Activity—Cupcake Geology

Drill a cupcake—an analogy to offshore drilling to uncover a geologic history.

Read descriptions of turbidites on previous pages.

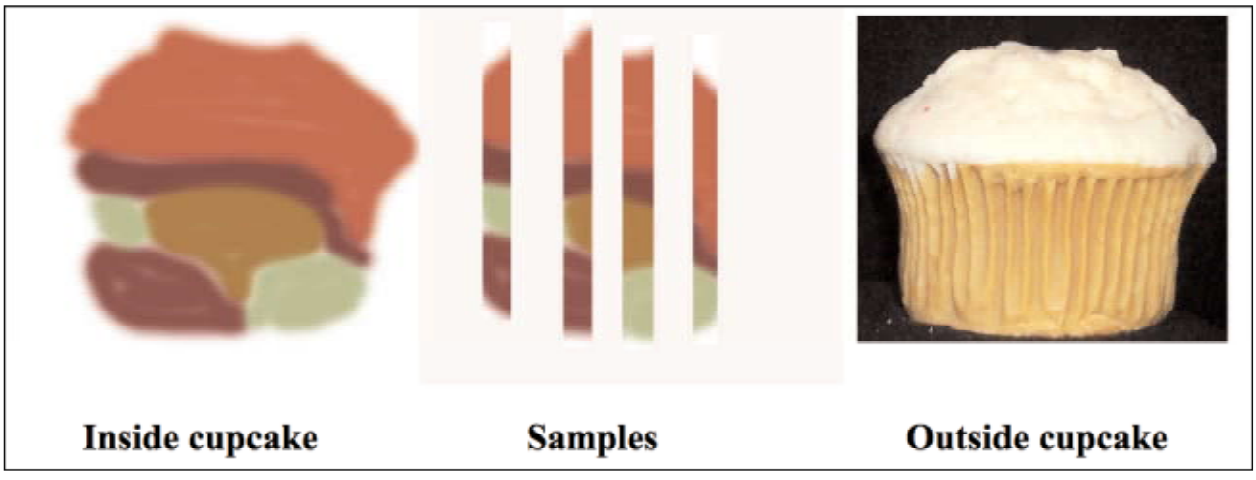
What's inside that cupcake?

All is not what it seems.

Using a large straw, students "drill" and collect samples through different parts of the specially layered cupcake and keep a log of the drill core. By defining different colored cake and filling, they can reconstruct a history of deposition. Student worksheets provided.

NGSS Science Standards

- Earth's Place in the Universe: MS-ESS1-4, HS-ESS1-5
- Earth's Systems: HS-ESS2-1, MS-ESS2-2, MS-ESS2-3
- Earth and Human Activity: HS-ESS3-1, MS-ESS3-2



Cupcake Geology

This activity was developed by Bonnie Magura, Jackson Middle School, Portland, OR.

Introduction:

Students' understanding of their environment must include some knowledge of the Earth below their feet. Knowing about differences in the Earth's structure and understanding the processes of scientific investigations are essential for knowledgeable citizens. Students will use the scientific method (below) to investigate unknowns. Sampling is a critical concept. This lesson is fun for students and actively engages them in a scientific investigation. (We have all hypothesized, then did some form of "drilling" exploration to discover just what was in that Holiday chocolate before committing to it.)

Concept:

Inquiry-based scientific investigation using a "layered-Earth" cupcake to learn how scientists discover what is hidden at shallow depths beneath the surface of the Earth.

Purpose:

Students will:

- learn that the earth is made up of various substances in different layers;
- learn how to hypothesize the outcome of an investigation, plan a sampling strategy, and test their hypothesis;
- understand the value of systematic sampling;
- become familiar with soil and be encouraged to ask questions about things they might not understand.

Materials

- Cake mix or recipe, frosting
- Food colorings
- •• Foil baking cup liners
- Clear Straws
- Plastic knife
- Colored pencils
- Lab recording sheet (see below)

Scientific method

- Observation
- Research (what might be found?)
- Construct a hypothesis
- Test hypothesis/ Experiment
- Analysis (support/reject hypothesis)
- Draw a conclusion
- Communicate results

Pre-class Preparation:

Prepare a white cake mix recipe; a fairly dense cake works best. Divide batter into several bowls and add various food colorings to each batch. Add small amounts of each colored batch to a cupcake pan. Bake. Top cupcake with frosting. Day old cupcakes work best. If you don't have time/ inclination to bake, filled cupcakes could work.

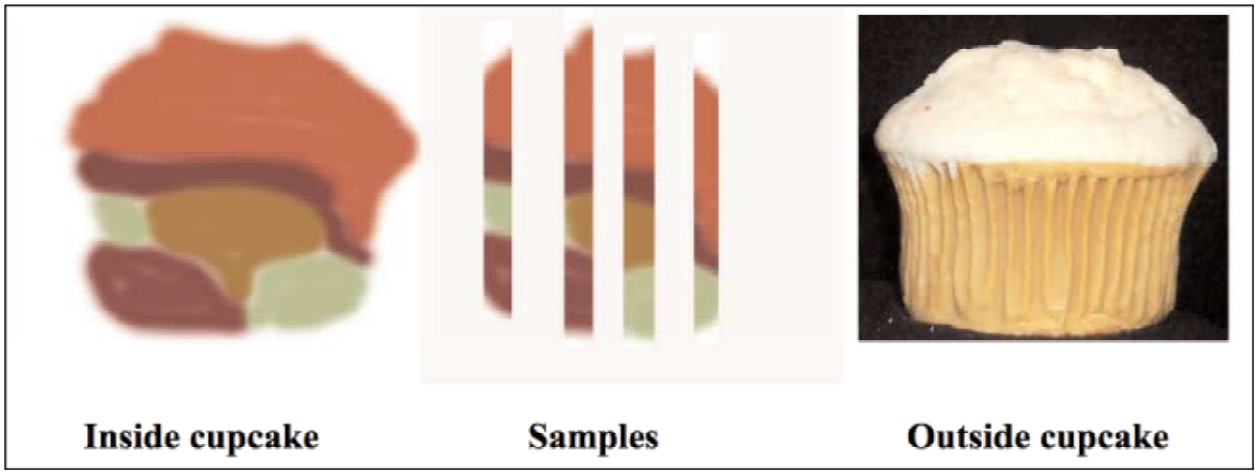


Figure 1.3 Cupcakes at various stages of the investigation. See Pre-class Preparation to see how the layers are made.

Set-Up Procedure—teacher

1. Pass out napkins, straws, plastic knife, lab recording sheet and a cupcake to students.
   Note: depending on how many students you have, you may want to use pairs or use cooperative learning table groups.
2. Explain to the students that geologists often don't know what layers lie beneath the Earth's surface. They must somehow predict what layers might be present and then do experiments to test their ideas. Geologists working for petroleum companies often detect subsurface layers by bouncing seismic (sound) waves off the layers and making an "echogram" of the subsurface. Marine geologists often use coring devices to collect sediment cores from the bottom of the ocean.
3. Demonstrate how to sample the cupcake with a straw and explain that this is similar to a core sample of Earth. Insert the straw into the cupcake, and remove.

   Diagram the position A – E where your demonstration core sample was taken.

Closure:

Discuss lab findings and applications of core samples in real world situations.

Extension:

Have students dig a hole in the soil near school and near their home. They should then draw or diagram the layers of soil they find and compare the differences.

Evaluation Strategies

Collect the students' diagrams of the investigation and have them explain how sampling is essential to scientific investigations.

Names: _____

_____

Cupcake Geology

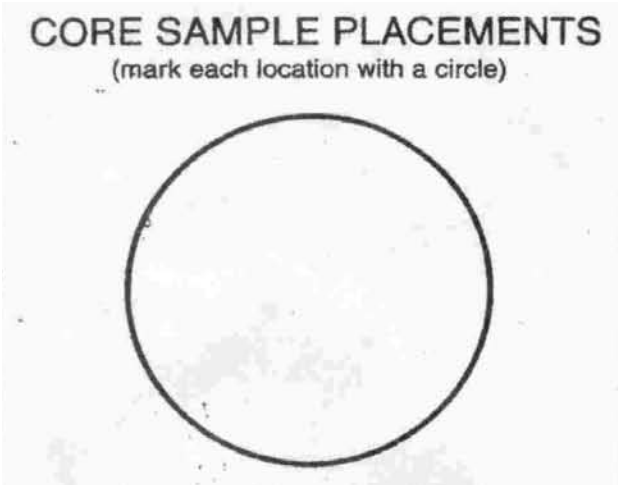
Modeling Geologic Core Samples

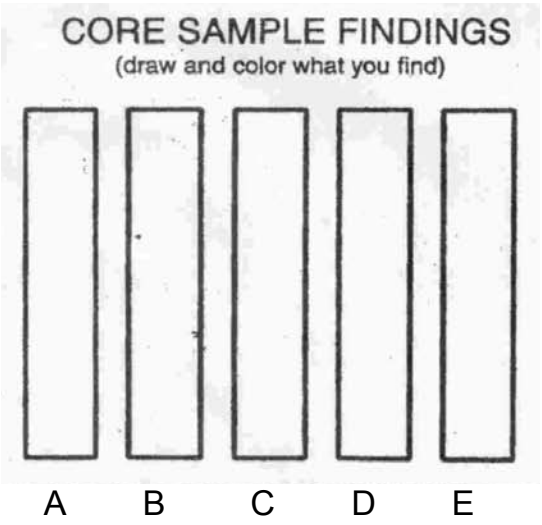
Materials

- Frosted cupcakes
- Plastic knife
- Clear Straws
- Colored pencils

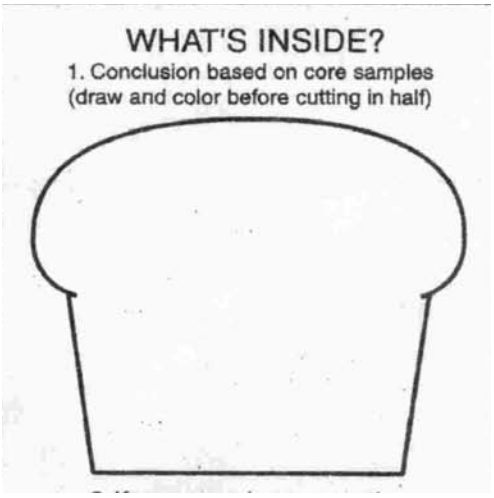
Procedure

1. Take core samples from the cupcake using your straws. Diagram the position A – E where each core sample was taken using the recording diagrams below.
2. Draw what each of your core samples looks like. Use colored pencils
3. Draw a cross-section picture of what you think the inside of the cupcake looks like based on the core sample diagrams. Use color.
4. Cut your cupcake in half and make a cross-section drawing of what your cupcake actually looks like on the interior. Use color.

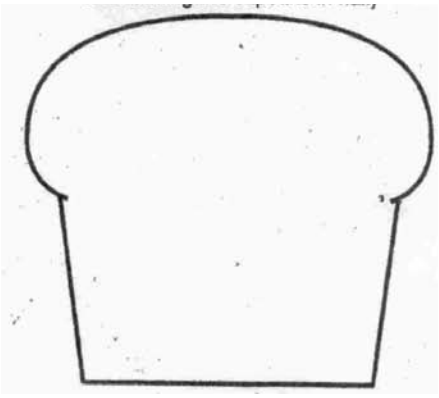




Prediction of cupcake based on core samples



Cupcake cut in half
Showing actual interior



Conclusion:

1. How did your assumptions about the cupcake change as the lab progressed?

   a. Cupcake with no information

   b. Cupcake with partial information (only one core sample)

   c. Cupcake with more information (all core samples considered)

   d. Cupcake cut in half

2. Describe at least two examples of real world situations where core sampling is used to provide information about unseen geology.

3. What other sampling techniques are used in the field to provide similar information?

4. Compare and contrast the Cupcake Geology core sampling lab with real-world core sampling situations. (Use thoughtful examples that demonstrate new understanding)

Similar	**Different**