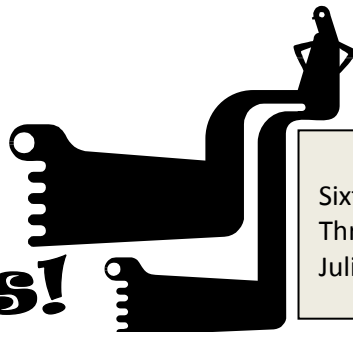


Ouch! That Hurts!



Sixth Grade Earth Science
Three-Day Field-Experience Laboratory
Julian Ripple – Teacher – SYIP 2009

Studying the Effect of Student Traffic in the Schoolyard and Beyond

Rationale for Study:

Using the Environment as an Integrating Context for learning (EIC) is a framework that links multiple subjects to the environment. It is an overlapping approach to education, providing an interdisciplinary, collaborative, student-centered curriculum that has many positive academic results. One study, conducted by the State Education and Environment Roundtable (SEER) clearly presents the benefits of an environment based curriculum in any school. The study found that:

- **100%** of schools using environment-based learning had students with **improved behavior, attendance, and attitudes** relative to traditional schools.
- Not only attitudes improved, but test scores increased as well.
- **77%** of schools with environment-based curriculum had **improved standardized test scores** and **73%** had improved **Grade Point Averages**.

Lesson Goals:

This investigation is designed to study effects of human impact on the grounds of the school yard. The school surroundings consist of many diverse ecological environments from which students will explore how man has altered the original environment and the effects of these alterations either good or bad. During this laboratory, students will participate in the following Georgia Performance Standards:

- S6CS1** - explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.
- S6CS5** – use tools and instruments for observing, measuring, and manipulating equipment and materials for scientific activities.
- S6E5** – explain the effects of human activity on the erosion of the earth’s surface.
- S6CS6** – will communicate scientific ideas and activities clearly.
- S6CS9** – will investigate the features of the process of scientific inquiry.
- S6CS10** – Students will enhance reading in all curriculum areas by demonstrating an understanding of contextual vocabulary in various subjects; use content vocabulary in writing and speaking, and explore understanding of new words found in subject area texts.

Materials:

For each group of 3-4 students:

- Soup type can with both ends cut off, (Children are encouraged to bring this item from home)
- Blue Tape to measure 2 cm mark on can
- Centimeter Ruler
- ½ Gallon Water Container with Water (Children are encouraged to bring this item from home)
- Graduated Cylinder
- Timer/Watch
- Clipboard / Datasheet

For whole class:

- Map of School and Schoolyard
- Large Presentation Sheets for Data Group Display (if PowerPoint technology is available, students may want to present their data in this method)
- Colored Markers

Setting up the Investigation:

a. Engaging students:

Did everyone have their coffee this morning? (Discussion continues about how coffee is made and the percolation process.)

b. Questions:

1. *If you were asked by somebody to make coffee in the morning, how would you go about it?*
2. *What do you think would happen if you packed coffee in the coffee basket too tightly?*
3. *Let's pretend that the coffee is the soil around the school. What do you think happens when water hits the soil in different parts of the schoolyard?(Compare and Contrast)*
4. *What does the soil look like where kids stand around a lot?(Comparative Questioning)*
5. *Where are you most likely to see mud puddles?(Observation)*
6. *Are some areas of land more likely to erode than others?(Comparative Questioning)*



Vocabulary:

Soil Percolation: The process by which a material more fluid than soil, usually water, moves through soil. Refers to the ability of soil to absorb water.

Pervious Soil: Open to passage or entrance; permeable or leaky.

Impervious Soil: A soil through which water, air, or roots penetrate very slowly or not at all.

Hypothesis:

Highly compacted soil is most likely to erode and cause runoff when hit by water.

Methodology

Experimental Design: This study explores the effects of human traffic on comparative areas around a typical schoolyard. Following guided instruction, students will choose two areas to sample following a prescribed procedure, analyze their data and report their findings to the class.

Timeline:

Day 1:

- Opening question/discussion. (Coffee)
- Go over questions and procedures for outdoor soil investigation.
- Tour of schoolyard to support Questions #4 &5.
- Students divide into groups and choose two comparative sites. (Site #1 with heavy traffic, Site #2 with little traffic)

Day 2:

- Demonstration of procedure and review of outdoor study guidelines.
- Groups of 3-4 students will go to targeted study site and identify different ecological areas based on the amount of student traffic. (Grassy, Natural, Heavily Trodden, Partial Eroded, Fill Areas, etc.)
- Students will begin to take, measure and record data from samples of soil from chosen sites. Each group should take and analyze three to four samples per site.
 - **Procedure:** Percolation here will be used as an indication of how compacted the soil is and how much water runoff might be expected in the two areas. Insert the soup can about 2 cm into the ground at the site to be measured by twisting. Try not to disturb the soil on the inside of the can. Pour 50 ml of water into the can and time how long it will take for all of the water to percolate into the soil. Record this time. For areas that have a LONG percolation time (water sits in the can), we would associate slow percolation of water into the soil and high surface runoff during rain, watering, etc. What is the significance of high surface runoff? EROSION!

Day 3:

- Continuation of field investigation with measuring and recording data.
- Compile outdoor study findings, decide on a conclusion and prepare for presentation to class.
- Share research findings as a class.
- Have final discussion about effect of soil compaction on erosion.
- Students will be expected to use new vocabulary words in presentation/discussion.

Sampling Sites:

- Groups of 3-4 students will choose from sites they would predict that would (1) be likely to erode and (2) would not be likely to erode, to choose for soil sampling.
- Students may also choose to bring in samples from home for further investigations.

Why are given sites selected? How are they similar or different from each other?

Predictions:

- If 50 ml of water takes longer to drain through 2 cm of soil, then these samples will come from areas that are more stepped on.
- If 50 ml of water drains quickly through 2 cm of soil, then that soil will come from areas that are less stepped on.

Resources:

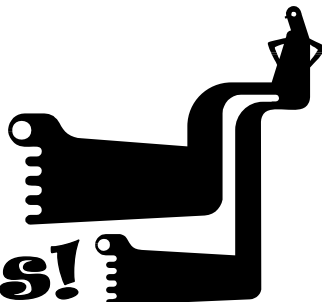
- National Wildlife Federation: Learning Through Environment-Based Education
- EarthDayNetwork: Waste Walk
- EETAP: Exploring Environmental Education in a Schoolyard Environment (Environmental Education and Training Partnership)
- SYEFEST Activity: Impacts of Schoolyard Traffic (Institute of Ecosystem Studies, Millbrook, NY)
- OBIS Activity: Investigation comparing the slope of a trail and soil erosion. (Outdoor Biology Instructional Strategies, Berkeley, CA)
- U.S. Fish and Wildlife Service: Schoolyard Habitat Project Guide
- Schoolyards Habitat Program: Reaching High Academic Standards on the Schoolyard

Budget:	Graduated Cylinders	\$3.00 ea.	Timers	\$12.00 ea.
	Metric Rulers	\$0.60 ea.	Markers	\$3.50 ea.
	Clipboards	\$2.00 ea.	Presentation Sheets	\$8.00 ea.
	Blue Tape, ½ "	\$3.50 roll		

Follow-up Investigations: *Hold A Hill Challenge*. Finding out how steep a trail can be and still prevent excessive erosion.

Community Outreach: Data, Investigations w/pictures could be published on the school website.

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Outdoor Investigations Guidelines and Procedures

Insert the soup can about 2 cm into the ground at the site to be measured by twisting. Try not to disturb the soil on the inside of the can. Pour 50 ml of water into the can and time how long it will take for all of the water to percolate into the soil. Record this time. Back in the classroom, your teacher will help your group wrap up the work so that you can summarize and analyze your data. You will then write conclusions about your findings to be presented to the entire class. Following are details of the specific science activities completed by each group.

Group Data Analysis Chart

Group Members:	
Prediction for Site #1:	Prediction for Site #2:
Description of Site #1:	Description of Site #2:
Trial #1 – Total Amount of time for all 50 ml of water to percolate into the soil sample:	Trial #1 – Total Amount of time for all 50 ml of water to percolate into the soil sample:
Trial #2 – Total Amount of Time for all 50 ml of water to percolate into the soil sample:	Trial #2 – Total Amount of Time for all 50 ml of water to percolate into the soil sample:
Trial #3 – Total Amount of Time for all 50 ml of water to percolate into the soil sample:	Trial #3 – Total Amount of Time for all 50 ml of water to percolate into the soil sample:
Trial #4 – Total Amount of Time for all 50 ml of water to percolate into the soil sample:	Trial #4 – Total Amount of Time for all 50 ml of water to percolate into the soil sample: