



# COMPOSTING

## A GUIDE FOR TEACHERS

Composting Basics

Activities for the Classroom

Additional Resources

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# COMPOSTING BASICS

It may sound intimidating – carbon to nitrogen (C:N) ratios, temperature control, precision layering - but it's not! Watch the leaves in the woods, the grass clippings on the lawn – eventually they disappear. They are decomposing as the result of microbial activity, the same process that occurs during composting. You can create a valuable resource from organic waste materials by gathering them and speeding up this decomposition process through composting –it's easy.

*Here are the basic steps for making compost:*

**Choose a spot.** It doesn't matter too much, but you will have a pile of stuff, so consider the view. Also, don't pile it against a building.

**Mix organic materials.** Anything that was once living will work, with a few exceptions. By mixing a variety of materials, you will provide the nutrients that the microbes need. The rule of thumb is to add similar amounts of "greens" and "browns". The more greens the faster the process, but the greater potential for odors.

- ❑ **Greens include** vegetables scraps (carrot or potato peels, onion skins, etc.), fruit scraps (banana skins, apple cores, etc.), egg shells, garden scraps (dead plants or weeds - no flowers) and grass clippings (too much can make a slimy pile).
- ❑ **Browns include** shredded or whole leaves, shredded newspaper, paper napkins, and sawdust.
- ❑ **Do not add** dairy products, oil or grease, meat or bones, manure from meat eating animals, and pits from fruit. These may result in pests, maggots and smells or not readily degrade.

**Jump start** the process by adding a shovelful of soil from the forest or a mulched bed to add microbes.

**Add water** but not too much. It should feel like a wet sponge, but no water should drip out when squeezed.

**Mixing** is needed to mix and create porosity for oxygen. A shovel or pitch fork will work fine.

## Why Compost?

It's a great way to:

- ✓ Recycle 'wastes'
- ✓ Improve soil
- ✓ Provide nutrients
- ✓ Have fun!

*A few more details will help:*

**Chopping** materials into smaller pieces will speed up the process.

**Smells.** It should smell earthy but if you notice a foul odor, it may be too wet or not have enough browns. The remedy is the same for both – add more sawdust, shredded newspaper or shredded leaves. You may want to cover the pile during a rainy period.

**Containers.** A large pile is just fine but chicken wire or other containment will help keep out raccoons and friends and make neighbors happy. It should allow air through the sides and be at least 3' x 3' x 3.' Bin systems are best because they allow mature composts to be kept separate from fresh. Only larger containers with fresh feedstocks will heat up much during small scale composting.

**Finished!** You're done when it looks more like dark friable soil. Use compost as a soil amendment, mulch, top dressing for your lawn or anywhere you'd use peat moss or topsoil. If possible, screen the compost through a 3/8" to 1/2" metal screen mounted on a frame or over a bucket and return the large fraction to the compost pile. The screened fraction can be used in gardens or even in potting media.

## What is composting?

It is the accelerated breakdown or decomposition of organic materials by microbes in the presence of oxygen (aerobic environment).

# ACTIVITIES FOR THE CLASSROOM

## I. What can you compost?

**Goal:** Compare different composting materials and practices.

**Materials:** Active composting bin or pile, different materials, string, mesh bags (e.g., onion bags) or nylon stockings, scale.

**Procedure:**

Comparing composting materials:

- 1) Choose different materials, including non-organic ones (plastic or rocks), ones that are not obviously plant-based (wood block, paper) as well as ones that are (banana peel, lettuce, grass).
- 2) Place equal amounts (weigh them) of each material into a mesh bag and tie shut, leaving a long string attached. Write down the weight and appearance of the material in each bag and your prediction of (a) how quickly it will decompose, and (b) what you expect to see happening.
- 3) Bury the bags in the compost pile at as close to the same depth as possible. Each bag should be surrounded by at least 3-4 inches of compost. Leave the string hanging outside the pile for easy retrieval.
- 4) Draw a map or document of where each bag is located in the pile. Be sure to identify the contents.
- 5) Once a week, remove each bag from the pile and write down the following:
  - a. Weight
  - b. Appearance of the material (color, size of pieces, etc.)
- 6) Repeat step 5 until materials are fully composted.
- 7) The experiment can be improved by using multiple replicates of each material. At each time point, one of the replicates is removed and the contents are dried. The dry sample is weighed. The dry weight data can be plotted to show the degradation over time.

Comparing composting practices:

- 1) Choose 1-3 different compostable materials,
- 2) For each material, prepare two samples that have been pretreated differently. Examples: (a) chopped vs. whole, (b) buried in soil vs compost (see step 3).
- 3) Go to step 2 above and follow the same procedure.

**Observations:**

- 1) Graph the change in weight for each material. This works best if dry weight is measured.
- 2) How did the appearance of the material change over time.
- 3) Which material composted the fastest? Slowest? Not at all?
- 4) How did the changes for the different materials match what you predicted?

## II. What can you do with compost?

**Goal:** Understand how compost can improve soil for better plant growth.

**Materials:** Soil\*, compost, string bean, tomato or other seeds, large styrofoam cups, measuring cups, mixing bowls.

\*Soil should be of poor quality, e.g., light colored or sandy from a construction site or area with little plant growth.

### Procedure:

- 1) Create 5 batches of different planting media made as follows:
  - a. 100% soil
  - b. 90% soil, 10% compost
  - c. 75% soil, 25% compost
  - d. 50% soil, 50% compost
  - e. 100% compost
- 2) Add water to each batch in small amount, mixing thoroughly after each addition, until the planting media feels like a damp sponge.
- 3) Mark large styrofoam cups with the type of media it will contain and number 1-20. You will need 4 cups for each planting media, for a total of 20 cups.
- 4) Fill each cup with the planting media as marked. Fill to about  $\frac{1}{2}$  inch below the rim.
- 5) Plant 4 bean seeds in each cup, approximately  $\frac{1}{2}$  inch below the top of the soil.
- 6) Place the cups in an area that is warm and sunny.
- 7) Record how many of the four seeds germinate. After germination, remove all plants but one.
- 8) Water as needed (soil feels dry when finger is pressed into it).
- 9) Record observations daily, Create a table to record data, for example:

DATE	CUP #1				CUP #2			
	Planting Media	Bean Height	Number Leaves	Leaf Color	Planting Media	Bean Height	Number Leaves	Leaf Color

### Observations:

- 1) Describe how the five media were different (color, texture, smell, other?).
- 2) What differences did you see between the different planting media? In which media did the beans sprout first? Grow the tallest?
- 3) What differences did you see between the 4 cups that held the same planting media?

# ADDITIONAL RESOURCES

## Building a compost pile or bin:

Overview: Compost and Its Benefits: <https://www.bae.ncsu.edu/topic/composting/pubs/us-composting-basics.pdf>

Composting Guide for Beginners: <https://billyoh.com/blog/diy/composting-guide-beginners/>

Home Composting Guide – Enriching Soil and Local Environmental Health: <https://usinsuranceagents.com/home-composting>

Compost-ology: The Science & Fun of Composting & Vermicomposting: <http://www.eulesstx.gov/composting/teacher/Compost-ology%20Workbook.pdf>

Composting Science & Engineering: <http://compost.css.cornell.edu/science.html>

## More ideas for classroom composting activities:

Composting Across the Curriculum: A Teacher’s Guide to composting: <http://www.marincounty.org/depts/pw/divisions/mcstoppp/~media/Files/Departments/PW/mcstoppp/education/nov%202012/Composting%20Curriculum%20out%20of%20print.pdf>

Composting Experiments: <http://compost.css.cornell.edu/science.html#Student>

Composting for Teachers Website (links to other sites): <http://compostingcouncil.org/composting-for-teachers-and-students/>

The Humanure Handbook. Online version: [http://www.weblife.org/humanure/pdf/humanure\\_handbook\\_third\\_edition.pdf](http://www.weblife.org/humanure/pdf/humanure_handbook_third_edition.pdf)

## COMPOSTING WITH WORMS:

Leader’s Guide: Vermicomposting. A 5<sup>th</sup> Grade School Enrichment Curriculum: <https://www.bae.ncsu.edu/topic/vermicomposting/pubs/ag-464-vermi-curriculum.pdf>

Vermicomposting Classroom Activities: <http://www.calrecycle.ca.gov/Education/Curriculum/Worms/98Activities.pdf>