

# John Hope Settlement House Composting Curriculum



Written and Edited by Rémy Robert  
Brown University, "Sustenance and Sustainability"  
Fall 2012



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# Introduction and Thanks

I write this as one of eight Brown students who have spent the semester working with John Hope. Each of us had a different focus, and in a nutshell, mine has been compost. I chose this for my project because I knew nothing about compost and I wanted to learn about it by doing it. My work on this has translated to everything from research to rolling an incredibly heavy compost tumbler from the ELC to the OST, where it has replaced the loose compost pile that was previously in the gardens. Plans are also in the works to build a second vermicomposter for Ms. Gina's classroom at the ELC in spring 2013.

In a conversation I had with Ms. Nancy in November, she talked about how much she and her students loved their vermicomposter but how they didn't know the details about using it. Ms. Tina echoed this sentiment in a separate conversation, stating that she and many others in the OST didn't know how to use the compost but would appreciate specific information that would help them make better use of it. My goal with this curriculum is to provide the information and resources they and other teachers want so that they may integrate composting as seamlessly as possible in their pre-existing classroom and garden lessons. Having come to this project with no prior knowledge about compost, it is my hope that these lessons help to clarify how composting is done, why we do it, and how it is useful, in much the same way that compiling these lessons has taught me.

I owe many thanks to members of the spring 2011 and spring 2012 "Sustenance and Sustainability" classes, who wrote their own garden curricula from which I have borrowed some of the lesson plans in this more focused, compost-centered curriculum. As for my own methodology, I streamlined the lesson format for the sake of consistency. Many of these lessons can be used at both ELC and OST; I have added at the top of each where they can be used, along with special stipulations for the different age groups. A couple of the lessons are better suited to one program or another: Two lessons are tumbler-specific and thus only suited to the OST; others use worms and are thus easier to implement at the ELC. In each lesson, there are learning objectives that explain what students will learn as well as a basic background so that the teacher can familiarize him-/herself with the material before introducing it to the class. For every step of the way, I have been aware of the learning curve that compost can present, and I tried to make each lesson as straightforward as possible so that it will be feasible to someone who, like I did, has little to no firsthand experience with compost.

Finally, I know that my work here is but one part of the larger garden education program at John Hope, from workshops and cooking

demonstrations to the greenhouse, rain barrels, and projects to add color to the garden. It is my hope, then, that these lessons complement the many other wonderful things that are going on in the classrooms at John Hope, and that increased knowledge about compost will complement increased involvement elsewhere in the gardens, increased interest in agriculture, and increased knowledge about how food is produced and where it comes from.

Huge thanks to the people from Brown: Professor Kathy DeMaster, my wonderful TAs, and my engaged classmates. Every one of you has constantly challenged me to think and learn in new ways. Most of all, thank you to the entire John Hope community for your help, support, and encouragement—Ms. Nancy, Ms. Tina, Butch, Ms. Gina, the countless students who ran up to my group and hugged us every time we were there, and so many others whose names I didn't get to know but who smiled and welcomed us every week. You have shown me the value of community, of rolling up my sleeves and getting to work, of change through collaboration. It's through conversations with all of you that I have been able to carry out this project, and I cannot thank you enough for making time to talk to us, to show us your classrooms, to trust us with your gardens, to help us in helping you best serve your students. You have taught me more than I ever dreamed possible.

—Rémy Robert, ENVS1560 student, Fall 2012

# Compost Bottles

**Age Groups:** ELC, OST

*For younger students:* You will want to cut the bottles and poke holes in the bottle caps beforehand. The students will be involved in assembling the bottles, adding the food, shaking the bottles, and checking them occasionally.

*For older students:* This lesson plan can be carried out as is, although you may want to supervise them as they work with the scissors.

## **Objectives:**

*Students will:*

- Be introduced to the process of composting by making small, homemade composters from commonly available products

*Educator notes:*

- The waste left over from food isn't completely useless. If left to decompose for enough time, it can become a good fertilizer with nutrients for new plants to grow in.
- When you start this activity with the class, explain this to the class. Perhaps, you can lead discussion by asking students what they think will happen: Will it stink? Will it attract bugs? Will it look rotten?
- As you start to make the bottles, explain that each step is happening for a reason that will help the food decompose into good compost.

## **Materials:**

- 3 two-liter soda bottles per group of students
- Scissors
- Water
- Tape
- Thumbtack
- Soil
- Plant-based food scraps

## **Preparation:**

Have the students bring in food scraps from home if they can.

## **Activity:**

1. Have the students get into small groups, each creating a soda bottle composter.
2. Cut off the top few inches of one bottle, the bottom of another, and top & bottom of the third. (Save the top of one of them.)
3. Use the thumbtacks to poke holes into a bottle cap and put it onto the bottle without the bottom. Place this top down into the bottle without its top. Use tape to keep them together.

4. Put the bottle without a top or bottom on top of the face down bottle and tape them together.
5. Fill the container with food scraps, as well as some soil. Shake and mix it up.
6. Tape the top part you saved onto the end of the container, and make sure it is capped
7. Use the thumbtack to poke some holes into the sides.

**Wrap-Up:**

Clean up the workspace and explain what will happen: In two or three months, the compost should be completely decomposed and ready to use. You will know it is ready when it is as moist as a sponge and the color of dark chocolate. When it is done, revisit the compost and show that it does not smell bad anymore but is instead earthy and fertile. Use the compost in the garden!

**Sources:**

Adapted from <http://pbskids.org/zoom/activities/sci/compost.html>



# Compost Bags

**Age Groups:** ELC, OST

*For younger students:* This activity is much like the compost bottles.

However, because it involves less heavy-duty cutting, you may find it more suitable for use with younger students.

*For older students:* Conduct the lesson as is, and see the Extension Activity at the bottom of the lesson for more information.

## **Objectives:**

*Students will:*

- Investigate the process of decomposition by engaging in a fun hands-on activity with their leftovers from lunch
- Understand the connection between waste and decomposition

*Educator Notes*

- Make sure that the students bring in a packed lunch from home for this activity.
- Because this activity involves scissors, you may want to cut the materials ahead of time, or else you will want to closely supervise the students' use of scissors.

## **Materials:**

- Lunch leftovers
- Scissors
- Plastic zip-lock sandwich bags (one for each student)
- Soil
- Spray bottle of water (you can fill up a Windex bottle with water)

## **Preparation:**

Place a handful of soil into each of the zip-lock bags before the start of the activity.

## **Activity:**

1. Start the activity by asking the students to name some of the things they have thrown away recently. What happens to these things? Do they stay the same forever? Do they disappear? Break down? Record the students' ideas on the board. As the students come up with ideas, try to incorporate explanations of the key vocabulary terms. Explain that the students are going to conduct an experiment with their leftovers to learn about what happens to the stuff they usually throw away.
2. Give each student a plastic zip-lock bag with soil. Explain to the students that they will place one small piece of every single item (food, peels, corners of lunch bags, napkins, utensils, etc.) from their lunch

- into the bag. Tell the students not to add any meat to their bag, as this could cause dangerous bacteria to grow.
3. After the students have filled their bags, go around to each student, and lightly spray the bag with water using the spray bottle. Now, ask the students to breathe air into the bags, and then seal them. Explain that the students will leave the bags in the classroom for 4 weeks and then see what happens. Tell the students that they will check on their bags periodically but not to open the bags until 4 weeks is up.

**Wrap-Up:**

Ask the students what they think is going to happen to the bags over the next 4 weeks. Will the food rot? Will the food start to smell? Will the food remain the same? Write these predictions on a large piece of poster paper, and return to these predictions at the end of the 4 weeks so that the students can see how their predictions compare to the actual results.

**Extension Activity (K-5):**

If older students are completing this activity, they should record the contents of their bag in a journal, and write down their predictions about what is going to happen to each item over time. During the wrap-up session, students should share their predictions with the class. The students can periodically check on their bags over the 4-week period and update their journals accordingly.

**Sources:**

[http://dug.org/storage/school-garden-curriculum/The\\_Rotten\\_Truth.pdf](http://dug.org/storage/school-garden-curriculum/The_Rotten_Truth.pdf)

# What Goes Into Compost?

**Age Group:** ELC, OST

*For younger students:* You can carry this out exactly as is. You will want to put pictures, rather than words, on the notecards so that students can participate even though they can't read.

*For older students:* Conduct the lesson as is, and see the Extension Activity at the bottom of the lesson.

## **Objectives:**

*Students will:*

- Gain an understanding of what goes into a healthy compost
- Be able to use the compost more successfully and independently
- Participate in a sorting activity

*Educator Notes:*

- Only certain materials can be placed in a compost to ensure that it remains healthy.
- At the basic level, things that are inorganic (things that were never alive), like plastics, must stay out.
- Beyond inorganics, it is also important to keep out dairy, meat and fats. In a vermicomposter, they can kill the worms; in a compost tumbler, they can cause odor and attract pests to the pile.

## **Materials:**

- Flashcards with pictures of different kinds of trash (e.g. banana peels, white paper, leaves, plastic, etc.)
- Two labels: one says COMPOST, one says NOT COMPOST

## **Preparation:**

As the teacher, you can construct flashcards with pictures of different materials that students might want to put into the compost bins. Some will have pictures of things that CAN go into the compost, while some will be things that CANNOT. These cards will serve as manipulables for the activity. Examples can be taken from the educator notes section above.

## **Activity:**

1. Students should be introduced to the components of compost in the form of a short lesson at the beginning.
2. Either in small groups or as a class under the direction of the educator, students should work to sort each of the materials on the flashcards into the piles COMPOST or NOT COMPOST. The flashcards can have pictures, if you want to allow the children to work with the ideas without reading.

3. Students will be able to physically move the pictures into the correct piles to ensure that they understand the ideas. They can repeat this activity until they thoroughly understand the concepts. This will ensure that they are able to interact with the compost independently.

**Wrap-Up:**

Once students can successfully complete this activity, they can each choose one item (from their lunch trash, brought from home, or from another source) to put into the composter. (Note that this may change depending on your composter and how full it is.) You can check to make sure that the students have understood the rules of the compost and have picked items that are compostable.

**Extension Activity (K-5):**

Older children can be tested with more difficult examples. The activity could become a competition for elementary school children- divided into small groups, they would have to sort their flashcards quickly and correctly. Perhaps a jeopardy style could also be used, with a reward for the team that sorts the fastest and most accurately.

# Worm Apartments

## **Age Groups:** ELC, OST

This works equally well for older and younger students, although it lends itself better to the ELC, where it relates more closely to the vermicomposter that is already there.

## **Objectives:**

### *Students will:*

- Understand how worms interact with the soil around them to create homes
- Observe the formation of worm habitats

### *Educator Notes*

- There are around 4,400 species of worms on Earth and 2,700 different kinds of earthworms.
- Earthworms are incredibly useful as decomposers that help break down organic materials.
- Earthworms eat soil and the organic material in it, such as insect parts and bacteria (*E. coli*); they aerate the soil, mix the top rotting materials with the ground below, and enrich the soil with their worm castings (worm “poop”).
- Worms can range in size from less than 1 inch to over 22 inches long and some can live as long as 15 years.
- Observations indicate that earthworms enjoy eating oatmeal, old bread, vegetable scraps, leftovers, shredded newspaper, grass, mulched leaves, ripe fruits, etc., whereas things they try to avoid include acidic and spicy foods, salt, and vinegar products.

## **Materials:**

- 2 clear plastic containers (one should be slightly smaller than the other)
- Soil (or compost, if ready)
- Worms
- Screen or piece of stocking
- Rubber band

## **Preparation:**

Each child or each pair of children should have the materials described above. This activity may require children to get a little dirty, so take caution if you are worried about a mess—newspaper can be put under children’s workspaces.

## **Activity:**

1. Have each child fill the space between his or her 2 containers with a good supply of fresh garden soil (not potting soil) or compost.
2. Tell students to keep their soil moist (but not soaked), the moisture of a kitchen or bath sponge or a squeezed-out wet paper towel.
3. Put in worms and cover the container with a piece of screen or stocking for good airflow. Secure this cover with a rubber band.
4. Now watch the worms as they tunnel through the soil! (Be sure to keep this out of the hot sun, and free the worms after a few days of observation.)

**Wrap-Up:**

Ask the students what they observed during the activity. How did the worms affect their environment and create their own habitats? Make the connection that other animals do this as well – humans build houses, birds build nests, and worms build tunnels. All living things interact with their environments to form habitats.

**Extension Activity (K-5):**

Have older students take care of the worms for longer, research how to feed them, and what else they need to survive. Encourage further discussion about what constitutes a habitat for a creature and what living things need to live.

**Sources:**

<http://tlc.howstuffworks.com/family/worm-activities4.htm>

<http://www.uen.org/Lessonplan/preview?LPid=18886>

# Worms, Compost & Decomposition

## **Age Groups:** ELC, OST

Again, this will be especially valuable and feasible at the ELC, where there are already worms. However, the activity is suitable for older students and could work in the OST in the future.

## **Objectives:**

### *Students will:*

- Learn about worms, composting, and decomposition by starting a worm compost bin of their own

### *Educator Notes:*

- The compost bin needs be kept moist in a dark space.
- Do not add water to the worm bin unless is dry.
- Dig under the bedding occasionally to mix and break apart any clumps.
- Make sure the temperature of the bin remains between 55 to 77 degrees Fahrenheit (you can easily do this by keeping the bins in the classroom at all times).

## **Materials:**

- One Rubbermade storage container
- Recycled newspaper
- Red wiggler worms
- Worm sandwich (old bread, egg shells, fruit peels)
- Fall leaves
- Magnifying glasses (for EXTENSION ACTIVITY)

## **Preparation:**

Poke holes 1 inch to 1 inch apart along the sides and bottom of the container to create enough aeration for worms. Cut newspaper strips into small squares. Prepare a cup of lukewarm water.

If possible, have the students go outside to collect leaves from the garden the day before this activity.

## **Activity:**

1. Before beginning this activity, show the students several pictures of red wiggler worms and ask the students what they already know about worms. Make a list of what the students know and use this as a starting point to provide the students with some basic information on worms, composting, and the connection between the two. For example, it might be a good idea to talk about why worm composting is good (i.e. it helps recycle materials).
2. Alternatively, tell the students some facts about worms (i.e. worms are invertebrates, worms are blind, worms breathe oxygen through their

- skin, worms have no teeth, worms possess both male and female reproductive organs, worms feed on decaying or organic matter).
3. Begin the activity by having the students gather around a table with the plastic container, the newspaper squares, and the dry leaves.
  4. Have the students take turns filling the container with the newspaper squares and dry leaves.
  5. Designate one student volunteer to pour lukewarm water into the container until the bedding of newspaper and dry leaves is moist but not soaking.
  6. Have the students take turns breaking up any clumps of newspaper that may have formed. Tell them that breaking apart the clumps will help to give the worms enough air to breath and prevent the bin from getting a bad smell.
  7. Take the worms out and allow the students to spend several minutes observing the worms. Explain what worms like to eat (decaying organic material) and make a worm sandwich while they watch: Using old bread and non-meat food scraps (vegetable peels, fruit, egg shells, tea bags, coffee grounds, etc.), make a “sandwich” while explaining to the class what can and what can’t be put into the bin. For example, explain that eggshells help the worms “chew” the food since they don’t have teeth.
  8. Once the sandwich is made, choose a couple of student volunteers to help bury different parts of the sandwich in different locations of the bin. This should be done by pulling aside some of the bedding, dumping a piece of the sandwich into the bin, and then covering it up with bedding.

### **Wrap-Up:**

Conclude the activity by having the students spend several minutes drawing a picture of the worms and/or the compost bin.

### **Extension Activity (K-5):**

If older students are completing this activity, students can spend time in pairs looking at the worms with magnifying glasses. In addition to simply drawing a picture of the worms after completing the activity, students can record their observations about the worms (how long are they? how many segments do they have?). Alternatively, if computer access is available, older students can research red wiggler worms and come up with five worm composting facts.

### **Sources:**

[http://dug.org/storage/school-garden-curriculum/Worms\\_Are\\_Our\\_Friends.pdf](http://dug.org/storage/school-garden-curriculum/Worms_Are_Our_Friends.pdf)



# Harvesting Worm Compost

**Age Groups:** ELC

## **Objectives:**

*Students will:*

- Learn how to recognize finished compost
- Learn how to harvest the compost (specifically, how to separate the worms from the compost)
- Have fun with worms!

*Educator Notes:*

- When compost is finished, that means the worms are out of food. To keep them happy and alive, the compost should be harvested when it is finished, and then the worms should be put back with new food to start the cycle over.
- In this lesson, you will have the chance to use one or a few methods to separate the worms from the compost so that it is easiest to gather the compost and replace the worms' food in the vermicomposter.

## **Materials:**

- Black plastic bag
- Light
- Half of a melon
- One bag full of onion scraps

## **Preparation:**

This lesson plan suggests three different ways of harvesting compost: **the plastic bag method**, **the melon method**, and **the onion bag method**. You may decide to use only one, or you may decide to use two or three. Feel free to choose based on available materials and on what interests you.

This is easiest when worms are hungry, so as soon as you notice that all the soil is composted, continue to starve the worms for a couple of days.

## **Activity:**

1. Plastic bag method:
  - a. Set out a black plastic bag, laying it flat on the floor. If you are worried about possible mess, arrange newspaper around the area.
  - b. Shine a bright light directly overhead.
  - c. Dump the contents (worms and compost) onto the black plastic bag. Because worms don't like light, they will keep going to the bottom of the pile, so you can scoop the compost off the top of the pile until you have reached the worms.

- d. Use the compost and replace the worms in the composter!
- 2. Melon method:
  - a. Place one half of a melon (ideally, one that is starting to decompose) in one side of the vermicomposter.
  - b. The hungry worms will flock to the melon, and after some time, they will all be in the melon. Remove the melon and harvest your compost, then put the melon and worms back in the composter along with new scraps and compostables.
- 3. Onion bag method:
  - a. Place food scraps in an onion bag that contains onion skins, and place the bag in the composter.
  - b. The hungry worms will enter the bag so they can reach the food. Once they have all entered the bag, you can remove the whole bag and harvest your compost.
  - c. When you create the new compost pile, using scraps, leaves, and other compostables, be sure to take the worms out of the plastic bag before replacing them in the pile.

**Wrap-Up:**

Ask your students what their favorite method was. Why did they like that method? What was the most fun?

Count the worms. How many were there? What was the biggest?

What will we do with this compost? When we put in the food scraps, where do they go? (Answer: The worms eat them and turn them into compost. How helpful!)

**Source:**

<http://www.wormladies.com/pages/aboutourworms.html>

# Compost Journals

**Age Groups:** OST

**Objectives:**

*Students will:*

- Learn about the way that compost develops over time by recording qualitative information through regular observation

*Educator Notes*

- In this activity, students will learn firsthand how compost changes over time.

**Materials:**

- One notebook or sheet of paper per student
- Pencils
- Thermometer deep enough to inject in the composting soil (optional but helpful)

**Preparation:**

In each student's notebook (or on each student's piece of paper), write or ask students to write the following:

Name:

Date:

Experiment start date:

Dates the compost has been turned in the tumbler:

Temperature of the compost: *[only if you have a thermometer]*

Observations (smell, color of material):

What effect did turning the tumbler have on the compost temperature?

What effect does turning the tumbler have on the speed that the material breaks down in the compost pile?

Why do you think this happens?

Before you start this project, work with your class to ensure that the tumbler already has materials in it. Be sure to include a variety of organic materials: grasses, leaves, food scraps, and possibly some paper products. Cut each material down to roughly six inches in length before adding it to speed compost time. When you have added enough to the tumbler, leave it alone until everything has turned into compost.

**Activity:**

1. Once there is material in the composter, have students do an initial journal entry about what's inside. Tell them to fill out each blank. If there is access to a camera or camera phone, consider taking a picture.

2. Talk to the students about tumbling. What do they think will happen in the end? How do they think this will happen? Explain that regular tumbling is important, and show them how to do it with friends, explaining that it can be fun! Tumbling every other day is best, so encourage your students to do it when they want, and/or make it a part of classtime to go out and tumble it together.
3. Once every week or so, fill out a new journal entry to observe what's changing. You should find, as time goes on, that certain items get smaller and smaller, eventually "disappearing" (decomposing into compost) altogether. Ask your students: What is disappearing? What isn't decomposing as quickly?

**Wrap-Up:**

After everything has totally decomposed, have your students revisit their journals. What surprised them? What did they accurately predict?

As a class, you can harvest the compost by shoveling it from the barrel into a wheelbarrow and using it immediately in the garden or bringing it to the greenhouse. When compost is totally decomposed, it should be the color of dark chocolate and the texture of soil; it should not be difficult to shovel, and you could encourage students to take turns doing it.

**Sources:**

<http://www.cvswwmd.org/uploads/6/1/2/6/6126179/spinningscrapsbooklet2010.pdf>

# To Biodegrade Or Not to Biodegrade?

**Age Groups:** OST

## **Objectives:**

*Students will:*

- Learn what can be composted and what can't be
- Learn what it means for something to be biodegradable
- Learn about the “behind-the-scenes” of composting

*Educator Notes:*

- Biodegradable materials are things that can break down easily and naturally. All products in the world are made of basic chemical elements, but certain things are not able to be easily or quickly decomposed into the ground.
- This lesson will take place over the course of several months, but it will open discussion about waste, recycling, and decomposition on a larger scale, such as when students throw away non-food waste at home.

## **Materials:**

- Organic, plant-based materials (food scraps, grass clippings, leaf matter, sawdust, etc.)
- Non-organic material (cans, bottles, paper, cardboard, plastic bags, etc.)
- Products that are labeled as biodegradable, such as napkins, paper plates, some plastic products
- Compost journals (see “Compost Journals” lesson)

## **Preparation:**

Assemble all of the biodegradable and organic plant-based materials, all of which can be composted. To this mix, add “non-biodegradable” items, as well as the more questionable materials (like biodegradable-labeled plastics).

## **Activity:**

1. Have students examine the items going into the tumbler and make notes in their compost journals describing the size, shape, and composition of each material. Ask them: What do you think will degrade? What won't?
2. Place the mix in the tumbler, and for the next three or four months, do not add any new materials to the tumbler. Turn the tumbler regularly; again, encourage students to do it frequently, and/or implement tumbling into class time.
3. Every two weeks, take a sample of the mix and have students describe it through written descriptions and drawings. What is degrading quickly? What isn't? Make sure that students date their entries.

**Wrap-Up:**

After a few months, look back at the compost. Ask your students: What has decomposed altogether? What is still here? You should find that the organic and biodegradable items have degraded partially or altogether over time.

Explain to your students that, eventually, these materials will decompose altogether, and ask: What will they become? How will they be used?

The non-organic and biodegradable items should still be basically intact. If you have added any items that are metal, some erosion or rusting may have occurred. How did the paper products degrade? Some papers will have degraded fully, while others that may contain plastic or wax won't have broken down as easily.

Ask your students: Why is it bad to have non-degradable items in the compost? Why can't we throw non-degradable items out into nature? You can transition from this talking point into a discussion about the life cycle of manmade products, litter, and recycling.

**Sources:**

<http://www.cvswwmd.org/uploads/6/1/2/6/6126179/spinningscrapsbooklet2010.pdf>