Nasco Education

LESSON PLAN

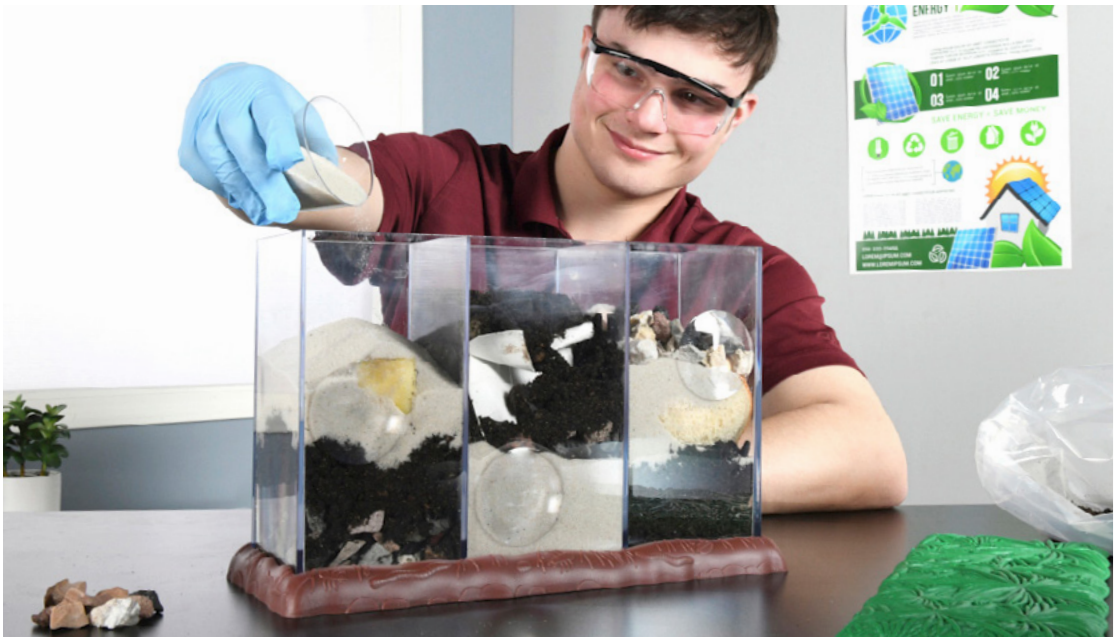
Science

Developed with Laura Beres, High School Teacher, Britestar Christian Virtual Education

Evaluating human impact on the environment with composting

Volume 28 | Gr. 9–12

Time: Initial lesson and assembly: 60 minutes; 8 weeks total for observation time



Standards

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Objective

Students will be able to design and evaluate different models of composting in order to determine a method of minimizing human impact on the environment.

Materials list

- Now You See It, Now You Don't™ See-Through Compost Container (**SB47477**)
- Soil [**KI01037(P)**]
- Rocks (**SB50622**, **SB50623**)
- Gravel/pebbles [**KI01049(I)**]
- Sand (**S09940**)
- Gloves (**C20030**, **C20031**, **C20032**)
- Safety glasses (**SB39510**, **SB39512**)
- Dried plant material
- Samples to place in landfills: Styrofoam, apple cores or bread, and small paper plates

Vocabulary

- **Organic waste:** Waste from organisms or their life processes that can easily be broken down
- **Inorganic waste:** Waste that does not contain organic compounds
- **Decompose:** To separate into components or elements
- **Full-loop life cycle**: A life cycle for a material that never comes to an end; for example, organic waste such as food scraps or grass clippings that are composted and turned back into soil
- **Linear life cycle:** A life cycle for a material that comes to an end; for example, things made from fossil fuels that will end in a landfill
- **Compost:** A mixture of decayed or decaying organic matter used to fertilize soil

Teacher notes

- Students should use the same sample material in all three chambers. The variable they are testing is the composting method and layering of other materials around that sample.
- This could be done as an end-of-unit assessment or project. Students will likely be able to engineer and think more deeply about their project if they have already learned about composting, landfills, and cycles of matter.
- You may also add 1–2 ounces of water to each chamber after all layers are in the chambers. Continue to add water to each chamber to keep the soil damp but not soaked over the weeks of observation.
- Soil or dirt from the environment is better than store-bought since it will already have some decomposers within it.
- You can provide materials to students or allow them to bring their own materials.
- The lesson can be done individually or in groups, and the observation period can be lengthened or shortened to fit unit or timing constraints.
- Safety glasses should be worn when pouring sand, dirt, or rocks in case of flying debris.
- Gloves should be worn when handling food samples during assembly and all samples when cleaning up.

Teacher prep

- Prepare a lab station for each group that includes a compost container, organic soil, gravel, sand, dried plant material, safety glasses, and gloves.
- Reproduce the "Designing a better compost method" handout on pp. 3–4 for each student and place copies at the stations.
- Decide how many weeks you will run the experiment and where the composting chambers will be stored.
- Determine if students will bring in decomposable material or if material will be supplied.

Instructions

1. Start by asking students to complete the pre-lab planning on the handout. If decomposition or composting have not been covered, you could do so ahead of time or use this as a means to start a unit.
2. Have students think of examples of organic and inorganic waste that they generate in their daily lives. Then, discuss the following questions:
    - What takes longer to break down — organic or inorganic waste? Why?
    - What happens to things thrown in the trash or recycling bin?
    - How do landfills impact the environment? (Leaching into water supplies, giving off odors from trash, taking up space that could be used for other things, etc.)
    - What can we do at home to limit the amount of waste that ends up in landfills? (Recycle, compost organic matter, reduce or reuse inorganic materials, etc.)
3. Clear up any of these misconceptions:
    - All things eventually decay or decompose.
    - Landfills don't impact the environment.
    - Disposable means compostable.
4. On Day 2, assign students to lab stations where they will find the materials for composting. Have each student fill out the pre-lab planning on their "Designing a better compost method" handout. Next, have them assemble their composting chambers.
5. Have students write down their observations each week. At the end of the experiment, have them analyze the data and write down their conclusions. Discuss as a class.

Extensions

- Students could repeat their testing with another sample to see if the best-performing method still works the best with another item.
- Connect to food chains and food webs by talking about decomposers and their roles in the environment.
- Test how other factors impact decomposition, such as sunlight or darkness, the amount of water in the system, and the type of materials in the container.
- Have students create a poster, slideshow, or other end product to demonstrate their knowledge.
- Students could use their data to communicate the importance of composting and proper trash disposal to the community or local lawmakers by writing a letter that includes data and a summary of their experiment.

Designing a better compost method

Name: _____ Period: _____ Date: _____

In this activity, you will assemble three different composting chambers to compare how materials decompose over time. Your goal is to create the most efficient technique to help the material compost the fastest.

Pre–lab planning:

What decomposable item will you place in all three chambers? This is the control of your experiment and will be the same in all three chambers:

_____

Draw three different plans for your composting chambers:

Remember: You are testing to find the most effective way to layer rocks, sand, or soil to allow for decomposition. Each chamber can utilize the same materials, but the order and design of each chamber should be different.

Which chamber do you think will perform the best and why? _____

_____

_____

_____

_____

_____

Observations

	Chamber 1	Chamber 2	Chamber 3
Initial observations			
Week 1			
Week 2			
Week 3			
Week 4			
Week 5			
Week 6			
Week 7			

Conclusion

Evaluate your observations.

1. Which chamber performed the best (had the most decomposed sample)?

2. Why do you think this happened?

3. What surprised you about the results?

4. What changes could you make to be even more efficient?

5. How would the environment be impacted if more people composted?