

*Recommended Grade Level:*

K-5

*Season:*

Year Round

Outdoor

# Composting: Healthy In + Healthy Out = Garden Goodness

## **Description:**

Students create a class compost bin for the garden. Students collect food scraps from their breakfasts and/or lunches. Only certain types of healthier foods are collected (like inedible uncooked fresh fruit and vegetable peels, scraps and cores). Students will learn that leftovers of certain healthy foods they eat can also contribute to the health of their garden. Students will learn about the carbon/nitrogen cycle in compost (layering of brown and green material) to create a chemical reaction.

## **Background:**

By creating compost, the students will learn the parts that make up the compost cycle. Many designs can be used to make a compost bin. This lesson uses a basic design for smaller scale composting. You can choose other designs or purchase one at a garden center. A compost pile needs: **nitrogen** that comes from fresh food scraps; **carbon** that comes from the brown layer from carbon rich brown items such as dried leaves or straw; **water** that helps the microbes and beneficial bugs convert the wastes to compost; and **air**. The students will learn that only certain healthy things can be put into the compost and how foods healthy for their bodies also create healthy benefits for the garden. This lesson may encourage students to increase their fruit and vegetable consumption and to care for the earth by reducing their waste and turning food waste into rich organic soil.

## **Materials:**

- Plastic trash can with the bottom cut out
- Composting 101 Sheet
- Investigating Soil Worksheet (optional)
- Hand lens (optional)
- Compost thermometer to measure temperature (optional)

## **Preparation:**

1. Remove the bottom of the trash can by cutting it off. Dig a hole about 10-12 inches into the ground and place the trash can in it. This will allow worms and microbes to interact with the compost and provide adequate drainage.
2. Collect dried leaves, newspaper, straw or other items that contain carbon to layer over food waste to create the brown layer. Reference the brown items in the Composting 101 Sheet for the items that contain carbon.

3. Determine what items will be allowed in the compost bin and how the items will be collected. Apple cores, orange and banana peels and melon rinds are examples of common food scraps from a school cafeteria. Produce with butter, salt or salad dressing should not be added; only fresh fruit and vegetable scraps.
4. As the compost pile builds, see the Compost Trouble Shooting Chart to make adjustments to the process.

**Activity:**

1. Gather the class and start a discussion on things they can do to help the environment, like recycling, picking up trash, not littering, conserving water, etc.
2. Explain composting to the students and tell them it's a way to reduce our trash while helping the garden at the same time.
3. Take them outside to the compost bin and explain how they will be contributing to the compost. Share with them things that can be composted and those that can't. Remind students that it's important for them to eat their healthy food before collecting items to add the compost bin.
4. Students come back to the classroom and create posters or flyers to show what items can be added to the compost bin. This can be placed in the cafeteria or classroom as a reminder. They can also write letters to their parents about composting and the importance of fruits and vegetables for their bodies and the garden.
5. Each day students will add the approved food scraps to the compost bin from their breakfasts and/or lunches. After the daily collection is deposited, add a small amount of the brown carbon layer. Once a week, the temperature of the compost will need to be monitored and then turned with a shovel or fork to add air. The ideal temperature is 120-160° Fahrenheit.

**Tying it Together:**

1. How are we helping the earth by composting?  
*Less trash goes to the landfills and compost creates healthy soil.*
2. How do healthy food scraps contribute to healthy soil?  
*They contain nutrients and vitamins. They help plants grow just like they help our bodies grow and be healthy.*
3. How are we helping our bodies by eating foods that can be composted?  
*Only certain healthy foods should be composted. Healthy foods have vitamins and nutrients that we need to be healthy. If it is easy to break down in the compost, it is easier for our bodies to digest.*

**Digging Deeper:**

Make a worm composting bin using vermicomposting worms. Vermicomposting is the process of using worms and micro-organisms to turn food scraps into a nutrient-rich compost. To create a worm bin, use a large tub with a lid (at least 10-gallon sized). Drill several holes in the bottom for drainage and several along the top for air. Fill half of the tub with soil and add vermicomposting worms, which can be purchased at a local bait shop or by inquiring at a local plant nursery. Place a 3-inch layer of shredded newspaper on top of the worms. Pour water on top of the newspaper to moisten. Lift the moistened newspaper and place small amounts of the food scraps collected for the compost

below the newspaper to feed your worms. The food scraps should be placed in different locations in the bins to help you monitor the amount of food they're eating. The shredded newspaper should be replaced when there is a less than 3-inch layer covering your soil and worm.

**Helpful Tips:**

- Worms need moisture to breathe. Since worms don't have lungs, their skin has to stay damp for the exchange of oxygen coming into their bodies and carbon dioxide going out of their bodies. Continue to add water to the worm bin to keep the newspaper moist and damp.
- They are vegetarians. Do not add meat, cheese or dairy products. Only fruit and vegetable scraps with no additives should be added. If you have 1 pound of worms, you should feed them approximately 3 pounds of food scraps each week.
- Bury the food scraps in a new place every day. This will show the quantity of food that your worms are eating. If you add too much food, it will rot and start to smell. If you add too little, your worms will be hungry. Adding the right amount will make the worms happy and create rich amendments for your garden soil. This should be monitored weekly to see if the worms are eating the food.
- The worm bin can be located inside or outside. If your worm bin is kept inside, keep a tray or liner under it since there are holes in the bottom. If your worm bin is outside, find a shady and cool area to keep them. Worms do not like extreme temperatures. The worm bin should be kept in an area that is 50-80° Fahrenheit to keep them healthy.

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Worms are dying	Too wet Too dry Not enough air	Add more shredded newspaper Moisten shredded newspaper Drill more holes
Bin stinks	Too much food Too wet	Do not feed for 2-3 weeks Add more shredded newspaper
Fruit Flies	Exposed food	Bury food in shredded newspaper

**National Standards:**

**NGSS**

- Interdependent relationships in ecosystems: Animals, plants, and their environment.
- Structure, function and information processing.
- Energy
- Matter and energy in organisms and ecosystems.

**Lesson Extensions:**

**Language Arts:** Write a narrative on the steps of making a compost and what it takes to turn food waste into garden magic.

Write a description of the process of the compost cycle and describe what happens at each step.

Explain why we only use certain food scraps in our compost.

**Math:** Track and record the number of students who composted each day.

Measure the compost temperature and record. The ideal temperature is 120-160°Fahrenheit.

Track the length of time it takes for the compost to be ready. The compost pile is ready when the ingredients are dark brown and has a slight earthy smell. This can take 3-6 months.

**Science:** Grow the same plants in soil with compost and soil without compost. Study and collect data on their growth. Make predictions and conclusions on what healthy compost does to help grow healthier plants.

After six weeks of building compost, take a look at different soil samples (sand, compost, garden soil). Have students use the Soil Investigation Worksheet to make observations about what is found in different soil types.

**Literature Connections:**

*Compost Stew* by Mary McKenna and Ashley Wolf

*Composting: Nature's Recyclers* by Robin Michal Koontz

*What's Sprouting in My Trash? A Book About Composting* by Esther Porter

## Investigating Soil

Look at sand, garden soil and compost with a hand lens or magnifying glass. List and sketch what you observed.

<p style="text-align: center;">Sand</p>	<p style="text-align: center;">Garden Soil</p>
<p style="text-align: center;">Compost</p>	<p style="text-align: center;">Benefits of Compost</p>

## Composting 101

### Greens – Nitrogen Rich

- Fruits and vegetable scraps
- Bread and grains
- Coffee grounds
- Coffee filters
- Green garden waste
- Paper tea bags with the staple removed

### Browns – Carbon Rich

- Nut shells
- Sawdust from untreated wood
- Hay and straw
- Yard trimmings (e.g., leaves, branches, twigs)
- Wood chips
- Leaves
- Shredded newspaper

### What not to add to the compost pile:

- Aluminum, tin or other metal
- Glass
- Dairy products (e.g., butter, milk, sour cream, yogurt) & eggs
- Fats, grease, lard, or oils
- Greasy or oily foods
- Meat or seafood scraps
- Pet wastes
- Plastic
- Stickers from fruits or vegetables (to prevent litter)
- Black walnut tree leaves or twigs
- Yard trimmings treated with chemical pesticides
- Roots of perennial weeds
- Coal or charcoal ash
- Treated or painted wood

### Troubleshooting Your Pile

Problem	Cause	Solution
Bad Odor- Rotten Smell	Not enough air or too much moisture	Turn pile and incorporate coarse browns (sawdust, leaves)
Bad Odor- Ammonia Smell	Too much nitrogen	Incorporate coarse browns (sawdust, leaves)
Pile does not heat up or decomposes slowly	Pile too small	Add more organic matter
	Insufficient moisture	Turn pile and add water
	Lack of nitrogen	Incorporate food waste or grass clippings
	Not enough air	Turn pile
	Cold weather	Increase pile size or insulate with straw or a tarp

Adapted from EPA Composting Fact Sheet and How to Guide. <http://www.epa.gov/waste/conserve/tools/greenscapes/pubs/compost-guide.pdf>