Program Title: What makes up soil? Part 1: Sorting

Duration: 55 minutes

Grade level: Kindergarten

Theme(s): The soil is alive!

Goal(s):
Students arrange and categorize soil components into its many parts, including living things.

Objective(s):

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<tr>
<th>Students Will Be Able To:</th>
<th>Educator verification method</th>
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<tr>
<td>1. Recognize the expectations of working with Oxbow Farmers on the farm and in their classroom.</td>
<td>Students follow CommuniTree guidelines and by the end of the lesson, incorporate their healthy soil observations into the CommuniTree poster.</td>
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<td>2. Identify at least three components of healthy farm soil.</td>
<td>Students sort a soil sample into different categories of materials.</td>
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<td>3. Reflect on prior experiences (from their trip to Oxbow or otherwise) to make predictions, then record and share their observations about what can be found in soil.</td>
<td>Students predict what they think they’ll find in the soil, orally sharing with the class while educator records predictions on the board. Then, through soil sorting activity, students make observations and draw their findings. Students share their findings in group discussion and tally up results on class sorting board.</td>
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<td>4. Determine that plants need soil.</td>
<td>Students identify that the roots of plants grow in soil and that this is a source of water and nutrients important for plant health.</td>
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<td>5. Define “soil” and “habitat.”</td>
<td>Through soil sorting, students understand that the soil is made up of many materials including living things; soil is a habitat for these creatures! Students create class definition of soil and sing the Habitat song.</td>
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Teacher Background:
As organic farmers, the health of our soil is a top priority. Worms and other decomposers like fungus, bacteria, and other invertebrates play an important role breaking down old plant parts to release nutrients back into the soil to continue feeding our crops. This lesson will serve as the foundational knowledge needed to introduce the next lesson about compost, introducing the idea that soil is made up of many living and non-living things.
What makes up soil?

Materials/Preparation:

- Soil ingredient sorting plates (one per student)
  - Soil ingredient sorting plate visual (PDF) for display board when working with whole class
- Plastic lunch tray, one per student, for containing the soil and critters
- Hand lenses (one per student)
- Magnifying lens paper cutout (one per student, attached as .jpg)
- Bucket of compost and soil mixed with extra worms added (enough compost for each sorting plate to have a handful)
- Smaller tub of soil with centipedes, pill bugs, potato bugs, slugs, and beetles
- Tablecloths (enough to cover student table groups) and/or trays (one per student)
- Pencils, colored pencils, crayons, and/or markers for every student
- Cut-out worms/bugs for the CommuniTree (several per tree, attached as .jpg)
- CommuniTree and/or plant part visual
- Activeboard or digital projector
- Lyrics to the chorus in the Habitat Song by Bill Oliver: https://www.youtube.com/watch?v=VVPyjukPxF

Prepare in advance: Soil sorting activity materials are distributed before class begins including scooping one handful of materials from mixed compost/soil tub onto each sorting plate.

Introduction: (10 min) Entire class seated on carpet. Ask students to recall their last visit to Oxbow. Ask what they ate when they visited and ask where those things came from (ex. Where were the apples growing? Where were the carrots growing?) Review the plant parts by displaying a plant picture on the board or use the CommuniTree and sing the chorus of the 6 Plant Parts song. What is the plant part that grows underground called? Roots!

Ask students where roots grow. (Potential student answers you might receive: dirt, underground, down.) Ask: What else can we find in the dirt with the roots? Record students predictions: rocks/pebbles, dirt, air, water, twigs/sticks, leaves, animals, etc. All these things make up the soil! “What is soil?” Have class practice saying soil, come up with a basic definition as a class by writing “Soil is…” on the board or screen, and filling in student answers.

Transition into Soil Sorting Activity Explain that together you’ll be taking a close look at soil brought from Oxbow and that you’ll be sorting the soil together. Demonstrate the soil sorting activity with props or on screen: If you find a bug, you’ll place it in the section of the plate labeled “bugs” if you find a piece of wood, you will put it in the section of the plate labeled “wood/sticks”, if you don’t know what something is, take a close up look with your magnifying lens, if you still don’t know, put it in your “?/unidentified” section of your plate.

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What makes up soil? Part 1

[Hold up magnifying lens] Explain to students that in order to take a closer look, you need the help of a tool! Ask if anyone has used a magnifying lens before. What will it help you do? Explain that you are going to use these magnifying lenses to help look at what you find in the soil. [Hold up magnifying lens paper cutout] Tell students that while they sort, they can draw different things they see on this paper to record what they find. Have students write their names on the paper magnifying lens first.

Teacher or Educator explains class rules for using tools and conduct for activity: Magnifying lenses don’t go near mouths and they aren’t used as weapons. Soil stays on the sorting plates, sorting plates stay on the trays, and trays stay at the desk. It is important to be gentle when you find any living creatures!

**Soil Sorting Activity: (25 min)** [Ask classroom teacher to help students find their seats at their desks]

In this activity students identify different parts/materials and living things that can be found in the soil. Students have a chance to practice sorting, counting, measuring, and using hand lenses.

If not already set up, pass out one soil sorting plate, one hand lens, and one magnifying lens paper cutout to every student. Explain each labeled sorting section on the paper plates and invite students to sort the materials they discover in their sample, using their hand lens to carefully inspect every piece. Different ingredients/materials will be sorted out of the soil by the students: wood/sticks, plastics/trash, rocks/pebbles, *bugs/worms*, and plants/roots. There is also a space for mystery items that cannot be sorted or identified.

Circulate helping students discover and identify parts of the soil while also asking leading questions: **Do you spy any little animals?** Is this their home? What does the soil feel like? Smell like? Look like? What colors do you see? What textures do you feel? Do you see anything that *doesn’t* belong in healthy soil? Do you see any sticks or roots? How did those get there? Is the dirt all the same or are there different types of dirt?

[MID-WAY ACTIVITY or when students start to discover living things, circulate with the smaller critter tub to introduce the organisms to tables.] Begin to ask students (at their tables) about the difference between living and nonliving things on their sorting chart. “In our soil you will find things that are living, like plants or animals [hold up worms/bugs cutouts], or non-living like rocks or plastic.

Continue to remind students that they are going to illustrate what they find on their magnifying lens paper cut out. Give students a 5-minute countdown until it is time to finish.

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**Transition into Soil Tally Group Discussion from table to carpet:** Instruct students to put down their materials and gather them to the carpet. Ask some review questions: What did you find in your soil? Let’s work together to count and see how many different materials we found!

**Soil Tally Group Discussion: (15 min)**

Lead group discussion about different things students observed while sorting their samples while recording group findings on the board by tallying up different observations; make one tally mark per student who observed each material. Save the following inquiry/tallying question for last: “Did anyone find any unidentified or unknown materials? What could that stuff be?”

**Inquiry/Guiding Questions:**

**Did you find any non-living things when you sorted the soil?**

- Wood/twigs?*
- Plastics/trash
- Rocks/pebbles

- How many did you find?
- What did they look like?

**Did you find any living things when you sorted the soil?**

- Wood/twigs
- Bugs
- Worms

- How many different types of living things did you find?
- What did they look like?

- Tiny little plants
- Plant parts/plant roots

- What colors were they?
- What did they smell like?

*As students share observations and identify if materials are “living” or “non-living,” the idea that **many parts of the soil were once alive but are now dead** may come up- this will tie this soil lesson with the upcoming compost lesson and is definitely worth discussing or at least stating to the group!*

**Transition into the conclusion:** [hold up a small soil sample underneath the document camera]

Did anyone find any unidentified or unknown materials?

- What could that stuff be?
  - Smaller parts of the other materials we found?
  - Dead stuff?
  - Castings? Talk about the castings and what are worms doing in the soil? Are worm castings good for the soil?

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**Conclusion:** (5 min)

Begin discussion about life in the soil. There are so many critters that like to live in the soil! At Oxbow we take very good care of our soil because we know that we are taking care of a lot of living things in the ground! They are like our pets who help us grow healthy food! These worms and bugs love living with sticks/twigs, little rocks/pebbles, and plant parts. Would you like to meet some other critters we brought from Oxbow? You have already met some of them!

Bring the small tub of critters to show up close through the document camera and hold up several to ask “Do these animals live in the soil with worms?”

Can you think of any other living things in the soil? What about mushrooms, could we find those? Some things are so small that we can’t even see them not even with a magnifying glass! (Bacteria, fungi).

Do you have anything to add to what soil is? [Show previous “Soil is …” definition on the board or on screen. Have class come up with a new definition of soil together: Soil is the place where plant roots grow and where those underground critters live—soil is made up of a lot of different things. The soil is alive! The soil is a HABITAT for plant roots and many creatures. Has anyone heard the word habitat before?]

Introduce students to some ASL hand signals for main concepts that make up a habitat: Are the worms and bugs drinking and eating underground? A habitat has FOOD and WATER. Are the worms protected from animals that might want to eat them underground? A habitat has SHELTER. Can they wiggle in any space they like? A habitat has enough SPACE for all the animals and plants that live in it. How is soil also a habitat for plant roots?

Explain that you will take student drawings of what they found in the soil and put them underneath the soil of the CommuniTree next to the roots so that the wiggly worms and bugs can have a habitat and the CommuniTree will grow big and strong! [Show class the worms/bugs cutouts, stick a few around the roots while adding their soil drawings to the CommuniTree]

Say goodbye and thank you to all of our Oxbow animals that love living in the soil!

*Optional: Sing chorus of Habitat song: “Habitat, habitat, have to have a habitat (x3) -have to have a habitat to carry on!”*]

*Optional: Review 6 plant parts cycle through song/dance: Roots, stems, leaves, flowers, fruits, and seeds!*

*Optional introduction to the post-lesson activity: Explain to students that they will have a chance to investigate the soil in their school yard. Ask how they think the soil at Frank Wagner will be different than the soil at Oxbow. Will there be worms in the soil at school? Will there be roots? Will there be seeds?*
**NGSS 3-Dimensions Connections:**

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<th>Dimensions from Framework</th>
<th>What students are doing</th>
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<tr>
<td><strong>Science and Engineering Practices (SEP)</strong></td>
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<td>Constructing explanations</td>
<td>Based on observations and through group discussion, students explain what contributes to the makeup of soil.</td>
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<td>Planning and Carrying Out Investigations</td>
<td>Students first make predictions about what is in the soil, then make and share their observations throughout the soil sorting activity.</td>
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<td>Obtaining, Evaluating, and Communicating Information</td>
<td>Throughout the soil sorting activity, students sort and share their observations with educators and their classmates through illustrated and written observations and tallying up results on recording sheets.</td>
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<td>Developing and using models</td>
<td>Students first explore the breakdown of the materials that make up soil, helping to build a foundational knowledge of what is underground in preparation for building compost in the next lesson (Part 2).</td>
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<td><strong>Disciplinary Core Ideas (DCI)</strong></td>
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<td>LS1: From Molecules to Organisms: Structures and Processes</td>
<td>During the introduction, students recall that plants go through life cycle stages and are made up of different parts/structures. This lesson introduces a basic understanding of the complex makeup of soil and the concept of building healthy soil as a process carried out by organisms over time.</td>
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<td>LS2.A: Ecosystems: Interactions, Energy, and Dynamics</td>
<td>Students are introduced to the concept of decomposition and learn about the inhabitants of the soil through exploration. Students learn the components of an animal habitat in the soil, where certain animals can meet their needs.</td>
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<td>ESS3.A: Earth and Human Activity, Natural Resources</td>
<td>Students learn the basic components of an animal habitat (food, water, shelter, space) and learn that animals in the soil can find their needs where they live. Students find parallels for what humans and animals need.</td>
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<td><strong>Crosscutting Concepts (CC)</strong></td>
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<td>Patterns</td>
<td>Students recognize patterns regarding what makes something a part of nature and what animals and plants need to survive, including the repetition of a life cycle and basic habitat needs (food, water, shelter, space). Students find patterns of living and non-living things, learning that soil is made up of both.</td>
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<td>Scale, Proportion, and Quantity</td>
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<td>After their investigation during the soil sorting activity, students and the instructor record the number of students who found materials of each category: wood/twigs, plastics/trash, rocks/pebbles, bugs/worms, plant parts/roots, and unidentified. As a class, they tally up their findings to observe larger patterns.</td>
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<th>Energy and Matter: Flows, Cycles, and Conservation</th>
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<td>Through the review of the plant part life cycles and exploring what materials make up soil, students discover that many materials in the soil are small pieces of larger things such as rocks, sticks, plant parts. Some things are even too small to see.</td>
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<th>Structure and Function</th>
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<td>Students review the six plant parts and focus on the soil, where the plant roots interact with the soil.</td>
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**Performance Expectation (P.E.) supported:**

K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.

**Five E Learning Model:**

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<tr>
<th>Engage: How does the lesson pique the learner’s interest and allow them to express their existing thoughts and opinions on the subject?</th>
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<td>Students share their predictions on what is in the soil, based on what they already know about soil or what they observed at Oxbow during their fieldtrip. Students do their own sorting of different soil materials—including food scraps, twigs or branches, worms, and live bugs.</td>
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<th>Explore: How does the lesson allow students to interact with each other and observe their surroundings. Does the lesson include problem solving or coming up with an answer to the question?</th>
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<td>Students make predictions as a group about what is in the soil, then make written and illustrated observations and record their findings individually during the activity. Results are tallied together as a large group.</td>
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<th>Explain/Elaborate: How does the lesson help students make a connection between new and former experiences. How does the lesson encourage students to record, reflect, and explain their new understanding to others?</th>
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<td>Drawing from their fall Oxbow fieldtrip, students recall the 6 main plant parts and what they might find in the farm soil.</td>
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<th>Evaluate: How will the students be encouraged to reevaluate their understanding of the phenomena and demonstrate what they have learned?</th>
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<td>After observing that soil is made up of many different living &amp; non-living parts, students will reflect on the impact this might have on plant growth and, in the following lesson, apply this knowledge to create their own healthy soil through composting.</td>
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What makes up soil?

Part 1

- Rocks
- Wood + sticks
- Madera y palos
- Bichos y gusanos
- Plants + roots
- Plantas y raíces
- Plastic
- Plastic unidentified
- Ricas y lico