

Activity: Cupcake Core Sampling

Lesson Summary

This activity helps students gain a better understanding of what is under Earth's surface. While this is a simulation, it is followed by an activity where students collect soil samples from around the school site to look for similarities and differences.

Ohio Standards Correlations

Standard: Earth and Space Sciences

Grades 3-5 Benchmark B: Summarize the processes that shape the Earth's surface and describe evidence of those processes.

Indicator(s)

Grade Four

10. Describe evidence of changes on Earth's surface in terms of slow processes (e.g., erosion, weathering, mountain building and deposition) and rapid processes (e.g., volcanic eruptions, earthquakes and landslides).

Grades 3-5 Benchmark C: Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved.

Indicator(s)

Grade Three

- 4. Observe and describe the composition of soil (e.g., small pieces of rock and decomposed pieces of plants and animals, and products of plants and animals).
- 6. Investigate that soils are often found in layers and can be different from place to place.

Standard: Scientific Inquiry

Grades 3-5 Benchmark B: Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.

Indicator(s)

Grade Three

- 2. Discuss observations and measurements made by other people.

Grade Five

- 2. Evaluate observations and measurements made by other people and identify reasons for any discrepancies.
- 3. Use evidence and observations to explain and communicate the results of investigations.

Grades 6-8 Benchmark A: Explain that there are differing sets of procedures for guiding scientific investigations and procedures are determined by the nature of the investigation, safety considerations and appropriate tools.

Indicator(s)

Grade Six

2. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.

Standard: Scientific Ways of Knowing

Grades 3-5 Benchmark C: Explain the importance of keeping records of observations and investigations that are accurate and understandable.

Indicator(s)

Grade Three

2. Keep records of investigations and observations and do not change the records that are different from someone else's work.

Grade Four

2. Record the results and data from an investigation and make a reasonable explanation.

Grades 6-8 Benchmark A: Use skills of scientific inquiry processes (e.g., hypothesis, record keeping, description and explanation).

Indicator(s)

Grade Six

2. Describe why it is important to keep clear, thorough and accurate records.

Time

Part I: One 30-minute class period

Part II: One class period to collect samples; one class period to analyze samples

Materials

Part I

Per Student: 1 paper plate or napkin/student, 5 clear straws, 1 cupcake (prepared ahead of time), a plastic knife, Training Protocol pages, colored pencils or crayons

Part II

PVC pipe for each group (see attachment A), a wood block, mallet or hammer, 1 roll aluminum foil, 1 dowel rod 1 inch diameter and journal pages.

Background

Geologists often take core samples of the earth in certain areas to determine more information. Students will be trying to find out what has happened to the area

within the earth (cupcake). Students will need to have a basic understanding of what geologic forces cause change to the earth's surface.

Teacher Tips

Part I: One cupcake for each student will be needed in this lesson. These cupcakes will represent an area of the earth's surface so that students can take "core" samples of their mini-earth. The cupcakes need to be made with at least three layers of colored batter. You don't want students to be able to see through the cupcake liner. Prepare 2 boxes of white cake mix batter according to the package directions. Divide the batter equally into 3 bowls. Add a few drops of food coloring to create 3 contrasting colors. The batter can be poured in a variety of ways so that all of the cupcakes are not the same. The cupcake can be tilted when the batter is poured to simulate the tilted layers of the earth. Bake the cupcakes in foil cups in muffin pans so students cannot see the layers. . Then, bake the cupcakes according to the package directions. Be sure that you do NOT frost the cupcakes or use chips/sprinkles. These will get stuck in the straws when the students try to take their core samples. When the students take core samples, they will take samples across the cupcake to see the differences between the middle and the edge of the cupcake.

Part II: When students are taking core samples in the schoolyard be sure to check out the area prior to taking students. You might want to look for an area that will not be hazardous to students and where the soil is "soft" enough to take a core sample from. Flower beds are usually good sites whereas some parts of the schoolyard might be more difficult because of the compacted material.

Procedures

Getting Started

Ask students to share examples of rocks that have changed due to weathering. Share photographs or examples that you bring in of weathered rocks. Ask the students to explain the changes they observe and infer how the rock has been changed.

Doing Science

Procedure:

Introduce the activity by reading the letter that has arrived from the Soil Sampling Project. This is the springboard to the activity. Students are asked to be trained in the proper protocol; which is Part I of the activity: cupcake core samples.

Part I

1. Provide each student with a cupcake, straw, toothpick and a recording sheet.
2. In the first section of the paper, students will draw what they predict the inside of the cupcake will look like. The foil cup will prevent the students from seeing the

interior of the cupcake much the same way a geologist can not see the middle of the earth.

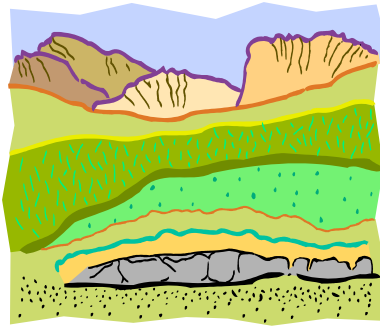
3. The students will be using the straw and knife as “tools” for this investigation. Review safety procedures for using these types of tools. Ask the class if there is a way to see the inside of the cupcake without cutting it with a knife or peeling off the foil. If no one suggests using the straw to collect a core sample, show the students how to push the straw into the cupcake to extract a sample. (Straws can be cut a little longer than the depth of the cupcake.) Students will then make a second drawing of the cross section of the cupcake using the information and observations of the three core samples. 
4. Now students will cut open their cupcake with the plastic knife, draw their observations and compare with the drawing of their prediction. As a class, discuss student observations and have students share their drawings. When finished, students may eat their cupcakes.

Wrapping Up- Part I

1. Compare what you did with the cupcake to the work of a geologist. (The students could not see the inside of the cupcake so they took a core sample similar to geologists not being able to see the inside of the earth and taking core samples to study rocks and soil.)
2. Describe the cross section of the cupcake that was extracted in the straw. (Students should describe the layers they observed and different colors and/or textures.)
3. How close were your prediction and actual findings? Why do you think they were similar? Or different?
4. What similarities did you find between the layers of the cupcake and the layers of the earth? (The cupcakes had different colors, textures and different thicknesses like the earth. Some of the cupcakes had evidence of an uplift or evidence of consistent layers of sediment.)

Extensions

As a follow up to this lesson, students will take core samples in their schoolyard. See the Soil Sampler pages (Attachment A) for detailed information about creating the sampler and the student pages. To conduct this activity, share the second letter from the Soil Sampling Project with the students. Explain that they will be collecting soil samples from the school site and writing about their findings. This extension is an effort to help students make the connections between the cupcake samples and an actual soil sample. You can also use this piece as an assessment to see what students understand about soil composition.



**Soil Sampling Project
1257 Loam Lane
Rocky Way, WI**

Dear Students,

For the first time in our history, we are asking for students across the country to help us with a soil sampling investigation. In an effort to make the sampling process consistent, we are asking you to complete the initial training and be approved before soil sampling your school site. Included in this training kit are the materials you will need as well as the scientific protocol to follow as you sample soils.

We at the SSP are pleased that you will be participating in the Soil Sampling Project this year. Good luck!

Name_____

Cupcake Core Sampling

Illustrate your prediction of what the inside of your cupcake will look like and describe it in writing below.

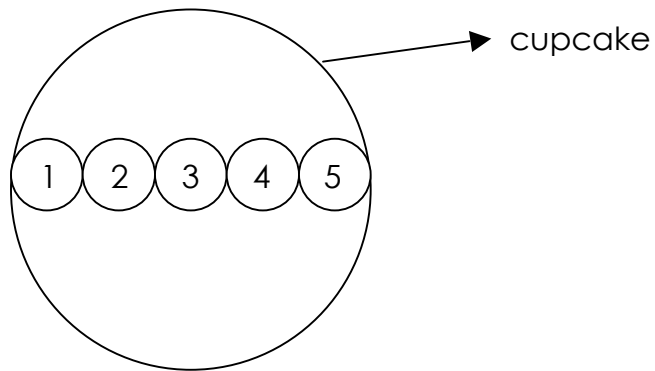
Illustrate the core sample that you took from your cupcake and describe it in writing below.

Illustrate the cross section of your cupcake that was revealed when you sliced it open. Describe below.

Name: _____

TRAINING PROTOCOL

1. Lay out a napkin on your work area. This will ensure that no contamination occurs.
2. Take out the first straw. Push the straw into the cupcake in the position shown below.
3. Pull out the straw by placing your thumb over the top of the straw and gently pulling it.
4. Place the straw below the bold number at the bottom of the page.
5. Repeat numbers #2-5 until you have taken 5 samples.
6. Use the information and complete the Training Analysis Page.



1

2

3

4

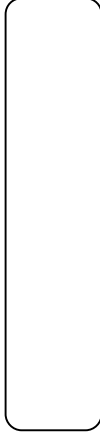
5

Notes

Name: _____

SOIL TRAINING ANALYSIS

1. Color the layers in the space below as you see them in your core sample column. Make sure you are accurate with your colors. Be sure to include any bends or curves.

					
Sample	1	2	3	4	5

2. What information did you learn about your “core samples” that you did not know in the beginning?
3. If your cupcake represents earth, what do your core samples tell you more about?

4. Geologists try to “look inside” the earth. An easy way to do that is to cut away or take a cross section, however this us hard to do in real life. Cut your cupcake in half using your knife. Draw your observations below.

5. Compare your cross section and your core samples. How are they similar? How are they different?

6. Okay! You've earned your reward! You can eat your cupcake as you answer **one** of the following questions on the back of your paper!
 - a. Scientists often take core samples instead of just looking at the earth's surface. What information do you think they get from doing this? Why might they take core samples?
 - b. What evidence can you get from a core sample that tells you about the earth processes that have taken place in a specific area?

Attachment A

Creating a Soil Sampler

The collection of intact soil samples is required to demonstrate the presence of shallow horizons. While a shovel will work in this regard, a soil corer is less intrusive and also permits the recovery of a soil sample which is compact and easy to examine.

Construction of a simple PVC soil corer

Obtain a piece of PVC pipe with a diameter between 1 ¼ and 2 ½ inches. Cut the tube to a length of from 2 to 3 ft. The length should be about six inches longer than desired depth of soil sampling, For example, a 2-ft tube will yield a soil sample of about 1 ½ ft in depth.

The maximum length of the corer will be a function of the degree of bending that the corer will experience when in use. The degree of bending and inefficiency in soil sampling increases with increased length of the corer. A corer longer than 3-ft in length may not work well. It is best to use a file to create a beveled edge which will increase the ease with which the corer can be inserted into the soil.

The effectiveness of the corer will be limited by rocky soil. Rocks will not only impede the penetration of the corer, but will also damage the beveled end. Any damage can be easily repaired with a file.

Use of your simple PVC soil corer

1. Drive the corer into the ground by hammering the top with a hammer or some other blunt object.

It will be best to place a flat wood block on the top of the corer and strike the block with a hammer. This will distribute the force of the hammer evenly over end of the PVC cylinder to minimize damage and enhance penetration into the soil.

2. Drive the corer to a depth of 2-3 inches. (Check w/ruler) Any greater length of sample increases the difficulty in extracting the soil core from the inside of the corer.

3. To extract the corer from the soil, twist it about ¼ to ½ turn and pull up with a somewhat twisting motion.

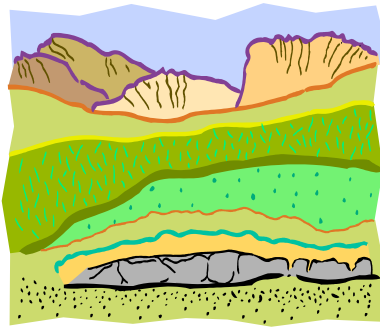
4. Extract the plug of soil by inserting a wooden dowel into the opposite end of the corer and then pushing down on the dowel to force out the soil. Tapping on the dowel with a hammer may be necessary. Collect the soil sample on flat surface. Aluminum foil can be used for this as well as to

wrap the soil to facilitate keeping it in the proper sequence if it is desired to take the sample back to the classroom.

5. Repeat the sampling of the soil by placing the corer back into the hole in the soil, pushing it down until it encounters solid soil and proceed to drive in the borer to take the next 2-3 inch soil sample. Extract the corer and soil plug in the manners done previously. Place each plug of soil in the proper sequence on the collection surface to produce one long soil sample.

6. Once soil sampling is finished, the core sample can be examined for changes in color or texture. Dividing each little soil plug lengthwise using a table knife can expose a better soil surface for examination than the surface that was in contact with the inner surface of the corer.

Once collected the soil core can be examined for the presence of horizons with particular attention paid to the presence or absence of roots and soil color and texture. Organic-rich soil horizons will typically be a dark brown. Clay-rich soil horizons can be deformed plastically to some degree under moderate pressure between the thumb and finger.



**Soil Sampling Project
1257 Loam Lane
Rocky Way, WI**

Dear Students,

We would like to thank you for the work that you have completed in your training. We hope you are learning and having fun. At this time, we ask that you participate more fully by collecting a soil sample from your schoolyard and applying what you have learned.

After you have analyzed your sample, we would like for you to tell us about your findings. As always, we are interested in what types of soils we find in many areas.

Thank you again for your hard efforts in helping us “un-earth” new learning.

~The Staff at SSP

Name _____

Schoolyard Soil Sampling

Illustrate your prediction of what the soil sample will look like and describe it in writing below.

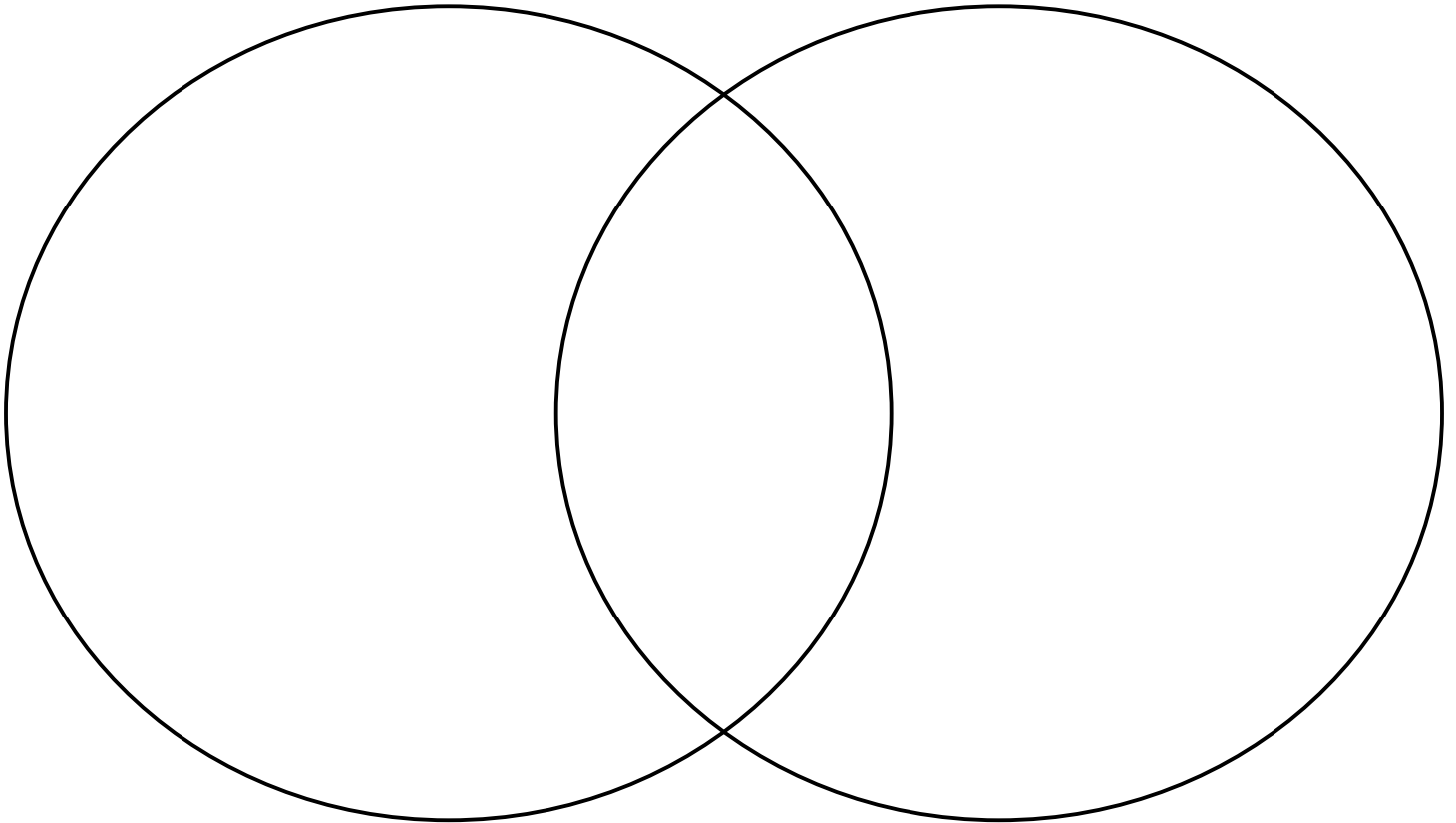
After extracting your soil sample from the site, illustrate and describe it in writing below.

Name: _____

Compare your cupcake core sample to the actual soil sample. How are they alike? How are they different?

Cupcake Core Sample

Schoolyard Soil Sample



Use pictures and/or words to describe the soil in your schoolyard.

Notes

Write a letter to the staff at SSP describing the soil from the school site. Be sure to include the following Focus Correction Areas (FCA's):

1. Use correct letter format
2. Describe the soil sample using correct terminology
3. Include a detailed drawing of your core sample

Core Sample Illustration

Name _____ Date _____

Reflection Mat

What I learned...

Questions I still have...

Possible student
stumbling blocks/
misconceptions

BIG IDEAS

How and when will I use this
with my class??

Management:
Students & Materials...

FROM TODAY

Assessment ideas...

Notes