Gardening

Grade 4 Subject: Science

Considering Composting

Overview

Students investigate the decomposition of organic and inorganic waste that is buried in September and dug up in April for re-examination. Students interpret their project in terms of landfill disposal and composting.

Standards/Benchmarks *

- Identify and investigate a design solution and how it was used to solve an every day problem. Science (4.1.2.2.1)
- Describe the positive and negative impacts that the design world has on the natural world as more and more engineered products and services are created and used. Science (4.1.2.1.1)
- In order to improve their existence, humans interact with and the influence Earth system. Science (4.3.4.1.1)

Background

Healthy ecosystems have a complex set of pathways that recycle and reuse materials in a continuous process. Humans are part of the process and have developed new materials— many of which are not easily reused or recycled. We utilize large quantities and many different kinds of materials during the course of our daily lives. Dealing with materials after the initial use poses a challenge. Fortunately, many of the materials we utilize are easily reused and/or recycled. Some materials, like air and water, if not seriously polluted are almost automatically recycled without our attention. As human needs increase we are more conscious of what happens to the materials we utilize, and increasingly more items are designed to reduce waste, or to be reused and recycled.

Given time many materials can be broken down (biodegraded) by living organisms. Most of these decomposition organisms, including small invertebrates, fungi and bacteria live in the soil or in natural settings like decaying trees. Gardeners learned long ago that composting would break down weeds and unused food plant parts into soil. Your school may compost leftover foods from the cafeteria to help reduce the amount of waste to take to landfills. Many modern materials, some plastics for example, are non-biodegradable or unlikely to be broken down by composting in thousands of years, so if not reused, must be discarded. Much of our thinking and design of systems benefits from following the patterns provided by nature, resulting in more recyclable products.

Be sure to obtain permission to bury the materials!

Time:

Day 1, Sept. – 1 hr.
Day 2, Sept. – 1 hr.
Day 3, April – 1 hr.

Skills:

Critical thinking
Observing
Recording/Data collecting
Drawing
Interpreting
Predicting
Drawing conclusions

Vocabulary:

compost
biodegradable
non-biodegradable, decompose

Materials Needed:

· banana peel
· plastic water bottle; biodegradable *Sun Chips®* bag
· paper towel
· glass jar
· gloves
· cereal box
· cloth
· grass clippings or leaves shovel
· science notebooks
· scale
· magnifying glass
· *Minnesota Weatherguide Environment™ Calendar*

The Activity -

Day 1

Warm Up – very early in school year

Review monthly pictures in the *Minnesota Weatherguide Environment™ Calendar* looking for:

1. Evidence of natural recycling, reuse or decomposition of materials.
2. Materials or objects that will take a long time to decompose. The trash truck comes by weekly to haul our trash away. What is in our trash – and where is 'away?'

Use the internet to show students pictures of landfills. Click here for:

HowStuffWorks "How Landfills Work" or copy and paste the address:

http://science.howstuffworks.com/environmental/green-science/landfill.htm

1. Ask students to make a list of things they have discarded this week.
2. Which of the items on this list can be recycled or reused?
3. Which of the items on the "discard list" will go to a landfill?
4. Discuss the vocabulary: decomposers, biodegradable, non-biodegradable, compost.
5. Sort your "discard list" into items the students think will be biodegradable and objects that are non-biodegradable.
6. Make predictions of how long items stay in a landfill. Use the items listed under materials as a starting point for their predictions.

Day 2

September

1. Review the student lists assembled yesterday.
2. Show students a pile of "trash" samples you have assembled: (here are some suggestions)

a banana peel, piece of bread, plastic bottle, cereal box, newspaper, old test paper, old shoe, glass jar, cotton rag, hair clippings, grass clippings, coffee grounds in coffee filter, a biodegradable Sun Chip bag, a heavier plastic potato chip bag.

3. Ask students to predict how long it will take each item to disappear in a landfill. Make predictions in their notebooks. Ask students to reserve 2 or 3 journal pages for data they will collect in the spring.
4. Explain that the class is going to do a school year long test of their predictions of how long items stay in a landfill. They will bury these items in a special spot on the school grounds.
5. Record the measurements on a chart made in our science notebook, using this format:

Item	Weight	Length	Width/thickness

6. Take items outside and bury in the ground approximately 8 – 12 inches down.
7. Draw a map of where the items are located for recovery in the spring.

Day 3

Late April or early May.

1. Review the vocabulary and discussions from the first lesson.
2. Discuss what the students may find when they dig the objects from the earth.
3. Dig the objects up in groups. Use gloves to handle items. Do not involve students with allergies in handling buried materials. They will be the record keepers.
4. Weigh and measure the length and width of each of the objects. (While some biodegradables may have been recycled by Mother Nature and can no longer be found, other items may need to be cleaned before they can be handled and weighed. (A brush or water may be necessary, but do not wash items that will absorb water.)
5. Make observations using a magnifying glass and measurement tools. Record all observations in journals.

Wrap Up & Assessment

1. Have each group share their findings with the class. The students should record their observations in their journals on each object. Compare data recorded before burial with data collected today.
2. Record any changes that were made over time to the objects, notice which objects show the greatest amount of change.
3. Have any of the items been recycled (decomposed) by Mother Nature to enrich the soil?

Questions for Discussion

· Did any of the buried items surprise them? Are the students using more biodegradable or non-biodegradable items daily? Student's answers will vary.

· What can students do in their everyday lives to minimize the trash that ends up in our landfills? Recycling bins and compost piles are a key part of this conversation.

· How can we start to become aware of our choices when purchasing and using more biodegradable items? Looking at the amount of packaging an item comes in before purchasing it, using reusable water bottles, etc.

Extensions

· There are many sites on composting for kids on Google. If your school does not already do so, these sites can help a school get starting in composting their lunch waste.

· Research which organisms are utilized for composting.

· Research why some items decomposed and others did not.

· Make a bulletin board somewhere in the school's hallways sharing their results on the bulletin board. Encourage the school population to purchase items that are biodegradable.

Resources

Minnesota Weatherguide Environment™ Calendar

http://jeffersfoundation.org/wrap.php

Music

Banana Slug String Band: *Dirt Made My Lunch*

(A lively album that contains the following songs: *Dirt Made My Lunch, Sun, Soil, Water and Air, Decomposition*).

Re, Re, Recycle—Billy B. (*Sun Up Sun Down* album)

Time estimates for decomposition.

The following information was found on this web site: *http://www.oregon.gov/DEQ/*

· banana – 3 to 4 weeks
· paper bag – 1 month
· cotton rag – 5 months
· wool sock – 1 year
· cigarette butt – 2 to 5 years
· leather boot – 40 to 50 years
· rubber sole (of a boot) – 50 to 80 years
· tin can (soup or vegetable can) – 80 to 100 years
· aluminum can (soda pop can) – 200 to 500 years
· plastic 6-pack rings – 450 years
· plastic jug – 1 million years
· Styrofoam cup – unknown? forever?
· glass bottle – unknown? forever?

*Minnesota Academic Standards

Standards Met

Subject	Code	Standard	Benchmark
Science	4.1.2.1.1	Engineers design, create and develop structures, processes and systems that are intended to improve society and may make humans more productive.	Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.
	4.1.2.2.1	Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.	Identify and investigate a design solution and describe how it was used to solve an everyday problem. *For example:* Investigate different varieties of construction tools.
	4.3.4.1.1	Water circulates through the Earth's crust, oceans and atmosphere in what is known as the water cycle.	Identify where water collects on Earth, including atmosphere, ground and surface water, and describe how water moves through the Earth system using the processes of evaporation, condensation and precipitation.