School Recycling Club SHIP

(Supporting Home Instruction Program)

Lesson Plan 6

Grade Level:	7-8
Lesson:	II— The Routes of Household Hazardous Waste - Pondering Percolation
Source:	*Teaching Toxics*
Activity/Craft:	Upcycled Gift Boxes (https://www.allfreechristmascrafts.com/Gift-Bags-and-Boxes/Upcycled-Gift-Box)
Video Link:	How Do Wastewater Treatment Plants Work? (https://www.youtube.com/watch?v=0_ZCCqqpS20)
Game Link:	The Water Cycle (https://www.discoverwater.org/water-cycle/)

Lesson Matrix Grades 4-6
Teaching Toxics

Lesson	Concept	Objective	Common Core Alignments		Skills
7-8 **What's Hazardous in the Home?**	Products containing hazardous substances are commonly found in the home.	• Become familiar with types and quantities of hazardous products in the home • Conduct an inventory of hazardous products	**Grade 7** CC.L.7.6 CC.RI.7.7 CC.SL.7.2 CC.W.7.1 CC.7.NS.3	**Grade 8** CC.L.8.6 CC.RI.8.8 CC.SL.8.2 CC.SL.8.4 CC.W.8.1	• Analyzing • Evaluating • Gathering data • Interpreting
7-8 **Hazardous Characteristics**	A substance is considered hazardous if it is corrosive, reactive, flammable or toxic.	• Become familiar with characteristics of a hazardous substance • Perform a series of experiments	**Grade 7** CC.RST.6-8.4 CC.SL.7.1 CC.W.7.7 CC.WHST.6-8.2	**Grade 8** CC.RST.6-8.4 CC.SL.8.1 CC.W.8.9 CC.WHST.6-8.2	• Carrying out investigations • Collaborating • Communicating solutions • Observing
7-8 **Pondering Percolation**	Soil characteristics influence how substances move in the environment.	• Observe how fast water moves through different soil types	**Grade 7** CC.RST.6-8.3 CC.SL.7.2 CC.W.7.2	**Grade 8** CC.RST.6-8.3 CC.SL.8.2 CC.W.8.2	• Carrying out investigations • Explaining • Hypothesizing • Observing
7-8 **Toxicity: A Relative Term**	The toxicity of a chemical is determined by its concentration, its amount and the individual characteristics of the person exposed to it.	• Become familiar with what determines toxicity • Perform a series of experiments	**Grade 7** CC.L.7.6 CC.RST.6-8.3 CC.W.7.9 CC.7.RP.3 CC.7.SP.4	**Grade 8** CC.L.8.6 CC.RST.6-8.3 CC.W.8.9 CC.8.EE.2 CC.8.SP.1	• Carrying out investigations • Explaining • Hypothesizing • Observing
7-8 **The Battle of Baking Soda**	Purchasing decisions are based on personal values.	• Compare toxic and non-toxic cleaning products • Examine the factors that influence how people choose cleaning products	**Grade 7** CC.SL.7.4 CC.W.7.1 CC.W.7.10 CC.7.NS.2	**Grade 8** CC.SL.8.4 CC.W.8.1 CC.W.8.10 CC.8.EE.2	• Analyzing • Communicating solutions • Gathering information • Observing

STUDENT WORKSHEET

What Are the Characteristics of a Hazardous Substance?

Answer the questions below on a separate piece of paper.

Learning Station 1

Directions:

1. Place the nail into a 10% solution of copper sulfate (10 ml cs/100 ml water).
2. Record your observations after 5 minutes and after 10 minutes.

Questions:

- What happened to the portion of the nail that was submerged in the copper sulfate?
- Why do you think this happened?
- What are the results of corrosion?
- Based on your observations, how would you define corrosion?
- What examples of corrosion do you see in your life?

Learning Station 2

Directions:

1. In a 500 ml beaker, measure out 50 ml of vinegar.
2. Add 1 gram of baking soda to the beaker.
3. Record your observations.

This experiment demonstrates what reactive means. It demonstrates a safe reaction. When we say something is hazardous because it is reactive, it means that a violent reaction can occur, or a toxic gas can be formed as a result of mixing with another substance.

Questions:

- Based on the results of this experiment, how would you define reactive?
- Would it be dangerous for a reactive waste to enter a landfill? Why or why not?

Learning Station 3 (Teacher Demonstration)

Write down the steps involved for each method your teacher uses to light the match. For each method explain why you think the match caught on fire.

Question:

- Based on your observations, how would you define flammable?

Method 1	Method 2	Method 3

7-8: Pondering Percolation

Subject

Science, Language Arts

Skills

Carrying out investigations, designing, hypothesizing, providing evidence

Materials

Student information sheet "Leachate and Landfills"
Per small group: three funnels; three beakers with gradation; dry samples of topsoil, sandy soil, clay soil (NOTE: lumpy clay soil should be avoided); water; food coloring; paper towels or filter paper; graph paper

Time

Two - three class periods

Vocabulary

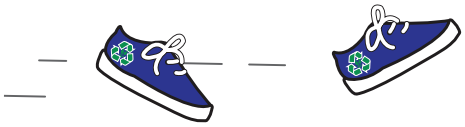
Percolation, precipitation, groundwater, leachate, watershed

Related NRRA *3R's of the Common Core* Activities

Please see NRRA's *3R's of the Common Core* additional information and activities on how landfills operate.

Source

Adapted from *Bag, Beakers and Barrels: An Action Curriculum Toward Resolving Hazardous Materials Issues*



Concept

Soil characteristics influence how substances move in the environment.

Objective

Students will observe how fast water moves through different soil types.

Background *See Information Section, pages 121-124.*

Household hazardous waste (HHW) entering landfills can potentially contaminate water supplies. When precipitation enters landfills, it percolates down through the trash, picking up contaminants, including HHW. This contaminated liquid, called leachate, can enter the surrounding environment. Many factors influence where contaminated water can travel including soil type. Contaminated water moves differently through different soil types. For example, the large pore spaces in sandy soils allow water to move very quickly. Spaces between clay soil particles are extremely small; therefore, the leachate's movement is slowed down.

Procedures and Activities

Learning About Leachate

- Have students read the student sheet Leachate and Landfills (following page). As a class, brainstorm with students about what things found in landfills contribute to the toxicity of leachate. e.g.: products from our houses containing hazardous substances: oil based paints, automotive products, some cleaning supplies, lead-acid car batteries; waste products from small businesses such as print shops, dry cleaners, film developers.

Pondering Percolation

- Ask students what environmental factors they think influence leachate's movement (e.g.: soil, geological formations.)
- Discuss with the students the three different soil samples you have collected. Ask students to predict which soil type they think will slow down the water's movement the most.
- Have student groups conduct the Pondering Percolation experiment. (See the student sheet on the following page for detailed instructions.) This experiment will demonstrate the differences in soil types in terms of leachate movement. (Clay soil is the most effective in blocking leachate.)

Common Core Alignments

GRADE 7

CC.RST.6-8.3
Reading in Science & Technical Subjects:
Key Ideas & Details

CC.SL.7.2
Speaking & Listening:
Comprehension & Collaboration

CC.W.7.2
Writing:
Text Types & Purposes

GRADE 8

CC.RST.6-8.3
Reading in Science & Technical Subjects:
Key Ideas & Details

CC.SL.8.2
Speaking & Listening:
Comprehension & Collaboration

CC.W.8.2
Writing:
Text Types & Purposes

- After students complete the experiment, discuss the following questions.
  - Which soil type facilitated the water's movement?
  - Which soil type delayed the water's movement?
  - Is there a difference between the first and the last interval? If so, why?
  - What soil characteristics influence water's movement?

Stopping Leachate

- In small groups, have students brainstorm everything they know about landfills and how they operate. What do students know about landfill design and leachate prevention?
- Have students design a landfill that will prevent leachate from reaching the groundwater. The following questions might help the process.
  - How can you use the results of your experiment to help write your plan?
  - What else do you need to consider in trying to prevent leachate from entering the environment?
  - What are your ideas on how to prevent leachate from forming in the first place?

Extensions

- Call your local solid waste department for information about the criteria for siting a landfill. Arrange for a representative to speak to the class. What is the process for deciding where to site a landfill? Have students compare these criteria to their own ideas.
- Discuss how a septic system operates. What types of soils are septic systems usually located in? What might happen if hazardous substances entered a septic system?

STUDENT WORKSHEET

Pondering Percolation

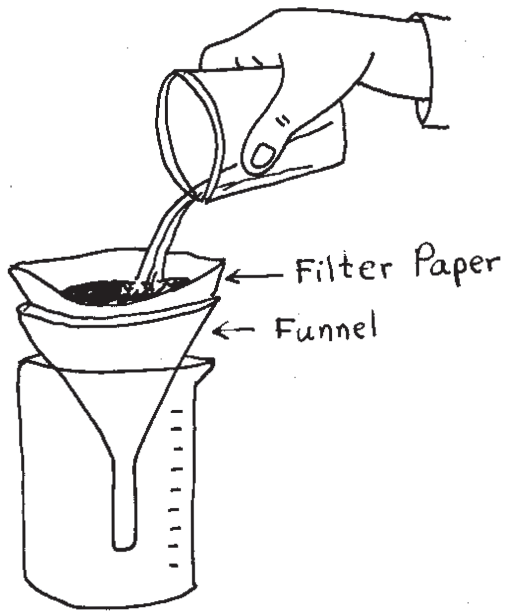
Your group has three different types of soil: topsoil, sandy soil and clay soil. Write a brief description of each type

	Descriptions of Soil Types
Topsoil	
Sandy Soil	
Clay Soil	

Predict which soil type the leachate will move through most quickly.

Directions:

1. Place filter paper in each funnel. Place each funnel in a beaker.
2. On a piece of tape, label each funnel with a soil type.
3. Fill each funnel ¾ full with the corresponding soil type.
4. One soil sample at a time, slowly pour 30 ml of water into each soil sample. Pour the water in the CENTER of the soil.
5. Time how long it takes most of the liquid to move through the soil sample. *Note: You don't have to wait for every last drop.*
6. Record, on the chart below, how long it takes for the water to seep through the soil.
7. Pour in the next 30 ml the same way. After this has seeped through, pour the remaining 40 ml.
8. Repeat steps 4 - 7 for each soil sample.



Observations:

	Soil 1	Soil 2	Soil 3
First 30 ml			
Second 30 ml			
Final 30 ml			