Title: Ice Cores

Grade Level: 3-5

Objectives:
Students will be able to:

- Identify what is an ice core;
- model core sampling techniques to find out what sort of layers are in a cupcake;
- make a core sample using cake material;
- write an explanation about what they observed from their sample and how it relates to the core samples taken from the earth.

Rationale or Purpose:
To demonstrate why geologists use ice cores

Source:
http://www.pbs4549.org/antarcti/cupcake.htm
http://en.wikipedia.org/wiki/Ice_cores

Materials:

- Cupcake mix
- Plastic knives
- Foil baking cups
- Food coloring
- Drawing paper
- Toothpicks
- Frosting
- Plastic transparent straws

Lesson Duration: 1 hour

TEKS Objectives:
Science, Grade 3:
(11) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:
(A) identify and describe the importance of earth materials including rocks, soil, water, and gases of the atmosphere in the local area and classify them as renewable, nonrenewable, or inexhaustible resources.
Science, Grade 4:
(10) Science concepts. The student knows that certain past events affect present and future events. The student is expected to:
(A) identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow.

(11) Science concepts. The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:
(A) test properties of soils including texture, capacity to retain water, and ability to support life
Science, Grade 5:
(11) Science concepts. The student knows that certain past events affect present and future events. The student is expected to:
(A) identify and observe actions that require time for changes to be measurable, including growth, erosion, dissolving, weathering, and flow
(B) draw conclusions about "what happened before" using data such as from tree-growth rings and sedimentary rock sequences.

Background Information:
An ice core is a core sample from the accumulation of ice and snow over many years that are cut out from ice sheets or glaciers. These cores could hold information about the composition of the ice from air bubbles trapped inside from previous time periods. This information can provide a picture of the climate at that time.

Ice cores are typically removed from ice sheets, which are very big glaciers. These ice sheets are commonly found at the polar ice caps of Antarctica or Greenland. Some glaciers from high mountains could also be used for ice core sampling.

As the ice forms from the buildup of snow, layers that are older are the lower layers and the younger layers are near the top. Ice cores contain ice that can be translated to be formed from over a range of years. Geologists use these layers to reconstruct a climatic record over the age range of the core.

Ice cores can contain information about the climate from the inclusion of snow in the ice by seeing cross bedding from wind, and to see which way it was blowing. Also geologist may find dust, ash, bubbles of atmospheric gas, and radioactive substances in the ice core samples. The variety of the climates in ice cores is greater to use than any other type of climate recorder, such as tree rings or sediment layers. Ice cores can include the climate findings of temperature, ocean volume, precipitation, solar variability, sea-surface productivity, desert extent, and forest fires.

An ice core from a site, such as those in Antarctica, can be reconstructed to show a detailed climate record extending over hundreds of thousands of years. It is the simultaneity of these properties recorded in the ice that makes ice cores such a powerful tool in paleoclimate research.

Procedure:

1. Have cupcakes made before class. Make cupcakes with different colors of batter by using food dye. Have at least three layers of colored batter.
2. Tell students today they will see how scientists use ice cores. First ask the students if they know what an ice core is.
3. Explain what an ice core is and pass out some pictures of ice cores and geologist sites, mainly of Antarctica (great source of pictures from the National Oceanic and Atmospheric Administration: http://www.arctic.noaa.gov/gallery.html)
4. Provide each student with a cupcake, 4 straws, a toothpick and drawing paper. Foil baking cups and frosting will prevent the students from seeing the interior of the cupcakes in much the same way that a geologist can't see the interior of the earth. Make sure the students do not eat or touch the cupcakes yet.
5. Ask the students to fold a piece of drawing paper into four sections and in one of the sections draw what they think the inside of the cupcake would look like. Ask the students if it was hard trying to draw something that they cannot see.
6. Ask the students how they might get more information about the cupcake without peeling the foil or cutting it open with a knife. Give them hints from what materials were given to them.
7. Someone may suggest using the straw to take a core sample. If not, show them how to push the straw into the cupcake and pull out a sample. Have the students only use one straw to take a core sample.
8. The students should make a second drawing of the cross section of their cupcake based on the information from the one core sample. Make sure the students identify the core sampling to where they have made the core sample.
9. Ask the students if one core sample is enough to see the layers inside the cup cake.
10. Ask the students to do 2 more cores samples to complete their cross section for their third drawing. Tell them to make sure the students still identify where they have taken the core samples. Remind them that they want to know all about the layers and think about where they might take the core samples.
11. Once students are finished completing their cross section, ask them if this was easier than before.
12. Now tell the students to cut open their cupcake and ask them to draw the real cross section of the cup cake for their fourth drawing.
13. Ask the students if their third cross section drawing look similar to their fourth drawing.
14. Relate back to the geologist of Antarctica. Ask them why geologists want to make ice core samples. Tell the students that geologist want to see how the glacier or ice sheet is formed and this is a way to see the layers of ice and compare it to other layers.

15. Discuss about this evidence and its usefulness.
16. Students are now able to eat their cupcakes if their drawings are done and turned in and that their core samples are thrown away.
17. Evaluate by assessing their drawings and participation.