

# Soils and Composting Explorations Unit

## Grade 3

**Grade Level:**

3rd Grade

**Concepts Taught:**

Sorting, composting, measuring temperature and plant growth, sentence writing

**Activity Time(s):**

\* Conducted as a unit: 6 class periods of 30 minutes each

\* Individual Lessons: 30 minutes per lesson

**Essential Questions:**

- What is compost?
- How is compost different from soil?
- What are some properties of compost and how does it effect plant growth?
- How long does compost take to decompose?
- How are worms used in compost?
- How does a worm move?

**NC CORE/Essential Standards:**

**ELA CCSS:** Key Ideas and Details strands 2 and 5; Integration of Knowledge and Ideas: strand 9; Text Types and Purpose: strands 2a, 2b, 2c, 2d; 3a;

**Math:** 3.NBT.1; 3.MD.2

**Science:** 3.L.2.2; 3.L.2.4; 3.L.1.1;

**Healthful Living:** 3.ICR.1.2;

3.ICR.1.4, 3.ICR.1.5, 3.MEH.1.2

**Visual Literacy:** 3.V.2.1; 3.V.2.2; 3.V.2.3; 3.V.2.4

**Objectives:**

- Students will sort and identify items that can be composted.
- Students will recognize that composting is a way to recycle plant and animal material.
- Students will investigate some of the properties of compost, including the relationship between temperature and active composting, and how compost can be used to improve poor soils.
- Students will identify soil types and investigate their properties.

**Materials:**

**Lesson 1:** *What Can We Compost* worksheet

**Lesson 2:** *Compost is Hot!* Thermometer worksheets A and B

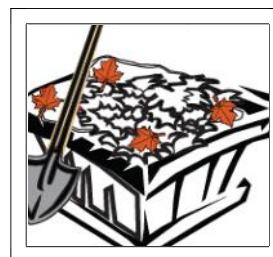
**Lesson 3:** *Compost Card Game*- one set of 3 cards for each student (one of each type)

**Lesson 4:** *Planting With Compost Lab:* Observation Chart Sheets A and B; identical pots or cups, soil, soybean seeds, waterproof marker, compost

**Lesson 5:** *Literature Connection:* book- Diary of a Worm by Doreen Cronin; brown paper sacks, scissors, felt pieces, glue, wiggle eyes, colored pencils/markers

**Lesson 6:** *Build a Mini-Composter:* Two emptied and cleaned water bottles, soil, a handful of food scraps such as orange peels or lettuce leaves chopped into small pieces, ruler, scissors, masking tape

**Lesson 7:** *Compost Relay Game:* 2 plastic hula hoops, plastic fruits/vegetables and meat/cheese, watering cans or empty water bottles, plastic shovels, bags of soil, newspaper, silk plants/leaves, small, hand-held personal fans



# Lesson 1: What Can We Compost?

**Grade Level:**

3rd Grade

**Concepts Taught:**

Sorting, identification

**Essential Questions:**

- What is compost made of?
- What types of items can go into a compost pile?

**NC CORE/Essential Standards:**

**ELA: Text Types and Purposes:**

2a,2b,2c,2d

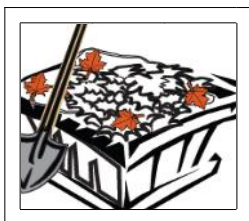
**Math** 3.NBT.1

**Materials:**

Copies of the worksheet “What Can We Compost” for each student or use one transparency

**Objectives:**

- Students will sort and identify items that can be composted.



**Procedure:**

1. Review the teacher background section on compost.
2. Have each student name one thing they throw away each day and write each item on half of the board.
3. Explain to students that not all the items must go into the trashcan. Some can be recycled, reused, or composted.
4. Explain to students that composting is a way to **recycle organic** (plant or animal) material. Items that can be composted include food waste such as orange peels, banana peels, potato peelings, bread crusts, eggshells, coffee grounds, and other non-food items such as shredded newspaper, teabags, leaves, grass, and sticks.
4. On the other half of the board, make four column headings: recycle, reuse, compost, and trash. Go back through the list of brainstormed trash items and have the students name where each item should go.

Recycle	Reuse	Compost	Trash

**Key:**

**Can be Composted:** Leaves, branches, banana peel, vegetables, grass, hay, sticks, apple core

**Cannot be composted:**

Oil, can, boots, books, cheese, bones, turkey, paint

*NOTE:* animal products such as cheese, bones, and turkey should only be composted in large-scale or commercial-type composting processes, not in classroom or residential compost bins

**Extensions/Modifications:**

1. Using the worksheet below, have students identify which items can be composted and which cannot.
2. Using old magazines or catalogs have students create a collage showing items that can be composted.

# Composting in the Classroom

Lesson 1

NAME \_\_\_\_\_

## What can we compost?

Make an X on things that do not go in a compost pile.  
Circle the things that can go in a compost pile.



leaves



oil



branches



banana peel



can



vegetables



boots



books



cheese



bones



grass



hay



sticks



turkey



apple core



paint

## Lesson 2: Compost Is Hot!

**Grade Level:**

3rd Grade

**Concepts Taught:**

Temperature, reading a thermometer, mathematical symbols (<,>, and =)

**Activity Time:** 20-30 minutes

**Essential Questions:**

- What makes compost create heat energy?
- How hot does compost get?

**NC CORE/Essential Standards:**

**ELA- Text Types and Purposes:**

2a,2b,2c,2d

**Math** 3.NBT.1

**Materials:**

Copies of the worksheets A and B

**Objectives:**

- Students will investigate some of the properties of compost, including the relationship between temperature and active composting.



**Procedure:**

1. Review the teacher background section on what causes compost heat up.
2. Explain to students that when a compost pile begins to work and break down, the inside of the pile heats up. When the material breaks down, or decomposes, it releases energy in the form of heat. The heat is important because it **sterilizes**, or makes safe, the compost for people to use it later.
3. We use different tools to measure things. For weight, we use scales, for length, we use rulers, and for temperature, we use thermometers.
4. Review how to read a thermometer with students. The thermometer sheet below can either be used as an overhead for review or for individual student assessment.
5. The temperature of an active compost pile is usually about 140 degrees Fahrenheit, or about 60 degrees Celsius. Students will use the sheet below to practice reading a thermometer and making comparisons using <, >, and =.

**Extensions/Modifications:**

1. Students can use thermometers to measure various items in the classroom including soil in potted plants, water, and cups of ice. Are these things colder or hotter than a compost pile?
1. Students can make a bar graph of the items measured above to visually compare the data.

# Composting in the Classroom

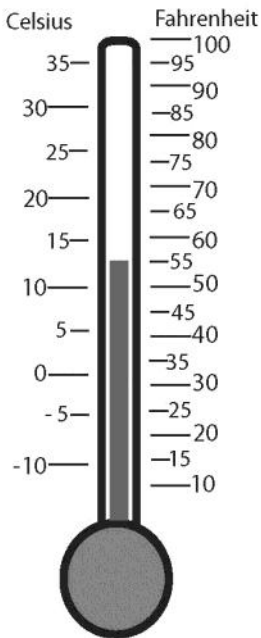
## Lesson 2—Worksheet A

Read the thermometer.

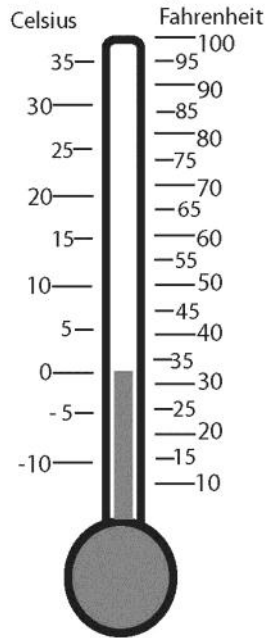
Write the temperature in Celsius on the space to the left.

Write the temperature in Fahrenheit on the space to the right.

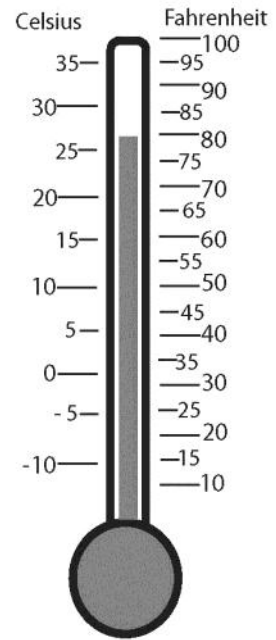
Name \_\_\_\_\_



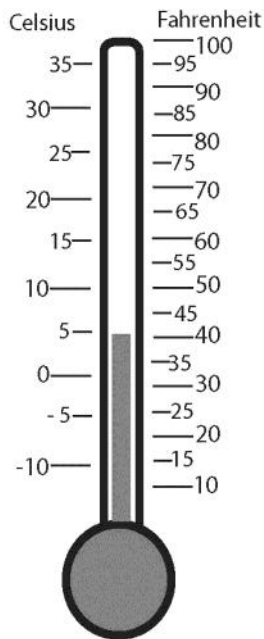
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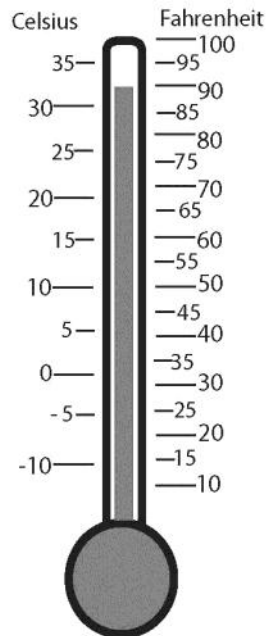
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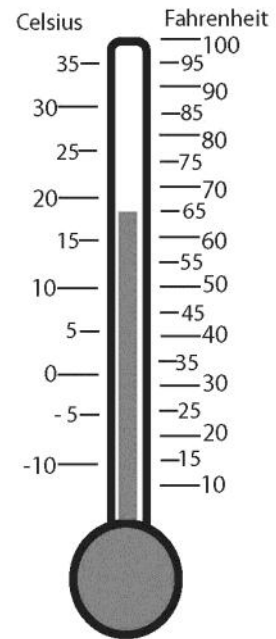
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# Composting in the Classroom



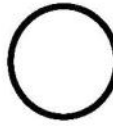


## Lesson 2—Worksheet B






NAME \_\_\_\_\_



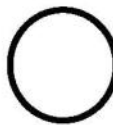


Compost gets hot! Look at the thermometers to see which of each group is hotter. The temperatures are in Fahrenheit. Write <, >, or = in the circle.











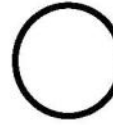



  
 200° hot chocolate      snow 30°



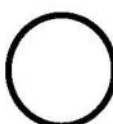







  
 122° compost pile      hot chocolate 200°











  
 122° compost pile      dirt pile 76°






  
 30° snow      compost pile 122°






  
 122° compost pile      leaf pile 61°






  
 38° rock pile      compost pile 122°






  
 122° pizza      compost pile 122°






  
 122° compost pile      hay pile 81°



## Lesson 3: Compost Card Game

**Grade Level:**

3rd Grade

**Concepts Taught:**

Composting

**Activity Time:** 10-15 minutes

**Essential Questions:**

- What are the 3 “ingredients” in compost?
- If one of the “ingredients” is missing will the compost pile rot?

**NC CORE/Essential Standards:**

**Math:** 3.NBT.1

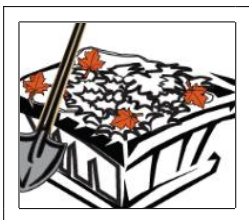
**Healthy Living:** 3.ICR.1.1,  
3.ICR.1.2, 3.ICR.1.4, 3.ICR.1.5

**Materials:**

Compost cards (below), 1 of each type for each student

**Objectives:**

- Students will utilize a card game to recognize the ingredients necessary to successfully make compost












*Note: This lesson is adapted from an activity originally developed by Brooke Smitherman*

**Procedure:**

1. Print out enough copies of the compost cards below so that each student has one of each card (Browns, Greens, and Soil, Water, and Air). Cards should be printed on colored or thick paper so that students cannot see through the back of the card.
2. Discuss with students how materials are recycled in nature through a variety of means: decomposers, detritivores, and composting. Decomposers, such as mushrooms, get their nourishment from leaf litter or decaying matter. Detritivores are animals that eat decaying organic matter (leaves, bark, trees, etc.) such as earthworms or beetles.
3. Remind students of the three basic things that are necessary to make compost:
  - a. **Greens:** Nitrogen-rich materials such as grass clippings and food scraps (items such as peelings, bread, rinds; but no cheese, meat, or bones)
  - b. **Browns:** Carbon-rich materials such as dried leaves, straw, and newspaper
  - c. **Soil, Air, and Water:** Compost piles often need “starter” soil rich in microorganisms, frequent turning of the pile to allow air in, and watering to encourage decomposition
  - d. Arrange students in groups of three and give each student one of each card: Browns, Greens, and Soil, Water, & Air.
4. This game will be played similarly to “Rock, Paper, Scissors.” The object of the game is for the group of three students to make compost with their cards. In order to make compost, each player will have to show a different card. For example, two “Greens” cards and a “Soil, Water, Air” card will not make compost.
5. Most groups like to count “One, two, three, go!” and then all players show a card without looking at which card they are choosing. When a group has one of each card played, they can say “Compost!”

**Extensions/Modifications:**

Groups can count how many times they get compost and compare with other groups’ results. Probability and statistics can be calculated as well.

<p><b>Browns</b></p> 	<p><b>Greens</b></p> 	<p><b>Soil, Water, Air</b></p> 
<p><b>Browns</b></p> 	<p><b>Greens</b></p> 	<p><b>Soil, Water, Air</b></p> 
<p><b>Browns</b></p> 	<p><b>Greens</b></p> 	<p><b>Soil, Water, Air</b></p> 



## Lesson 4: Planting With Compost

**Grade Level: Grade 3**

**Concepts Taught:**

Composting, measuring plant growth

**Essential Questions:**

- What does compost do?
- How can I tell when compost is helping the soil?
- What are some properties of compost and how does it effect soil?

**NC Core/Essential Standards:**

**ELA : Text Type and Purposes:**

strands 2a, 2b, 2c, 2d

**Science :** 3.L.2.2; 3.L.2.4; 3.L.1.1;

**Materials:**

Soybean seeds

two identical pots or cups

soil (NOT potting soil-you may want to use soil dug from your school's grounds)

Compost\*

Water

permanent markers

Lab sheets #1 and #2

\*Compost can be obtained at municipal yard-waste facilities and many gardening or hardware stores.

**Objectives:**

- Students will investigate some of the properties of compost, including how compost can be used to improve poor soils.
- Students will compare a plant grown in plain soil with a plant grown in compost-amended soil.

**Procedure:**

**Information about soybean plants:**

- Will germinate 3-6 days after planting. If they have not germinated after 7 days, throw out both pots and start over.
- Flowers will appear 4-5 weeks after planting

**1. Soil only pot:** Fill pot or cup with soil up to ½ inch from the top. Dig small hole in soil (approx. 1 in. deep) with fingertip. Place 1 seed in the hole. Re-cover with soil. Add water to moisten soil. Explain to students that this is the “control” pot since it has only soil. Using a permanent marker, label this pot “Control.”

**2. Compost-amended pot:** Prepare amended soil by filling the pot or cup two-thirds full with soil. Fill the rest of the pot with compost. Mix thoroughly to distribute compost throughout soil (this may be done by emptying the contents of the pot into a zip-top bag and shaking well). Explain to students that this is the experimental pot since it contains soil and compost. Using a permanent marker, label this pot “Experimental.”

2. Return the compost-amended soil to the pot. Dig small hole in soil (approx. 1 inch deep) with fingertip. Place 1 seed in the hole. Re-cover with soil. Add water to moisten soil.

3. Place seeded pots in an area where they will get sunlight (or in a grow-lab if available). Water daily or every other day, making sure that each planting gets the same amount of water each time.

4. Have students make predictions based on their knowledge of compost as to which plant will grow best.

6. Observe changes and measure growth of the plants (using a ruler) every day for 3 weeks.

7. Record all observations and measurements on the observation lab sheet 1 & 2.

**Extensions/Modifications:**

1. Discuss with students how they will measure which plant grew “best.” Should they measure plant height only? Should they measure the number and size of leaves or roots?
2. If the plant grown in compost showed better growth, why? By process of elimination, have students conclude that the nutrient supply was different in the pot with compost since the plants were watered the same and were exposed to the same amount of light.

# Composting in the Classroom

Name \_\_\_\_\_

## Planting Lab Sheet #1 – Soil Only

DAY	OBSERVATIONS	PLANT HEIGHT (in.)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

# Composting in the Classroom

**NAME** \_\_\_\_\_

## Planting Lab Sheet #2 – Soil + Compost

DAY	OBSERVATIONS	PLANT HEIGHT (in.)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

## Lesson 5: Literature Connection: Diary of a Worm

**Grade Level:**

3rd Grade

**Concepts Taught:**

Listening skills, sentence writing

**Activity Time:** 10–15 minutes to read/discuss book; 30 + minutes for puppet making

**Essential Questions:**

- How are worms beneficial to soil?
- How are worms helpful in a compost pile?

**NC Core/Essential Standards:**

**ELA: Key Ideas/Details:** 2, 3, 5; Integration of Knowledge/Ideas: 9; Text Type/Purpose: 2; Comprehension/Collaboration: 1a-1d, 2

**Science:** 3.L.1.1

**Visual Literacy:** 3.V.2.1; 3.V.2.2; 3.V.2.3; 3.V.2.4

**Materials:**

Book: Diary of a Worm by

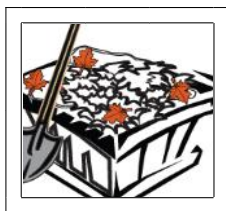
*Doreen Cronin*

small brown paper bags (lunch bag-sized) for each student  
glue

Scissors

construction paper

crayons or colored pencils



**Objective:**

After reading (or listening to) Diary of a Worm, students will create their own diary of a worm and recognize the importance of worms in creating soil and compost.

**Procedure:**

Read aloud Diary of a Worm to students, paying attention to the following details:

**March 20-how does the worm help the earth breathe?** (By turning the soil over, allowing air into the soil so that roots can get oxygen)

**April 15-at the bottom of the left-hand page, the worm has a note to “eat all your trash.” Why is the worm eating trash?**

**June 5-the worm is now eating macaroni. What does this tell us about their diets?** (They are opportunistic feeders, meaning that they’ll eat just about anything.)

**July 28-Why can’t the worm chew gum?** (Even though he’s “eaten” just about everything else, there are some foods that worms don’t like, and they also don’t have teeth. This is reinforced on July 29.)

Look back at the various references to worm anatomy-May 15, May 28, June 15, July 29.

**Making the worm puppet:**

1. Discuss how the worm moves. Like our muscles, a worm’s muscles help it to move. The worm contracts one section of muscles after another, moving down its body, to make its body move. This can be compared to sports fans doing the “wave.” The muscles contract one after the other sequentially down its body.
2. Using the side of the paper bag that does NOT have the flap, have students pick three days of the year to write a diary from a worm’s perspective. They will pretend that they are worms and in one or two sentences for each day, describe what they are doing. Emphasize that their writing should be from a worm’s point of view and have activities and comments that a worm would have. Sentences should demonstrate correct grammar, punctuation, point of view (first-person), and tone.
3. On the reverse side of the bag (the side with the flap), have students create their own worm puppet using the flap as the worm’s mouth.

## Composting in the Classroom

### Extensions/Modifications:

1. Students can share their diaries with the class, and diaries can be hung in the classroom from the ceiling or a string so that both sides are visible.
2. Students can examine live worms obtained at a bait shop or dug from the ground. Have students measure the length of their worm and identify their parts.
  - Can you find eyes, ears, nose, or a mouth? Why or why not? Worms do not have eyes. Instead, they have special cells near their head that can sense light.
  - Worms do not have noses. That might be why they eat just about anything.
  - Worms do not have ears. In order for them to detect danger and to help them move, worms have tiny hairs called setae all over their body.
  - When a predator such as a bird walks over them, the tiny hairs can sense the vibrations as the bird walks, and they are sometimes able to get away.
  - Worms do have mouths that are covered by a flap of skin that looks like a big upper lip.

Have students visit <http://urbanext.illinois.edu/worms/> to learn more about worms and their life histories.

## Lesson 6: Building a Mini Composter

### Grade Level:

3rd Grade

### Concepts Taught:

Composting, time lapse

### Essential Questions:

- How long does it take for compost to decompose, or rot?
- What items decomposed the fastest? The slowest?

### NC Core/Essential Standards:

Science Objective 3.L.2.2

### Materials:

Two emptied and cleaned water bottles (one for mini composter, one for mini landfill)  
soil (can be dug from school grounds or potting soil)  
a handful of food scraps such as orange peels or lettuce leaves chopped into small pieces, ruler  
scissor  
masking tape

**Objective:** Students will conclude that composting is a way to recycle plant and animal material

### Procedure:

1. Explain to students that they will be able to view composting in the classroom on a small scale. Show students the materials collected.
2. Using scissors and following the diagram, cut off the top two inches (below the mouth) of the bottle. Save this portion for later. It will be used in step 6.
3. In the bottom of the bottle, place 1" of soil. Do not compact the soil.
4. Place the food scraps on top of the soil and cover with another 1" of soil.
5. Using scissors carefully poke 5-7 air holes in the top (cut off) portion of the bottle.
6. Use the masking tape to secure the two sections of the bottle, being careful not to cover the air holes with the tape.
7. Place the bottle in a sunny place that is not too hot or too cold.
8. Over the next 1-2 weeks, shake the bottle once daily to mix the soil and food scraps, being careful not to spill the contents. This represents the turning that would ordinarily occur in a backyard compost pile and allows air and moisture to circulate through the soil and scraps.





## Composting in the Classroom

9. Discuss with students what they observe each week. Is the food decomposing? Why or why not?
- What would happen if the bottle were not shaken?**
  - What would happen if there were no air holes in the bottle?**
- Why was the soil added?**

### **Extensions/Modifications:**

Build a mini-landfill with students. Follow steps 1 and 2 above.

1. In the bottom of the bottle, place 2" of soil. Compact the soil by pressing it down into the bottom of the bottle.
2. Place the same amount and type of food as in the mini-composter and repeat step 2. Do not make air holes in the top portion.
3. Tape the top back onto the bottle. Place the bottle in a dark place in the room or cover the sides with a dark material such as construction paper or black plastic.
4. After a few weeks, ask students what they expect to happen. Remind them that the mini-landfill was not shaken, had no light, and had no air holes.
5. Remove the tape from the bottle and examine contents. Did the material decompose as much as the material in the mini-composter? (It should not.) This is what happens when food scraps are thrown away instead of composted. Rather than breaking down as compost will do, food scraps in the landfill decompose very slowly and will not be used again.

## Lesson 7: Compost Relay Race

**Grade Level:**

3rd Grade

**Concepts Taught:**

composting, evaluating and synthesizing, sorting, classifying

**Activity Time:**

Allow 20 minutes for background instruction and for one cycle of the relay. Allow more time for multiple relay cycles

**Essential Questions:**

- What are the 3 main “ingredients” needed in compost?
- Will a compost pile work if one of the “ingredients” is missing?

**NC Core/Essential Standards:****Healthful Living Objectives**

3.PCH.1.2; 3.ICR1.2; 3.ICR.1.5;  
3.MEH.1.2

**Materials:**

2 plastic hula hoops  
A Variety of plastic fruits/vegetables, meat/cheese (or use laminated pictures)  
Watering cans, kids plastic shovels  
plastic Ziploc bags of soil  
newspaper  
silk plants/leaves  
small, hand-held personal fans

\*Note: There should be enough materials so that each student can choose an item during the relay and that the materials can be divided equally between 2 teams of students (i.e. each team should have a watering can)

**Objectives:**

- Students will learn the three major groups of ingredients needed to prepare compost.
- Students will identify and evaluate items to decide if they can be composted.

**Procedure:****Activity Preparation:**

All materials should be piled up at one end of the relay space (materials can be combined into a single pile from which both teams will choose items or 2 separate piles – one for each team). Hula-hoops should be placed at the other end of the relay space to mark the home base for each team.

**Activity:**

1. Divide students into 2 teams.
2. Provide students with background information about the 3 major groups of compost ingredients (greens, browns, and things from the environment).
3. Students should run (if outside) or walk (if inside) to the other side of the relay space and choose one item from the pile that would be a good ingredient for compost and bring it back to the team’s hoop.
4. Once each student has had a chance to choose an item, all items are to be identified as green, brown, or thing from the environment.
5. Then items should be grouped with 1 green item, 1 brown item, and 1 thing from the environment to form compost “piles”.
6. For a competitive dimension teams can be awarded points for each “pile” they created with point deductions for any meat/cheese items they have.

Relay can be repeated as many times as wanted.

