

Adapted by: Jennifer DeBruyn
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**Chroma:** saturation of color. (Think about it as if you were mixing paint, and chroma is how much of the color you add.

**Student Handout: Answer This! Answers:**

Is a 5R 6/6 more yellow or red? **RED (“R” stands for red)**

What is the chroma of 5YR 2/4? **4**

Which one of these is darker: 5YR 2/4 or 5YR 8/4? **5YR 2/4 (value is “2”, which is darker than “8”)**

Next, have your students classify the soil samples using the simplified Munsell color chart. (Tip: laminate the color page to re-use with multiple groups). Record the Munsell colors in the chart. Finally, have them speculate on the aeration and contents of the soil, based on the color. Have the students guess where you collected each soil from, based on their observations (e.g. from a wetland, a well-drained field, a forest, garden etc).

**Generalize & Apply**

Some questions for discussion:

Do we all see color the same way?

Was there more agreement between people when we used the chart?

Why do soil scientists need to use a color chart?

**Extension I: Get outside**

Go outside! Take the color chart and a trowel and find different soils around the school yard. Have your students practice classification in the field.

**Extension II: Soil Art Projects**

**Soil Paints:**

Materials needed:
- 4+ soils of various colors (dried)
- Coffee bean grinder
- Pantyhouse
- Small containers for paint
- Art paper
- Paintbrushes
- Clear glue OR Mod Podge OR clear acrylic
- Water
- Stir sticks

Instructions:

1. Prepare the soils: Grind dry soils in a coffee bean grinder. Pour soils into a cup, stretch pantyhose over top, turn upside down and shake into a second cup. This will leave you with a fine-sieved soil. [Note: students can help with this step, or to reduce the mess (and time) you can do this step ahead of time.

2. Put fine-sieved soil into small cups. Add clear artist acrylic OR Mod Podge OR clear glue. Thin with a few drops of water, if necessary. Stir well.

3. Have students draw a design with felt tip markers. If you want to provide some direction, suggest a picture of why soil is important to you.

4. Let them paint their pictures with the soil paint.

Other soil art projects:

**Soil crayons:** Prepare the soils as above, then mix into melted paraffin wax, pour into molds and let harden.

Instructions here: http://doctordirt.org/soil-crayons

**Dirt shirts:** Make tie-dye dirt shirts using soil.

Instructions here: http://www.doctordirt.org/teachingresources/dirtshirts

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