From the Mountains to the Estuary: From the Schoolyard to the Bay

Meaningful Watershed Experiences for Grade 6 Students

Created by:

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Experimental Design

Data Collection and Analysis

Will It Soak Right In?

Overview:

In this lesson adapted from *Lessons from the Bay,* [1] students will experiment to determine which types of land surfaces allow water to soak in, and which cause water to run off above the ground.

Teacher Background:

- Runoff is the part of precipitation, snow melt or irrigation water that appears uncontrolled in rivers, streams, drains and sewers. It includes both surface *and* subsurface flows.

- Runoff plays a key role in determining water quality in the Chesapeake Bay watershed. Runoff carries with it sediment and other potential pollutants. Excessive runoff, especially when it flows at high rates of speed, causes erosion and flooding of waterways. The amount of runoff from a particular storm is a result of the physical characteristics of the land and the amount of water that runs across and soaks into the surface. A surface's ability to hold water in place – thereby preventing runoff – is affected by such factors as the percentage of rock in the soil, the proximity to the surface of rock and groundwater, and the degree to which the soil is compacted.

- A percolation test measures the rate at which water seeps into soil. The rate of percolation is determined by how porous a surface is. If a land surface is not porous (e.g., pavement), water will not soak in but rather run off it rapidly. If a surface is very porous (e.g., areas of thick grass with permeable soil), it can soak up large volumes of water. When water can soak into a surface and travel through the ground slowly, much of the pollutants are filtered out Water that runs off the land quickly, on the other hand, carries pollutants directly to the waterways.

Materials for each group:

- 2 plastic water bottles that are the same size, filled with water
- Water source to fill jugs
- Stopwatch
- Ruler
- Schoolyard map developed in Schoolyard Mapping Activity
- Student Data Sheet
- Clipboard
- Red or Blue Food Coloring

Setting the Stage:

Ask students to think about how water would flow in their schoolyard. Have them make a prediction about an area where the water would run over the surface and an area where the water would percolate, or soak into the ground. Write their predictions on the board.

[1] *Lessons from the Bay* is available via Virginia Department of Education at: http://www.doe.virginia.gov/VDOE/LFB/

Acquisition of Learning:

1. Tell students that they are going to design and conduct an experiment that tests whether their predictions are correct.
2. Using the Experimental Design Diagram, have your students design an experiment to compare the amount of run off of two different surfaces in their schoolyard.

   Example: Independent Variable: Type of Surface

   Dependent Variable: Distance water travels (cm)
3. Take the class into the schoolyard and have the groups go to the first testing area.
4. Place three drops of food coloring on the spot where the students are going to pour the water.
5. Instruct students to complete their tests by following the directions given on the Student Data Sheet. Remind them to record their results in the Data Chart on the back of the Student Data Sheet.
6. Repeat the procedure on the same surface two more times. The students will need to move to a dry location on the same surface type.
7. After they have run three tests, have the students go to the second surface type and repeat the procedure.
8. Back in the classroom, analyze the data. Direct them to answer the following questions in their summaries:

   Did you accept or reject your hypothesis?

   Which surfaces had a lot of run off? Which didn't have any?
9. Ask each group to report orally their results for each land surface tested. Create a class chart to display the reported data. Have students analyze the data in the chart. If math skills allow, ask students to find the average size of wet areas on each surface. (Teachers may choose to have students also find the median [the value at the middle in a ranking of all observations], mode ["most popular" value], and range [maximum minus minimum).)

Closure

Draw conclusion from results. As a class, discuss the results of the experiment. Which land areas around the school have a large amount of run off? Which have a smaller amount?

What did the food coloring represent? *(pollution)* Did it travel differently over the two surfaces? How does this relate to the water quality in the Chesapeake Bay?

What are two things you would change in your school lot to keep more water onsite so it doesn't run into storm drains or creeks?

Extension

Conduct another experiment where the students test if the flow rate (how fast the water is poured out of the gallon) affects the amount of run off.

Student Page

Name(s): _____

Experimental Design Diagram
E.D.D.

Question: How does _____ affect _____?

Hypothesis: If _____ then _____

because _____.

I.V.: Independent Variable. What "I" change.		
Experimental Group or Types of the I.V.		
Number of Repeated Trials		
Control Group		

Dependent Variable: _____

How will the dependent variable be measured? Describe in detail including units.

_____

_____

_____

Constants: The parts of the experiment that remain the same to keep it fair.

_____

_____

Student Page

Runoff Experiment

Names of Group Members:

_____

Procedures:

1. Go to first surface that your group is testing. Carefully, put three drops of food coloring on surface.

2. Start stop watch and gently pour water onto surface. Record your observations.

3. After the water is poured, measure the distance the water traveled from the starting point. Record your information on data sheet.

4. If the water is still traveling after 3 minutes, stop timing and measure the distance the water has traveled.

5. Record the distance in the data chart below.

DATA CHART

Surface Type	Distance Trial #1	Distance Trial #2	Distance Trial #3	Observations About food coloring