

TTCD Lesson Plan (19): Composting 101

Unit: Composting 101	Grade(s): All	Class Size: 1-30	Lesson Duration: 1 hour	Location(s): Classroom
Topic(s):	Composting, Decomposition, Soil Nutrients			
Student Prerequisites:	N/A			
Essential Questions:	What is composting? Why do some things decompose faster than others? What is soil health? How can adding compost to a garden improve soil health?			
Student Objectives:	Students observe and explain the decomposition process and identify the methods and ingredients for making compost. Students learn about the components of healthy soil.			
Standards:	Supports NGS Standards: 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. Relevant NGS Disciplinary Core Ideas: <i>Energy and Matter</i> Matter is transported into, out of, and within systems. Energy can be transferred in various ways and between objects. Cultural Standards E.1: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: recogniz[ing] and build[ing] upon the inter-relationships that exist among the spiritual, natural and human realms in the world around them, as reflected in their own cultural traditions and beliefs as well as those of others; 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:	The class can gather and use local scraps to add to the compost. Once the organic materials have decomposed, there is an option to distribute the compost to the local garden/local plots.			

Vocabulary:	Biodegradable: capable of being broken down through the actions of living organisms and natural processes over time Compost: a mixture made of decaying organic material used to fertilize plants and amend soils Decomposer: an organism that feeds on and breaks down dead plant or animal matter Decomposition: the process of breaking down or being broken down into simpler parts or substances especially by the action of living things (as bacteria or fungi) Nutrient: a substance that provides nourishment essential for growth and the maintenance of life Soil health: the continued ability of soil to function as a vital living ecosystem that sustains plants, animals and humans
Dena'ina language words:	
Materials:	✎ 1-quart Ziploc bags, 1 or 2 per student pair ✎ Masking tape ✎ Example items: one biodegradable item and one non-biodegradable item ✎ Markets ✎ Decay Buffet: fruit and vegetable peelings, leaves, small twigs, plastic bag, paper bags, hay, straw, grass, plastic utensils, paper cups, drinking straws, paper napkins, etc. (Caution: no meat or dairy) ✎ Scissors ✎ Soil, 1/2 to 1 cup per student pair ✎ Spray bottles or bowls of water ✎ Gloves (food handlers gloves will work) ✎ Compost prediction worksheet: Composting 101 Worksheet ✎ A bucket to transport all of the compost to a farm/planting area.
Instructor Prep:	Either as a class or individually, compile the items for the decay buffet and set it up on a table for the students to access: fruit and vegetable peelings, leaves, small twigs, plastic bag, paper bags, hay, straw, grass, plastic utensils, paper cups, drinking straws, paper napkins, etc. Bring in an item that is biodegradable and an item that is non-biodegradable.
Introduction:	Introduce the vocabulary words to the students and assess prior knowledge by asking the class: What is compost? Compost is mixture made of decaying organic material used to fertilize plants and amend soils. Ask the class, what is a decomposer? A decomposer is an organism that feeds on and breaks down dead plant or

	animal matter. Ask the class, who can give me an example of a decomposer? Worms, ants, beetles, mushrooms and bacteria all participate in the process of decomposition, breaking down substances into smaller parts. Ask the class, what does the word biodegradable mean? When something is biodegradable it is capable of being broken down through the actions of living organisms and natural processes over time. Hold up the two examples of items – one of which is biodegradable and one of which is non biodegradable – and ask students to identify the difference between the two classifications. Brainstorm together. Decomposition is a fundamental process in which all life depends. Bacteria, fungi, and other microscopic organisms that live in the soil, air, and water are responsible for turning once-living plants and animals into nutrients that can be used again and again. Think of these organisms as nature’s recyclers. They have the ability break down dead plants and animals, use them as food, and in the process, create a substance known as compost, which is rich in nutrients that help plants grow. As they eat, many microorganisms grow and multiply—in just four hours, one bacterium can grow to a colony of 5,096. In a teaspoon of soil, there are more bacteria and fungi than all the people on Earth! Despite their small size, you’ve probably seen evidence of them right in your own home. Remember that orange and blue-green mold in the back of the refrigerator? Or that black or white fuzzy slice of bread? These are colonies of our microbial friends hard at work practicing the fine art of decomposition. Watch this composting timelapse: https://www.youtube.com/watch?v=6em_8iFfKIk or this video of 300 worms eating a banana: https://www.youtube.com/watch?v=kT_1y-PG1ss
Activity	1. Divide the class into pairs. Give each pair a quart-sized Ziploc. Ask them to write their names on a piece of masking tape and stick it on the bag. 2. Set up a “Decay Buffet” of items like those noted in the list of materials. 3. Instruct students to place one small piece of each item from the Decay Buffet into their bags. If necessary, have them cut or break the items into small pieces that will fit into the bags. 4. Ask the students to record the items they place in the bag as they place them in. Once the students return to their table, have them use the composting worksheet to record their predictions for what they think will happen to each item. 5. Next, ask students to add about 1/2 cup of soil to their bags and to lightly mist the contents with a plant mister (adding a teaspoon of water and mixing the contents will work the same way). 6. Have the students blow into the bags to inflate them slightly and carefully seal them. Once the bags are sealed, leave them for 2–8 weeks. Tape or clip the students’ compost worksheets nearby the bags. 7. On the designated date of opening, have the students take their bags outside. Distribute plastic gloves to the students to wear while sorting through the contents of their bags with their partners. Caution: Students with known

	allergies to fungus and fungal spores should not participate. 8. Have students use their compost worksheet to record any items still identifiable and in their present state. Provide spray bottles or water bowls so items can be cleaned off for closer observation and identification. Have students compare their findings to the original list of items and note anything that is missing.
Wrap-Up:	Ask the students: How did the results compare with your predictions? What happened over the course of 8 weeks? Define and discuss the process of decomposition. Highlight that some things decomposed faster than others. It depends on the temperature, moisture and chemical composition of the organic material. Ask the students, why is healthy soil important? - We rely on soil to grow the food we eat. Ask the students, why is compost important for soil? - Compost contains nutrients that grow healthy plants. One way of introducing nutrients is through composting organic matter. Other ways include fertilizer. <i>Evidence of learning:</i> Ask the students, why might someone choose to use compost instead of fertilizer to give their soil nutrients? - It's natural. It's free because it comes from waste we were going to throw out. It is environmentally friendly because it avoids sending food waste to landfills. It enriches soil with nutrients, improves soil structure by increasing water retention capacity. It reduces the need for chemical fertilizers.
Lesson Adaptations:	Use the Make Your Own Worm Bin instructions to create a classroom vermicomposting bin out of a recycled styrofoam cooler. Prepare the cooler ahead of time, and then have students add the bedding, worms, and vegetable scraps.
Extensions:	1. [For younger students] as a class, read the book <i>Magic School Bus Meets the Rot Squad</i> by Joanna Cole You may also watch the movie here (25 mins): https://www.youtube.com/watch?v=A1OKxuZQ-0M 2. Take a trip to a local farm or garden plot and spread the students' compost on that plot. Check back at the end of the growing season to compare how that plot produced food compared to other plots of similar sizes nearby. 3. Teach a mini lesson on the importance of compost ratios: 1 part green (fresh grass clippings, kitchen scraps, etc.) to 2 parts brown (straw, aged manure, dry leaves, etc.). In small compost piles, no meat or dairy items should be included because they can potentially introduce harmful bacteria that will not only stink, but that also have the potential to make people sick. Layering helps the pile to get going, but stirring the pile is important and will accelerate the decomposition of your dead plants and scraps into beautiful, earthy smelling compost. Ask students to brainstorm some items in their home kitchen or

	backyard that are green or brown.
Reflections:	How did it go? What did students understand most/least? What could change about instruction or lesson plan?
Resources Used:	Agricultural Literacy Curriculum Matrix: The Rotten Truth Decomposition Time Lapse: https://www.youtube.com/watch?v=6em_8iFfKlk <i>Magic School Bus Meets the Rot Squad</i> : Video Composting 101 Worksheet