How Do Glaciers Scratch And Move Rocks?

Purpose: Students will model the action of a rock-filled glacier with ice cubes and learn how glaciers can make scratches in Earths surface.

Text: McGraw Hill, Pg. 175 Explore Activity
McGraw Hill Science Journal, Pg. 75

Resources: I have added an additional experiment that you can do in your classroom after lab to reinforce the concepts being taught this week.

Learning Outcomes: Students will discuss and know how glaciers scratch and move rocks.

(Homeroom Teacher)

Bridge-in: Share student's hypothesis with class: How can a block of ice help shape the Earth's surface?

Prior Knowledge: How are icebergs formed?
Do you think that a glacier is able to make scratches in the Earth's surface?
If YES, then HOW? If NO, then WHY?

Input from you: Review what a prediction is.
What is meant by using, the word, *variable(s)* in an experiment?
What is an observation?
What do I mean when I use the term *inference*?

(Science Facilitator)

Materials:
Science Notebook
Science Journal Pg. 75
Paper towels
Clean ice cubes
Ice cubes made with sand
Aluminum foil
Wood scraps, large enough to scrape ice cubes against.

Guided Procedure:

Predict: Which ice cube do you think is more like a real glacier?
Record your prediction and reasons in your journal.

Using Variables: Think about how you could use the materials to test your ideas.
Which ice cube will scratch a surface?
Record your observations for each ice cube.

Observation: Which cube will leave "*rocks*" behind?
Place the ice cubes on a folded paper towel. Allow them to melt. Observe and record what is left behind.

Closure:
Share: How did each model feel as you rubbed it over the surface?
Which model scratched the foil? The wood?
Observation: What happened when you pushed down harder on your ice cube?
What happens to the sand when the ice cube melts?
Infer: What made the scratches?

Check for Understanding: Encourage children to ask their own questions to explore, such as: What other materials might be in glaciers and how would that affect their action?

(Homeroom Teacher)

Assessment: How does this model help you explain how a glacier scratches and moves rocks? Share your thoughts with the class.

RECIPE FOR A GLACIER

You will need:

- 1 pint of chocolate swirl or marble ice cream, 3 chocolate chip cookies (or your favorite kind)
- 1/4 cup of marshmallow syrup
- plastic glove or sandwich bag
- bowl (clear so the students can see the deformation)
- spoon

Words to know:

Glacier: Massive sheet of moving ice. Glaciers were present in Ohio during the Ice Age or Pleistocene.
Glacial till: Materials such as rocks and dirt deposited by the melting of a glacier.

Directions:

1. Crumble cookies and place in bowl. *The crumbled cookies represent the glacial till.*
2. Put two large scoops of the ice cream on top of the cookies. *A glacier begins as clean snow. However, as a glacier travels, it picks up dirt and rocks from the ground and becomes "dirty". The ice cream with the chocolate swirls represents the dirty glacier.*
3. Wear a disposable glove (you can get one from the nurse); or you can place a plastic sandwich bag over your hand, then slowly push down to "shmoosh" the ice cream so that it oozes. Notice that the cookies stick to the ice cream. *A glacier moves much in the same manner. As more and more ice and snow fall on the glacier, the weight causes it to ooze, pushing the dirt in all directions.*
4. To see how glaciers move (or ooze), warm up the marshmallow syrup or add a little hot water to make the syrup thinner. Then pour the syrup over the ice cream glacier.

SCIENCE LESSON PLAN

Earth Science

Monday

TEKS: 4.1.A; 4.2.A,B,C,D; 4.3.C; 4.4.A; 4.10.A

Text: McGraw Hill; Pg. 174, 176-177

Resources: http://vulcan.wr.usgs.gov/Glossary/Glaciers/framework.html
http://nsidc.org/glaciers/

Purpose: Intro to Earth Science by providing background information for discussion on glacier, glacial till, outwash plain, moraine, erratic, and terminus.
Students will identify vocabulary, and define selected vocabulary words; glacier, glacial till, outwash plain, moraine, erratic, and terminus.

Learning outcome(s): Students will explore the features left behind by glaciers and propose a possible explanation for how they are formed.

Bridge-in: Students will be discussing the Earth's surface features by learning about the glacial forces that shaped them and continue to shape them.

Prior Knowledge: Does anyone know what a glacier is?
Does anyone know how glaciers might affect the Earth?
Encourage students' to suggest that other materials besides ice are involved in glacial action.

Input from you: Point out that an *erratic* is something out of place, and that it does not belong in the place where it is found. The word moraine is a French word. Share any information you have on glaciers, have reading books available with a *"Glacier"* theme.

Guided practice: Students will read and discuss McGraw Hill Pg. 175. Refer back to Prior Knowledge Questions. Have students predict how a glacier could scratch rock and move boulders. Allow time to define and discuss the vocabulary words.

Closure: Recap key concepts, help students consolidate knowledge; (Where do icebergs originate?) and give recognition to those students that participated in discussion.

Check for understanding: Play a Vocabulary game: Students are each given either the definition of the word or the vocabulary word. They then try to match them up with the correct word to the definition. There are 6 word strips and 6 sentence strips (2 students to each strip). If the students initial choose the wrong strip to match-up. Still leave it up until every pair has submitted a match. Then ask the students to go back and make any corrections.
Demonstration: Put an ice cube in a pan of sand. Ice in a glacier picks up material as it moves along. Demonstrate this by putting the ice cube in one end of the pan and dragging it to the other end. Sand will be pushed ahead; some will adhere to the ice. Ask: How can a block of ice shape Earth

Assessment: Have the students (in a group) create a crossword puzzle with the definitions and the vocabulary words. Have a different group complete the puzzle.
Short on time: then create the puzzle yourself.

Tuesday

TEKS: 4.10.A;
Text: McGraw Hill; Pg. 176-177
Resources: http://www.eoascientific.com/campus/earth/multimedia/glaciers/view_interactive
http://www.greenland-guide.dk/ice_snow.htm
http://www-nsidc.colorado.edu/glaciers/questions/index.html
Purpose: Children will explain how glaciers form and change Earth's surface.
Learning outcome(s): Students will describe what a glacier is made of and how it moves.
Students will describe features left by glaciers and how glaciers affect the land they move over.
Bridge-in: Students will recall Monday's discussion, and discuss the Earth's surface features and the glacial forces that shaped them and continue to shape them.
Prior Knowledge: Ask the students if they have ever ice skated, or seen ice skaters.
What makes skates glide over the ice? (A thin film of water forms when pressure melts the ice.)
Ask the students if they can think of an example where a thin film of liquid changes the movement of a heavy object over a surface. (A car can slip on the road when there is a light rain or a film of oil on the road. Sometimes this creates car accidents.)
Input from you: Refer to "Science Background" on Pg 176 of TE.
http://www-nsidc.colorado.edu/glaciers/quickfacts.html
Guided practice: Students will read and discuss McGraw Hill Pg. 176.
Context clues: What does the word *debris* mean?
Students will describe what a glacier is made of and how it moves.
How does a glacier form? Describe how a glacier moves?
What happens to debris in a glacier?
Students will read and discuss McGraw Hill Pg. 177.
Context clues: What do the words *drumlin*, and *continental glaciers* refer to in reading selection?
Students will describe features left by glaciers and how glaciers affect the land they move over.
What do you think the terminus of a glacier would look like?
What happens to the terminus of a glacier during a long winter?
During the summer, when a glacier melts and retreats, what happens to the rocks in the glacier?
Refer back to Prior Knowledge. Acknowledge students where appropriate.
Closure: Recap key concepts, helps students consolidate knowledge; give recognition to those students that participated in discussion.
Students will describe what a glacier is made of and how it moves.
Students will describe features left by glaciers and how glaciers affect the land they move over.
Check for understanding: Point out to the students that the conclusion is stated in the first sentence in the right hand column. They will use logical reasoning and find facts to support this conclusion.
Identify five land features formed by glaciers.
How are these formations evidence of erosion?
Why are glaciers powerful erosive agents?
Assessment: Create a thinking map to depict the difference between moraine and glacial till.
Students can draw a diagram depicting the parts of the glacier, label the parts, and describe the parts either verbally as groups or in a written format.

Wednesday

TEKS: 4.1.A; 4.2.A,B,C,D; 4.3.C; 4.A; 4.10.A

Text: McGraw Hill; Pg. 178-179; Science Journal Pg. 77-78.

Purpose: Explore ways in which minerals form in the earth's crust.

Resource: IceAge (2002, PG movie)
http://www.uvm.edu/whale/GlaciersGlacialAges.html

Learning outcome(s): Students will explain that glaciers move today and have moved in the past.

Bridge-in: Students will refer to lesson from the previous lessons, specifically the way in which glaciers affect the land they move over. Remind students that glaciers move slowly, picking up material in their paths.

Prior Knowledge: Ask the students how they could tell if there had been glaciers in the past. Do they know what the word *flow* means? What do we mean when we say that a glacier flows?

Input from you: Review safety procedures (Wear goggles and apron.)

Plan Ahead: Mix a pound box of cornstarch with 380 ml of water in a large container. Very little water should be left standing on the surface, It should jiggle like gelatin.

Guided practice: Students will complete and discuss McGraw Hill Pg. 178.
Students are making a model to determine how glacial ice flows.
Follow the Skill Builder in the student's Science Journal on Pg. 77.
Refer back to Prior Knowledge. Acknowledge students where appropriate.
Students will discuss McGraw Hill Pg. 179.

Closure: Recap key concepts, helps students consolidate knowledge; give recognition to those students that participated in discussion.

Check for understanding: Explain that in some ways scientists are like detectives: they search for clues to explain what happened. Ask students to imagine they are scientists looking for evidence of past glacial action.

ASK: You have discovered a huge boulder that is very different from the rock around it. What might your discovery mean?
You are in a part of the world where no glaciers exist and discovered scratched rock in a large U-shaped valley. What can you infer about this area?

Assessment: **Write responses in journal:**
Based on the model created in your group and what you have learned so far about glaciers, define glaciers?
How can scientists tell that glaciers existed in the past?

Language Arts: Write a short story about what the world might have been like during the ice ages.

With the impending ice age almost upon them, a mismatched trio of prehistoric critters find an orphaned human infant in this smash animated hit. Together, Manny the woolly mammoth (Ray Romano), Diego the saber-toothed tiger (Denis Leary) and Sid the giant sloth (John Leguizamo) become reluctant heroes and embark on an epic, hilarious journey to reunite the baby with his parents.

Art: You may want to have the students use clay and rocks to create their own model of a glacier with its glacial features labeled: erratic, and outwash. (You could also use plaster-of-paris, although it takes longer to set up.)

Thursday

TEKS: 4.2.B,C,D; 4.3.E**;** 4.10.A

Text: McGraw Hill; Pg. 180-181

Purpose: The students will identify agents that wear away Earth's surface features. The students will identify some other agents of erosion that change and affect Earth's surface.

Learning outcome(s): Students will name other agents of erosion that change and affect Earth's surface.

Bridge-in: Fill a pan with soil and stand it at a slant. Slowly pour water into the high end, washing the soil downwards. (Create a stream table.) Discuss how running water on the Earth's surface does the same thing. Discuss the recent rainfall in San Antonio, and where they think this rainfall went.

Prior Knowledge: Ask students if they can think of any ways that the surface of Earth is changed. (Refer to stream table demo-visual.)
What do you know about hurricanes, and tornados? (In light of recent events in Florida, students may think that a hurricane changed the land surface of Florida immediately.) Do they affect the Earth's surface features? (Yes, but in a very slow way.)

Input from you: Refer to *"Science Background"* TE Pg. 181
Agents of erosion such as wind, waves, running water and gravity *slowly* change Earth's surface.

Guided practice: Students will read and discuss McGraw Hill Pg. 180
Refer back to Prior Knowledge. Acknowledge students where appropriate.

Main Idea: How can wind cause erosion?
What forces make coastlines change?

Context clue: What is a delta?

Closure: Recap key concepts, helps students consolidate knowledge; give recognition to those students that participated in discussion. What other forces shape the Earth?

Check for understanding:

Inference: What two forces scan cause a mudslide?
What types of things do you think scientists might look at when studying a glacier?

Overall Assessment: Explain what glaciers are and how they are form and move.
Name and describe a glacier feature made up of glacial till.
Describe two features that result from glacial erosion.
Why do you think isolated boulders left behind by a glacier are called erratic?
Suppose a giant boulder, different from the limestone in the area, north of San Antonio sits in the Edwards Aquifer Recharge Zone. How do you think it might have gotten there