



## Compost in a Bottle

A 35 minute action-learning lesson

The average American produces 4.4 lbs of waste each day (EPA 2012). Of this amount, approximately 14% consists of food waste. This food waste does not necessarily have to be thrown away like all other waste. Because food waste is biodegradable, it can be composted and diverted away from landfills and other waste disposal methods. The decomposition process requires myriad organisms, water, and a good balance of carbon- and nitrogen-rich materials. With the proper care, composting can create rich soils that fuel gardens, thereby growing new food with old food.

In this 35 minute lesson, students will think critically about the materials that compose their school lunch. The students will be challenged to consider what material inputs there are to the school to create their lunch as well as the outputs in the form of waste. Student will identify the biodegradable and compostable components of their lunch, then build a miniature composter for some of these materials. Students will use a worksheet to think through the school lunch system and identify how composting can divert some waste from this system.

### Before beginning, students should:

- know that decomposition is carried out by living organisms



Source: compostcab.com

### Essential Question:

*The objective of this lesson is to show students how to build a composter and how composting can address some waste issues.*

*At the end of the lesson, students will be able to:*

1. *Identify biodegradable waste materials and how this differs from compostable materials*
2. *Create their own mini compost*
3. *Describe how compost can address some waste issues*

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**Standards Addressed:** *Science Strand 1: Inquiry Process, Concept 1: Observations, Questions and Hypotheses, Concept 2: Scientific Investigation; Science Strand 3: Science in Personal and Social Perspectives, Concept 2: Science and Technology in Society*

**Themes:** Systems dynamics, trade-offs

**Skills:** Problem solving skills

### Key Vocabulary

**Biodegradable:** a material capable of being decomposed by living organisms

**Compost:** Decayed organic material used as plant fertilizer

**Waste:** material discarded as no longer useful

**Recyclable:** conversion of a material into a new usable form

### **Materials Needed**

- Compost in a Bottle\_Student Worksheet.pdf
- Compost in a Bottle\_Instruction Sheet.pdf
- 2 liter soda bottles (2 per compost)
- Tape
- Nail or other sharp object to poke holes in the soda bottles
- Scissors (1 pair per two students)
- Garden soil or compost soil
- Shredded paper
- Compostable materials (apple cores, banana peels, strawberry tops)

### **Safety Precautions**

Be sure students use the sharp objects including scissors and nails with care.

### **Teaching Instructions**

#### **Advanced Preparation**

Set out pairs of scissors, tape, nails, and bottles for each pair or table of students.

Position a bin of shredded paper and a bin of compostable material where accessible to students.

This lesson can be achieved in a shorter time-frame if the bottles are pre-cut.

#### **Engagement**

1. Handout a worksheet to each student.
2. Ask the students to read the first question of the worksheet and list some items

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3. Ask the students to share their list with the student sitting next to them or with the other students at their table
4. Solicit some responses from the class as a whole and record them on the board for the whole class to see. Typically, the students will only list food items.
5. Follow up this question by asking the student if there were materials associated with their lunch that weren't edible. Ask the students to add this to their list on the worksheet.
6. Give the students a minute to list some additional items, pair them to exchange answers with each other, then ask them to share their answers with the whole class. Again, record answers on the board.
7. Make the point that our lunch includes a lot of things that we can't even eat. Where does this stuff come from and where does it go when we're done with lunch?
8. Repeat the same list, pair, and share steps with questions 2 and 3 on the student worksheet. You may need to clarify that inputs and outputs do not have to be edible items.
9. Tell the students that they will do an activity to make their own mini composter and explore how this can address some of the outputs you have been discussing as a class.

### Explore

10. Hand out the instruction sheet for building the composters
11. Instruct students to follow steps 1 through 4, before they actually fill the composter with soil, paper, and food waste

### Explain

12. Ask the students what it means for a material to be biodegradable. Try comparing different materials based on how long it would take for them to break down into soil. Note that the process of decomposition requires living organisms.
13. Ask the class what "compostable" means and how is it different from biodegradable. Explain that some materials would be a nuisance in the compost such as:
  - a. Meat that would attract scavengers such as coyote, fox, vultures, or flies.
  - b. Dairy that would contribute to bad odor.
  - c. Materials that take a very long time to biodegrade such as fruit pits.
14. Ask the students why you have to add soil to the mini composter. Answer: the soil contains the organisms necessary to do the decomposition.
15. Based on this discussion, ask the students to answer question 4 on the worksheet about which of their lunch items can be composted.

### Extrapolate

16. Complete the final steps to make the mini composter by place shredded paper, a handful of soil, and some food scrapes into the constructed bottle.
17. Ask the students to answer question 5 on the worksheet. Have the students write, pair, and share there answers. Make the connection here that composted soil can be used for gardening. The food you throw away can become the food you eat again!

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## Evaluate

18. Collect worksheets from students.

## Homework

Have students keep a photo journal of the decomposition process by taking a photo once per week and posting it to a class website/twitter feed.

Come up with a list of materials as a class that would have different decomposition times. Have student collect the materials and add it to their mini composters. Instruct the student to collect weekly data on the decomposition process and compare with other materials from the rest of the class over time.

## Additional Resources

To find about the microorganisms in compost, see the following website:

<http://compost.css.cornell.edu/microorg.html>

For more general information about composting, see the following website:

<http://web.extension.illinois.edu/homecompost/science.cfm>

To learn more about waste in the U.S., visit:

<http://www.epa.gov/epawaste/nonhaz/municipal/>

## References

Soda Bottle Composter, WNIT Public Television, *WNIT.org*.

Environmental Protection Agency, Municipal Solid Waste, *EPA.gov*.

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