Lesson Plan/Activity Beginner

The Energy of Decay

Lesson Objective

In this lesson, students will describe physical properties of objects; they will also explain how waste can be turned into energy.

Activating Prior Knowledge & Concept Building

All living organisms on earth will eventually die. Many plants naturally complete their life cycle and die within a year, but even the longer lived plants such as trees have a limited natural life span. Nearly all animals in nature will succumb to disease, being killed or being eaten, it is very rare for any to make it to old age. If every organism that died did not decay and rot away, the earth's surface would soon be covered in a deep layer of dead bodies that would remain intact indefinitely. A similar situation would arise if animal and plant wastes never rotted away. Fortunately this does not happen because dead organisms and animal wastes become food or a habitat for some other organisms to live on. Some dead animals will be eaten by scavenging animals such as foxes or crows. Those which are not eaten by larger animals are quickly decomposed or broken down into their constituent chemicals by a host of creatures including beetles and their larva, flies, maggots and worms as well as bacteria, molds and fungi. Collectively these are known as decomposers. The lives of many of these organisms depends on the death of others.

The Science Behind It

Decomposition is the natural process of dead animal or plant tissue being rotted or broken down. This process is carried out by invertebrates, fungi and bacteria. The result of decomposition is that the building blocks required for life can be recycled. During the process of decomposition, the decomposers provide food for themselves by extracting chemicals from the dead bodies or organic wastes; using these to produce energy. The decomposers will then produce waste of their own. In turn, this will also decompose, eventually returning nutrients to the soil. These nutrients can then be taken up by the roots of living plants enabling them to grow and develop, so that organic material is naturally recycled. Virtually nothing goes to waste in nature. When an animal dies and decomposes, usually only the bones remain, but even these will decompose over a much longer period of time.

Materials:

- Fruit that decays rather quickly (e.g. banana) (3 for each group of students) Note: Use fruit that has been bruised, damaged, or partially eaten as this will decay at a faster rate than fruit that has not been touched.
- Sealed plastic bags/bins to reduce odor and pests (2 for each group of students)
- Container with lid filled with dirt (1 per group of students)
- Refrigerator
- Goggles (1 per student)
- Gloves or tongs (1 per student) Note: determine if children have latex allergies before providing gloves
- Magnifying glasses (1 per student)
- Crayons or colored pencils
- Journals

Instructions for Instructor:

1. Ask students to think about how the following items can be useful: an old metal soup can, old plastic milk jug, and an old newspaper. Brainstorm and discuss.

2. Provide students with an additional challenge. Ask them to identify some possible uses for an old piece of fruit. Brainstorm and discuss.

*__FOOD DECAY__ leads to: __GAS__ leads to: __ENERGY__

Discuss how this process is an example of the fourth R in Reduce, Reuse, Recycle, and Recover. **Recovering** involves converting waste into useful products. Explain how large amounts of waste in a controlled environment like a landfill can generate enough methane gas that can be captured and used as an energy source.

Special Note to Teachers: You may also want to mention composting as an additional example of recovering resources. A special kind of red worm can aid in turning organic matter into rich soil. While this process, called vermiposting, is too slow for large-scale efforts, composting is an eco-friendly way to make use of vegetable waste and get some great garden soil at the same time.

3. Allow students to investigate the conditions that produce the most rapid decay of a banana (or another piece of fruit). Discuss the variables that will change in the investigation (e.g. one banana will be placed in a plastic bag/bin at room temperature, another buried in dirt inside a container with a lid, and another placed in a plastic bag/bin in the refrigerator labeled clearly as an experiment.). Be sure that the bag has plenty of air/oxygen in it before it is sealed. Students can press the bag lightly to feel the air. Discuss how decomposition requires oxygen in the process. Discuss the variables that will stay the same in the investigation (e.g. the type of fruit, the frequency of observation). Ask students to predict which banana will decay the fastest and explain the reason why they think so. You will likely get a difference of opinion, so record all the hypotheses and the reasoning behind them.

4. Allow students to observe the banana using a magnifying glass every 2-3 days for 2 weeks and record their observations in a journal using both pictures and words. Encourage students to use all of their senses EXCEPT taste as they record their observations. To avoid contact with bacteria, students should NOT handle the decaying fruit directly. Be sure students wear goggles and use gloves and tongs as a safety precaution while opening the containers and observing the fruit. Use non-latex gloves for all students if any students have a latex allergy. During storage, keep food in a sealed airtight container to reduce odor and pests.

5. As an extension, repeat the investigation with a different fruit such as a peach or pear.

Closing

Review the activities of the day with the students and assess what concepts they took away or what they missed. List the key learning points on the board. Have students reflect on the activity by sharing out and writing about it in their science journals (or activity document).

Debrief Questions: How can waste be turned into energy? How will you recycle rotten foods?

Source:
http://teachers.egfi-k12.org/the-energy-of-decay/
http://www.countrysideinfo.co.uk/decompos.htm