



Title: Build an Indoor Compost Bin

Grades: 3-5

Subject: Science, Social Studies, Language Arts

Time: 60 minutes for lesson and 3-6 months to add materials to the compost bin.

Standards:

Science Standard 2: Understand Earth's composition and structure.

- Benchmark # 4:

Science Standards 6: Understand relationships among organisms and their physical environment.

- Benchmark # 5: Know that all organisms (including humans) cause change in their environments and these changes can be beneficial or detrimental.

Technology Standard 4: Understand the nature of technological design.

- Benchmark # 6: Use appropriate tools, techniques and quantitative measurements to implement proposed solutions.

Technology Standard 6: Understand the nature and uses of different forms of technology.

- Benchmark # 2: Know that elements of an agricultural system are designed to maximize the interaction and production of all the elements in the system (e.g., by composting).

Geography Standard 14: Understand how human actions modify the physical environment.

- Benchmark # 3: Know how human activities have increased the ability of the physical environment to support human life in the local community, state, US and other countries (e.g., improving soil quality through composting).

Language Arts Standard 1: Use the general skills and strategies of the writing process.

- Benchmark # 7: Write expository compositions (e.g., develop the topic with simple facts, details, examples, and explanations, use structures such as cause-and-effect, chronology, similarities and differences).

Objectives:

- Describe the composition of soil and give examples of the ways in which it is formed.
- Identify and describe ways to protect the environment (e.g., composting and recycling).
- Identify and describe the role of decomposers (worms) in a community.
- Write an expository piece that provides facts and details, and describes and analyzes the composting process.

Materials:

- Opaque (no light shows through) plastic or wood bin with a lid
- Earthworms (the best kind are called "red worms," "red wigglers" or "manure worms")
- "Brown" material (newspaper, paper towels, leaves, cardboard)
- "Green" material (coffee grinds, plants, grass, vegetable and fruit scraps)
- Thermometer
- "Building an Indoor Compost Bin Directions" worksheet provided below

Overview: Living in a city can be great, but sometimes children miss out on participating in nature related activities. This lesson addresses that issue by bringing gardening and composting inside, year-round. To compost inside, you will need some of the same materials as outdoor composting, but there is one additional key ingredient – worms!

Kid's Speak: Even if you live in a city, you can enjoy gardening and composting inside, year-round. An inside compost bin is just like an outside bin. You just need to add one thing: worms!



Eco-Fact: Yard and kitchen wastes make up about 30% of the waste stream in the US.

Procedures: Before Making Indoor Compost Bin: - Explain to the students that both gardening and composting can take place in cities and that an indoor compost bin is just like an outdoor bin with one main exception, an indoor compost bin needs worms. - Explain to students that some problems can be encountered with an inside bin because of the lack of natural elements and climate, and explain solutions to commonly faced challenges.

Challenges and Solutions of Indoor Composting:

Challenge: The worms are escaping from our compost bin! **Solution:** The compost heap or bin is the worms' residence. Like anyone, they don't like to be too hot, too cold, too dry or too wet. Analyze what conditions may be causing the worms to jump ship. If a compost bin isn't well-ventilated, the worms can get overheated. (See Step 2. below.) If the newspaper (or brown ingredients) are too dry, they won't decompose. On the other hand, if the paper is too wet, the heap gets soggy. Worms will be swimming in the heap, rather than eating it. The consistency should feel like a damp sponge. If the bin is too soggy, add dry, shredded newspaper or paper to absorb excess moisture.

Challenge: Fruit flies have taken over!

Solution: Fruit flies are attracted to rotting fruit. When adding fruit to your compost bin, bury or cover the fruit. Simply, make a small hole with a trowel, put the fruit in, and cover it up. Fruit flies will not be attracted to the compost bin when fruit is covered with either paper towels or chopped newspaper.

Challenge: The compost bin smells!

Solution: Smell is caused by bacteria. Bacteria are caused by having too much nitrogen (green stuff). Balance out the ratio by adding carbon (or brown) ingredients like sawdust or dried leaves.

Instructions for Making Indoor Compost Bin:

1. Pick out your bin. You might use a colored, plastic storage bin with a lid. To figure out the size, first decide how many people will be using the bin. Then use the chart below to determine the bin size and the number of worms needed.

Number of People	Quantity of Worms	Bin Size
1 or 2	1 lb.	15"h x 1.5'w x 2'l
2 or 3	1 lb.	15"h x 2'w x 2'l
4 or 6	2 to 3 lbs.	15"h x 2'w x 3.5'l

2. If you and your class are making your own bin or several bins, make sure you cut small holes in the sides and lid to let the worms breathe. Where should you drill, and how big? It is recommended you drill 3" apart in the sides and cover of the bin, and the holes should begin approximately 4" from the bottom of the bin. The holes should not be wider than 1/8". Always have the teacher or an adult handle the drill.
3. Once you have the bin ready, you'll need to make a bed for the worms. Making their bed is fun, and a little dirty. Mix "brown," carbon-producing materials like paper, leaves, towels, and cardboard, together. This mix should be enough to fill the bin about ¾ of the way.
4. Wet the mixture until it's about half damp. It is important to keep the compost material consistently damp.
5. Mix a few handfuls of soil into the bedding.
6. Add a layer of "green" material (plants, vegetable scraps, grass) to the bottom of the bin. As they decay, the top layer of the bedding will keep it from smelling.



7. Pour the brown bedding mix into the bin.
8. Add the worms.
9. Place a thermometer near the bin. Worms like to live in places that are between 40 degrees and 80 degrees Fahrenheit.
10. As food scraps or paper diminish, add a new supply.
11. After 3-6 months, the worms will have done their job. You will know it is time to harvest when the worms are too crowded and the original bedding has disappeared. You can remove the fresh compost, and add new bedding and vegetable scraps to start the process all over again!

Note: To keep fruit flies at bay, freeze banana peels for a few days prior to adding to the bin. Also, every time students dry their hands on paper towels in class or from the lavatory have them dampen and add them to the top of the bin. A stack about 6 inches high will keep the fruit flies away. If you do get fruit flies students can make a fruit fly trap by placing a banana peel in an empty and cleaned out container such as a cottage cheese container. Make some holes in it and leave near the compost. The flies should attach to the banana peel. Once they are on it, in the “trap” have the students empty the container to an outside compost heap or waste bin. Repeat this step until the flies are gone. Always bury the new food items into the compost well below the paper towel layer.

After Making Indoor Compost Bin:

- Have students write an essay explaining why they think there are more challenges with indoor composting than outdoor composting. Students can also discuss what challenges they faced with their indoor bin and what they would suggest to people starting an indoor compost bin.

Adaptations: Students can build their own compost heap in a small container.

Extensions:

- Use the fertilizer to nourish a class garden.
- For tips on dietary guidelines and healthy eating habits visit the USDA Food Pyramid.

All lessons listed on the GEF website have been aligned with the McREL Compendium of Standards and Benchmarks for K-12 Education. GEF curriculum has been developed in accordance with the McREL standards in order to reflect nationwide guidelines for learning, teaching, and assessment, and to provide continuity in the integrity of GEF curricular content from state to state. The decision to utilize McRel’s standards was based upon their rigorous and extensive research, as well as their review of standards documents from a variety of professional subject matter organizations in fourteen content areas. Their result is a comprehensive database that represents what many educational institutions and departments believe to be the best standards research accomplished to date. To access the McREL standards database, or for additional information regarding the supporting documentation used in its development, please visit <http://www.mcrel.org>.