

Lesson Summary

Students learn what kinds of things decompose by conducting a simple experiment wherein items are sealed in a bag with soil for a month, observed, and weighed.

Overview

In this lesson, students will:

- Learn about decomposition.
- Predict if an item will decompose or not.
- Conduct an experiment to test their prediction.
- Learn about composting.

Time

45 minutes for two lessons one month apart

Vocabulary

- Prediction
- Decomposers
- Decomposition
- Organic Matter
- Compost
- Fertilizer

Preparation

- Label each of the items on the Materials list starting with the aluminum can and ending with the penny. Make labels by writing the name of the item on a small quarter sheet of scrap paper; attaching one end of a 3-foot string to the paper via stapler or tape; and then attaching the other end of the string to the item itself via tying or stapling.
- Have students read *Composting with the FBI* Fact Sheet and answer the comprehension questions.
- Collect and display the listed material items.

Materials

- *Composting with the FBI* Fact Sheet and comprehension questions
- *Prediction & Data* Worksheet
- 50 feet of string
- Scrap paper
- Large garbage bag and rubber band or twist-tie
- 1-2 gallons of natural soil (NOT store bought)
- Gram Scale
- Aluminum can
- Slice white bread
- Foam cup
- Plastic bag
- Paper bag
- Sheet of newspaper
- Glass bottle
- 3 grapes on stem
- Apple core
- Peanut shell
- Square of toilet paper
- Leaf
- Penny



Background

Decomposition is a magical process! It is the result of billions of microorganisms such as bacteria and fungi, as well as some larger decomposers like worms and bugs. These decomposers are often called the “FBI:” fungus, bacteria and invertebrates. The FBI break down *organic matter*—things that were once alive—into smaller particles called *compost*. Compost is the waste product of decomposers and provides necessary nutrients for plants by building up our topsoil and keeping it healthy. It is dark brown like chocolate and smells fresh like the earth after a rain. Compost is a natural *fertilizer* that is part of nature’s recycling

process. It is free of synthetic chemicals, which are found in commercial fertilizers and can be harmful to the environment. Decomposition, also called *rot*, is a critical part of the life cycle. Not only does it provide necessary nutrients for new life to grow, but without decomposition, dead matter would cover the earth!

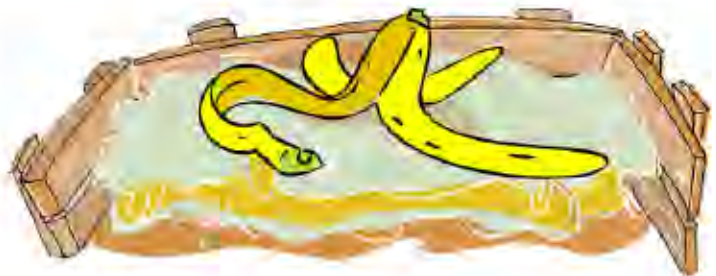
Pre-Activity Questions

Ask students:

1. What is a prediction? (*A guess of what will happen in the future based on observation, experience, or scientific reason.*)
2. What is decomposition? (*When decomposers like bugs, worms, fungus and bacteria break things down into compost.*)

Classroom Activity - Part One

1. Tell students they are going to conduct an experiment.
2. Show students the collected items and explain that you will be putting all these items into a sealed plastic bag with some soil. In one month you will open the bag and see how the items inside have changed.
3. Divide the students into pairs or small groups. Pass out the prediction worksheets and review them.
4. Tell students they will conduct the experiments as follows:
 - They will have several minutes to discuss with each other what they think is going to happen to each item in the bag. Ask them to recall what happens to old bread and old apples, as well as old plastic and paper bags when it sits around for a long time. Instruct them to use their prior knowledge and the information they read in the *Composting with the FBI* Fact Sheet to help them predict if each item will break down.
 - Though they are discussing as a group, each student should be able to make her/his own predictions individually.
 - After discussion has ended, each student then writes their predictions on their worksheet.
5. Have students share their predictions with the class. What is their reasoning? Collect prediction sheets.
6. Take the large plastic bag and put in 1-2 gallons of moist soil. **Note:** *The soil shouldn't be too wet; it should be the consistency of a wrung-out sponge.*
7. Explain to students that the soil is full of microscopic decomposers like fungi and bacteria that are invisible. Share facts about microorganisms from the *Composting with the FBI* fact sheet. (*Example: There are many "good germs," living all around us and on our bodies, helping clean our skin. Without these microorganisms, nothing could live and grow.*)
8. Mix all the items into the soil so they are distributed throughout the bag. Make sure that each item's string and label dangle out of the bag. Blow the bag up with air, then seal tightly with rubber band or twist-tie, leaving the labels hanging out.
9. Make a sign for the bag that says, "What will happen?" and list all the items in the bag and the date.
10. Put the bag in an out-of-the-way place for one month.



Classroom Activity - Part 2: One Month Later

1. One month later, hand out the prediction worksheets and remind students of the experiment and its purpose.
2. Open the compost bag outside. Sift through the contents and look for the original items and any decomposers. Remove each item from the bag by its string and read the label out loud.



*To protect you and your students from inhaling mold spores, do not let students handle items from the bag and do not hold the items close to your face.

3. Bring a master list of all the items, and based on a general consensus of observations from the students, record the degree of decomposition of each.
4. Back in the classroom, have each student compare their predictions with the master record you just completed.
5. Discuss results and ask the following questions:
 - Why did some things decompose and some not? Did the students recognize a pattern in decomposition? (Decomposers only break down *organic matter*.)
 - Did the things that decompose all turn completely into compost? (*No.*) Why not? (*Things decompose at different rates. Nevertheless, all things that were once alive will eventually decompose back into compost.*)
 - How good were the students' predictions? Were students surprised by their predictions and what actually happened?

6. Tell students that they can document how much an item has decomposed not just by looking at it, but also by weighing it.

Explain to students that just like many scientists, they are going to conduct the experiment again, and this time they are going to weigh each item before they put it in the bag and after they take it out of the bag after a month. Explain that the difference between how much the item weighed before going in the bag and how much it weighs after it comes out, will equal the amount it has decomposed.

7. Follow the same procedure with the students, but this time have them take turns weighing each item on the gram scale before putting it in the bag and record the weight on their worksheet.
8. After a month, remove the items, weigh them, and instruct students to record the weights on their worksheets.



* Once again, to protect you and your students from inhaling mold spores, do not let students handle items from the bag and do not hold the items close to your face.

9. Using the weights recorded on their worksheets, instruct students to calculate the difference between the before and after weight for each item and record it on their worksheet. Remind them that the difference equals the number of grams that each item decomposed.

Discussion Questions

1. Discuss the results of the second round of the experiment with the class. Did their results from the second round match what they observed in the first round of the experiment?
 - Did the same items decompose this time?
 - Which items decomposed the most?
 - Which items decomposed the least?
2. Discuss what the world would be like without decomposers. What would happen to all the garbage and dead stuff if there were no decomposers? (*It wouldn't "disappear" and the planet would be covered with dead things.*)
3. How can an apple core turn into a peach? How can some lettuce turn into a sunflower? (*The apple core decomposes into the compost and a peach tree can be planted in that compost. Similarly, sunflower seeds can be planted in compost left from decomposed lettuce.*)
4. What should we do with things that don't decompose like an aluminum can, a penny, or a plastic chip bag? (*We should reuse them—like the penny; recycle them—like the aluminum can; or throw them away into the garbage—like the plastic chip bag.*)
5. Have the students write two paragraphs about the experience. What did they predict would happen to the objects in the soil? What actually happened to these objects? Why is decomposition an important part of the life cycle?

Extensions

- Start a compost pile at your school or create a worm bin. See *Let's Build a Worm Bin!* lesson plan at:
http://www.sfenvironment.com/aboutus/school/teacher/lesson_plans/worm_bin.pdf
- Do a similar experiment by burying a variety of items for a period of time. Dig them up occasionally to compare rates of decomposition.
- Ask students to do research on decomposers, pick their favorite decomposer, and then write and draw a cartoon strip of them hard at work in the compost pile.



National Science Standards Addressed

- Grades 9-12: Abilities necessary to do scientific inquiry (12ASI1)
Understandings about scientific inquiry (12ASI2)
Matter, energy, and organization in living systems (12CLS5)
- Grades 5-8: Energy transfer, food webs (8CLS4.3)
Abilities necessary to do scientific inquiry (8ASI1)
Understandings about scientific inquiry (8ASI2)
- Grades K-4: Abilities necessary to do scientific inquiry (4ASI1)
Understandings about scientific inquiry (4ASI2)