Anchorage School District
TTL 4
Unit of Instruction

Unit Overview

Title:	Dynamic Alaska		
Author:	Elizabeth Rawlins	**Grade Level:**	4th

Subject(s) Addressed: Please check all that apply

☐ Arts (Visual and Musical)	☐ Library/Information Literacy
☑ Communication	☐ Mathematics
☑ English/Language Arts	☑ Science
☐ Employability	☐ Skills for a Healthy Life
☐ Geography	☑ Technology
☐ Government and Citizenship	☐ World Language
☐ History	☐ Other:

Duration:	5-6 weeks
Synopsis:	This unit is designed to teach the students about earthquakes, glaciers, and volcanoes and how they shape the earth and their impact on people and animals. Students will be using the technology within the unit to help them build their understanding to complete the culminating project. This unit is designed to be supplemental to the Rocks and Minerals Science Kit.

Desired Results

Enduring Understanding:	The students will understand how geologic processes impact the landscape and our lives.
Essential Question:	How do the forces that shape the earth affect me?

Standards: Content, Cultural, Performance, &/or Grade Level Equivalents

Standard: Text & Reference Number (if applicable)	**Method of Assessment:** Written Product, Quiz, Model, etc.
The student demonstrates an understanding of the forces that shape Earth by **[4] SD2.1** observing models of how waves, wind, water, and ice shape and reshape the Earth's surface by eroding rock and soil (**L**) **[4] SD2.2** identifying causes (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, and avalanches) of rapid changes on the surface	Written product, rubric
The student comprehends literal or inferred meaning from text by	Written product, oral assessment

[4] 2.2.1 Locating information explicitly stated in narrative and informational text to answer literalcomprehension questions* **[4] 2.2.4** Drawing conclusions based on information presented in the text (e.g., cause and effect, character motivation)*	
The student restates/summarizes information by **[4] 2.4.2** Restating information after identifying accurate summaries	Written product
The student writes about a topic by **[4] 2.1.1** Writing a paragraph that maintains a focused idea and includes details that support the main idea **[4] 2.1.2** Organizing ideas logically (**L**) **[4] 2.1.3** Writing a story or composition with a beginning and middle and ending with a concluding statement (**L**)	Written product
The student writes for a variety of purposes and audiences by **[4] 2.2.2** Writing in a variety of nonfiction forms using appropriate information and structure (i.e., personal letters, recounts, descriptions or observations)	Written product/rubric
The student documents sources **[4] 2.5.1** Giving credit for others' information by citing title and source (e.g., author, storyteller, translator, songwriter, or artist) (**L**)	Written product/rubric
Alaska Content Standards: A: A student should be able to operate technology-based tools. B: A student should be able to use technology to locate, select, and	rubric

manage information.	
Knowledge & Skills: Knowledge & skills students will need in order to successfully complete the Culminating Task	
Students Need to Know:	**Students Need to be Able to:**
• How the forces of nature affect the land and themselves.	• Take digital pictures and video with a digital camera. Use iMovie.

Evidence of Understanding

Culminating Performance Task: ☑ Scoring Guide Attached	The culminating performance task for this unit will be an iMovie where the students will be teaching their classmates about earthquakes, glaciers, or volcanoes.	
Types of Understanding Culminating Performance Task Emphasizes:	☑ Application ☐ Empathy ☑ Explanation	☑ Interpretation ☐ Perspective ☐ Self-Knowledge
Student Self-Assessment, Logs, and Peer Reviews:	Self assessment rubrics, oral assessments	
Written, Oral, or Visual Products:	Science notebooks, culminating iMovie	
Formal Observations or Interviews of Students:		
Quizzes & Tests:		
Public Performances, Exhibits, &/or Models:		

Learning Experiences & Instruction

☑ Handouts Attached

Activity:	**Timeline:**
Guiding Question: What is the earth made of? Activity: Teacher will guide the students through the creation of a KWL chart and exploration of non-fiction tradebooks. Assessment: Tell the teacher one fact from the lesson. Self-assessment on cooperation and participation, score yourself 1-5.	1-2 class periods
Guiding Question: How do I set up my science notebook? Note: Throughout the course of this unit, the students will be expected to keep a daily log of the lessons of the day. Some days they will reflect only, other days they will be expected to use their notebooks to paste in handouts, answer questions, or draw diagrams. See each specific lesson for the requirements. Activity: Take out a spiral notebook and label the front cover with name, number, and science notebook. Label first page with name, number and date. Review rubric and allow time for questions. Paste or tape rubric on inside cover.	1 class period

Guiding Question: How do I set up my science notebook? Note: Throughout the course of this unit, the students will be expected to keep a daily log of the lessons of the day. Some days they will reflect only, other days they will be expected to use their notebooks to paste in handouts, answer questions, or draw diagrams. See each specific lesson for the requirements. Activity: Take out a spiral notebook and label the front cover with name, number, and science notebook. Label first page with name, number and date. Review rubric and allow time for questions. Paste or tape rubric on inside cover. Spend one minute brainstorming about the word "reflection." Discuss thoughts about what reflecting is. Define reflection and copy it down on the brainstorming page. Spend 1-2 minutes writing one paragraph on what has been learned so far about earthquakes, glaciers, and volcanoes. Assessment: Rubric-collect notebooks 1x/week	1 class period
Guiding Question: What are the layers of the earth made of? Activity: Create a Layered Look Book on the layers of the earth. Students must have 3 facts and one illustration about each layer. Assessment: Layered Look Book containing facts and illustrations about the layers of the earth.	1 class period
Guiding Question: What can I learn about other volcanoes? Activity: Review and add to the KWL chart. Show the movie "Eyewitness-Volcanoes." Have the class, during the movie, log their observations and conclusions in a T-chart. Discuss what observations and conclusions were made and add to the KWL chart. Assessment: T-chart (written in science notebook)	1 class period
Guiding Question: How big are volcanoes? Activity: Review and add to the KWL chart. Hand out the "How Stuff Works" worksheet. Review the directions on the worksheet and expectations. Go to http://express.howstuffworks.com/web-quest.htm. (Mountains of Fire). Read and discuss the article as a group. Do worksheet in teams. Create a bar graph of the worlds 18 tallest volcanoes, using appropriate scale. Assessment: Bar graph (tape into the notebook when complete)	1 class period
Guiding Question: What causes an earthquake? Activity:	1-2 class periods

Review the KWL chart and add any new information to it. Brainstorm ideas about what causes an earthquake. Go to http://volcano.und.edu/vwdocs/vwlessons/lessons/lesson.html. (The Rolling Earth) Watch the slide show. Answer and discuss the end of the slide show questions. Explore earthquake centers. • Jumping sand (pounding on a table with sand to simulate an earthquake) • Slinky (simulating compression waves) • Jump Rope (simulating sheer waves) Assessment: One paragraph (written in the science notebook)explaining what was learned about earthquakes and about sheer and compression waves.	
Guiding Question: What happened during the 1964 Alaskan Earthquake? Activity: Access prior knowledge of the event by brainstorming. Watch the movie "The Alaskan earthquake 1964." During the movie, fill in the answers on the worksheet. Discuss the answers to the worksheet at the end of the movie. Place answer key under LCD projector to correct. Assessment: Write four comprehension questions (per student) about the movie in the science notebook. Trade notebooks and have another student answer the questions.	1 class period
Guiding Question: What is a Glacier? Activity: Review the KWL chart and add any new information. Add any questions about Glaciers to the KWL chart. Pair up students and explore the Glacier Power website http://asf.alaska.edu/educational/glacier_power/intro_begin.html. Have each student divide a page (with the appropraiate heading on top) into a T-chart with questions and observations. Spend 20-30 minutes exploring the site and logging questions and observations on the T-chart. Discuss what was logged on the T-chart. Add any new information to the KWL chart. Assessment: One paragraph written reflection, logged questions and observations	1 class period
Guiding Question: What does a glacier do that shapes the earth? Activity: Review and add to the KWL chart. Discuss Guiding Question. Discuss what a glacier is and define it as a class. Label Science Notebook page with name, number, date. Create a T-chart on the page labeled with "What I did" and "What Happened." Hand out 2 clear ice cubes, 2 sandy ice cubes, 1 plastic cup and 1 paper towel per group. Rub the sandy ice cube against the cup. Log results in the notebook.	1 class period (requires prep. overnight)

Repeat the same procedure using the clear ice cubes. Log results in the notebook. Discuss why the sandy ice cube scratched up the cup and the clear one did not. Write one paragraph reflection in notebook. Assessment: **3 points:** Students participated actively in class discussions; worked well with their groups to complete the activity; and drew conclusions from the results of the activity. **2 points:** Students participated in class discussions; worked with their groups to complete the experiment; and drew some conclusions from the results of the activity. **1 point:** Students participated only minimally in class discussions; did not work well with their groups and did not complete the activity; and had difficulty drawing conclusions from the results of the activity.	
Guiding Question: What causes rapid changes on the earth's surface? Activity: Review the KWL chart and add any new information. Divide students into groups of 4-5 students. Hand out directions sheets to each group. Allow time for questions Gather materials for the projects. Have each group assign themselves "jobs" to do within the groups. Build the models and take pictures and video of the models in action (ie: the earth shaking, the volcano exploding, the glacier advancing). Have each group present to the class. Assessment: Rubric will assess areas of participation, listening and cooperation, following directions, real life connections, quality of model and explanation.	2 class periods
Guiding Question: How do the geologic forces affect the land and me? Activity: Review all information collected on the KWL chart. Add any new information. Introduce project, students will be creating an iMovie (in groups of 3-4 students) Hand out project outline and review with the class. Hand out project rubric and review with the class. Review how to use a storyboard. Help each group get started with their planning and allow class time to work on it. Give students class time to download pictures that they took earlier, and picture off the internet. When iMovie has been finished, hold a screening for parents. Assessment: Rubric assessing the areas of Requirements, Rough Draft, Workload, Sources, Transitions, Titles, and Effects, Attractiveness, Movie quality, Content, Essential Questions, and Causes.	3-4 weeks

Other Considerations	
Accommodations to be Inclusive of All Students:	Peer partnering, all audio read into a microphone (for hearing impaired students), modify written assessments through eliminating questions, oral, instead of written assessments (when needed).
Author's Reflection: *Why is this a good Unit?*	I believe this is a good unit, because it touches on all three of the major forces of nature. It has a good mix of both traditional paper and pencil and teacher directed activities, as well as more modern technology based lessons, like Web Quests. When students are finished with this unit, they will walk away with the enduring understanding of how the geologic processes impact the landscape and their lives. More importantly, they will be able to teach others this enduring understanding.
Materials Needed:	• Lesson 1: markers chart paper non fiction trade books with the theme of earthquakes, glaciers, and volcanoes. sticky notes • Lesson 2: 1 computer for every 3-4 students (ideally, if possible, use the computer lab so you have one computer for each student) 1 copy of How to Dig a Hole to the Other Side of the World by, Faith McNulty (included in Rocks & Minerals science kit) Sticky notes Chart paper Lesson 3: Markers, crayons, or colored pencils Glue Red, orange, and yellow construction paper (8.5x11) (have a volunteer cut the paper ahead of time-to save time, have the volunteer sort into red, orange, and yellow piles and paper clip together.) Various earth science related books KWL chart from previous lessons Lesson 4: 1 One copy of Lesson #2 Content Sheets for each student Hands-On Materials: 1 Two maps (Pangea, World today) for the students to study. 2 Two "World Cut Up" maps for each student pair to cut into the seven moving continental plates.

	3 Two pieces of blue construction paper (9 X 12) that will represent the oceans of the world. 4 Glue 5 Scissors 6 Colored Markers Lesson 5: 1. Two colors of modeling clay (for each pair of students) 2. Two wooden blocks 4 in. x 6 in. x 4 in. or larger 3. computers (at least1 for every 3-4 students) Lesson 6: Science notebooks Eyewitness-Volcano video Lesson 7: Computers Graph paper How Stuff Works-Volcano handout http://express.howstuffworks.com/pdf/wq_volcano_st_material.pdf Lesson 8: 1 One copy of the Content Lesson #4 for each student 2 Plastic Table 3 Three cups of sand 4 Rubber Mallet 5 Jump Rope 6 Slinky 7 Computers (at least one for every 2-3 students) Lesson 9: Paper Pencils 1 copy of “The Alaskan earthquake 1964” movie 1 copy each student of the movie handout 1 copy, on transparency or place under LCD projector, of the movie handout Lesson 10: Science notebooks Computers Pencils Lesson 11: Paper and pencils Newsprint and markers Ice cube tray Water Sand Two plastic cups for each group Teaspoon Paper towels Science notebooks Chart paper Lesson 12:

	Volcano: • Old aluminum pie tin (or baking pan or paper plate) • Lots of old newspaper • Baking soda (about 3-4 tablespoons) • Vinegar (about 1/2 cup) • A few drops of liquid dishwashing detergent • Small plastic bottle (like a small pop bottle) • Modeling clay • Funnel • Measuring spoon and measuring cup • Red food coloring • Glitter (optional) plastic shoe box Glacier: • one 16-oz box of cornstarch • one to two cups of water • one 2-qt mixing bowl • 5 wooden toothpicks • 5-6 large pebbles • one 5" x 7" inch index card • pencil Earthquake: • Box with smooth bottom, at least 25-cm wide X 20-cm long • Sugar cubes • Bouillon cubes • Gelatin cubes (Follow instructions on box to make, but use 1/3 as much water as the recipe calls for. Use a pan or ice cube tray. Chill until very firm and cut into small cubes, about the size of sugar and bouillon cubes). • Pencil • Ruler • (Optional: wood and plastic cubes as additional building materials) Lesson 13: Digital Camera Storyboard template Computer Firewire drive (optional)
Resources:	• Kathy Schrock's Guide for Educators-Assessment Rubrics http://school.discovery.com/schrockguide/assess.html • Scott Johnson's Volcano Lessons http://volcano.und.edu/vwdocs/vwlessons/lessons/lesson.html • How Stuff Works http://express.howstuffworks.com • Alaska Satellite Facility (University of Alaska Fairbanks/Geophysical Institute) http://asf.alaska.edu/educational/glacier_power/ • Newton's Apple http://www.tpt/org/newtons/15/glaciers.html

Dynamic Earth-The forces of nature
Lesson 1

Lesson length: 1-2 class periods of 1 hour.
Grade level: 4th

Objectives:
1. The students will read non fiction books for information.
2. The students will work cooperatively in groups.

Materials:
markers
chart paper
non fiction trade books with the theme of earthquakes, glaciers, and volcanoes.
sticky notes

Standards addressed:
AK R2.2.1-The student comprehends literal or inferred meaning from text by
Locating information explicitly stated in narrative and informational text to answer literal-comprehension questions

Procedure:
1. Make a KWL chart and review with class what the different sections of the chart mean. (ie: What we know already, What we want to know (questions we have), What we learned after researching our questions).
2. Explain that the topic is earthquakes, glaciers, and volcanoes.
3. Next, ask the class to raise their hands and share what they know about those three forces of nature.
4. Go around the class several times calling on students who want to share what they kn about these topics. If the discussion dies down, help guide their thinking by asking them about specific events, like the volcanoes in Hawaii or the eruption of Mt. Augustine, the 1964 earthquake, etc.
5. When the chart is filled or the class seems to have shared all they can, move on to the W section of the chart and start asking the class about questions they have or what they'd like to know more about.
6. Call on students one by one and writing down their questions in the W section. Guide students thinking by having them phrase what they want to know in the form of a question (ie: Why is lava red?, What makes the earth quake?)
7. When the class has finished sharing all of their questions move on to the books. (*If you have reached the end of your science class period or 1 hour, this is a good point t stop for the day.)
8. Have a helper hand out sticky notes to each student in the class.
9. Explain to the students that they will be using the books to find the answers to their questions that they brainstormed on the KWL chart.
10. Review how to code the text as they read through it. *= answer to question, !=something really interesting I want to share, ?=I have a new question about this.
11. Further explain that the sticky notes will be used to help them as they read through th books. They will need to code the sticky notes when they come across a part in the text, and write down a few words about what they are thinking at that point in time.
12. Allow students to ask any questions they have about the task they are about to perform, and if there is none, allow the students to find a partner and choose a book.
13. As the students work, circulate through the classroom, asking questions of the studer or helping them with their reading and text coding.

14. After 20-30 minutes, give the students a warning signal that it is time to return to their seats, and use an egg timer to time them for 1-2 minutes before expecting them in their seats again.
15. After students have returned to their seats, with their coded books, call on individual students to share what answers, to their questions, they found in the books.
16. Write those answers they share in the L column of the KWL chart and cross off the questions as you go along.
17. When the class has finished with their answers, allow them some time to share what new information they learned or questions they still had or came up with as they were reading. Write those down as they are shared.
18. Review with the class all of the new information they learned as they read in their books.
19. Conclude the lesson by having each student share one new piece of information they learned during the lesson(s).
20. Set the egg timer again, and give the students 2-3 minutes to return the books (witho the sticky notes) to their proper place and transition to the next subject.

Assessment:

1. Students will be assessed on objective 1 during the lesson conclusion. Students will orally state one thing that was learned during the lesson.
2. Students will be assessed on objective 2 by giving themselves a score of 1-5 of how well they participated, followed directions, and worked cooperatively with others.

Science Notebooks Set up/ How to write a reflection

Objectives:

The student will:

1. Daily label each page with name, date, and number.
2. Complete all daily work using correct, spelling, punctuation, and complete sentences.
3. The student will write a daily reflection of one or more paragraphs. The reflection will include what was learned that day, what questions they have, and possible answers to those questions.
4. During experiments, draw and label a detailed diagram of their experiment.

Materials:

1 notebook/student

Background:

Throughout the course of this unit, the students will be expected to keep a daily log of the lessons of the day. Some days they will reflect only, other days they will be expected to use their notebooks to paste in handouts, answer questions, or draw diagrams. See each specific lesson for the requirements. This lesson should be taught after lesson number 1, but can be done anytime.

Procedure:

1. Have each student take out a spiral notebook and label the front cover with their name and number, and Science Notebook.
2. Next, have each student open to the first page in their notebook and write their name, number, and the date in the upper right corner.
3. Hand out a copy of the science notebooks rubric and go over it with the class.
4. Have each student staple or paste a copy of the rubric inside their notebook.
5. Write the word reflection on the board, have the students write the word on the page in their notebook that has today's date on it and have them spend 1 minute writing down what they think the word reflection means.
6. While each student is writing, circulate and see what they are writing down.
7. At the end of the minute, call on students to tell what they think the word reflection means.
8. While each student shares, write down their answers on the board.
9. After each student has shared, summarize their answers into one sentence.
10. When finished, explain to the class that after every science lesson, they will be expected to do a reflection in their notebook (among other expected tasks that will vary from lesson to lesson).
11. Explain that the students will be expected to write one or more paragraphs on their thoughts about what they learned that day.
12. Explain to the students that they will also be expected to write down questions they have about what they learned and possible answers to their questions.

13. Write down expectations on the board and have the students copy them down on the same page as their brainstorming. Circulate throughout the class helping students.
14. When everyone is finished, have them as a class, brainstorm all that they've learned so far about earthquakes, glaciers, and volcanoes. Write all suggestions students share on the board.
15. Give each student 1-2 minutes to reflect on what they've learned about earthquakes, glaciers, and volcanoes. At the end of the 1-2 minutes, allow for another 1-2 minutes of time for students to share their reflections.
16. At the end of the lesson, have students turn in their science notebooks to the homework basket.

Assessment: See Next page

Objectives	Low performance	Below average	Average	Above Average	Exceptional	Points earned
The student will label each page with their name, date, and number.	**1 point** Little evidence of the standard	**2 points** Below the standard	**3 points** Nearly meets the standard	**4 points** Meets the standard	**5 points** Exceeds standards	
The student will complete all daily work using correct spelling, punctuation and complete sentences.	**1 point** Little evidence of the standard	**2 points** Below the standard	**3 points** Nearly meets the standard	**4 points** Meets the standard	**5 points** Exceeds standards	
The student will write a daily reflection of one or more paragraphs. The reflection will include what was learned that day, what questions they have, and possible answers to those questions.	**1 point** Little evidence of the standard	**2 points** Below the standard	**3 points** Nearly meets the standard	**4 points** Meets the standard	**5 points** Exceeds standards	
The student will, during experiments, draw and label a detailed diagram of their experiment.	**1 point** Little evidence of the standard	**2 points** Below the standard	**3 points** Nearly meets the standard	**4 points** Meets the standard	**5 points** Exceeds standards	
Comments:					**Score:**	

Dynamic Earth-Lesson 2
The Layers of the Earth

By, Scott Johnson, Lincoln Elementary School, Grand Forks, North Dakota
http://volcano.und.edu/vwdocs/vwlessons/lessons/lesson.html

Objectives:
The students will be able to

1. Name and label the four layers of the Earth;
2. Identify the main minerals that make up each layer;
3. Explain how scientists formulated the idea that the Earth is comprised of four layers.
4. Ask questions about the story and make connections.

Materials:
1 computer for every 3-4 students (ideally, if possible, use the computer lab so you have one computer for each student)
1 copy of How to Dig a Hole to the Other Side of the World by, Faith McNulty (included in Rocks & Minerals science kit)
Sticky notes
Chart paper

Procedure:

1. Begin by explaining to the students that they will be learning about the layers of the earth. Also explain that as you are reading the story to them, they will use their sticky notes (have them already passed out) to jot down any questions or connections that they come up with as you are reading. Emphasize that everyone has to come up with at least one of each.
2. Begin reading the story aloud pausing after every page or so to show the class the pictures and allow them to write down their questions and connections.
3. During the time that you are pausing, allow students who have questions to ask them.
4. When you're done with the story, allow students to share their connections with the class. Log the connections and questions shared on a piece of chart paper.
5. Explain to the class that they will be using the computers to go to the following website http://volcano.und.edu/vwdocs/vwlessons/lessons/Earths_layers/Earths_layers1.html. They will need to go through the slides and answer the questions at the end.
6. As the students are going through the slides, circulate and ask them questions about what they're learning as they go through the slides.
7. At the very end of the slide show, have the students, individually, answer the questions.
8. When the whole class is done with their questions, discuss them as a class. Allow students to share their answers.
9. Survey the class to see who got the same answers. Ask the class why they think that it is right.
10. Next have students share what they learned during the lesson. Add the new information they've learned to the KWL chart created in the previous lesson. Also add any new questions they have to the chart as well.

Assessment:

Objectives 1-3 will be assessed through the end of lesson questions and the in class discussion. Students will have met the objectives by answering at least 3 out of 4 questions correctly.
Objective 4 will be assessed during the discussion following the story. Students will have met the objective if they are able to share at least one connection and one question.

Dynamic Earth-Lesson 3
The Layers of the Earth pt. 2

Objectives:
The students will be able to:

1. Name the layers of the earth.
2. Explain what makes each layer different from the others.
3. Identify which minerals are contained in each layer.

Time required: 60 minutes

Materials:
Markers, crayons, or colored pencils
Glue
Red, orange, and yellow construction paper (8.5x11)
(have a volunteer cut the paper ahead of time-to save time, have the volunteer sort into red, orange, and yellow piles and paper clip together.)
Various earth science related books
KWL chart from previous lessons

Procedure:
Background: This lesson is a review of the concepts learned in the previous lesson.

1. Review with the class the objectives of the lesson for today.
2. Review the KWL chart and discuss with the class the questions they have and the new information they learned that was added to the KWL chart.
3. Explain that today they will use that information to create a book that will teach other students what they learned.
4. Each student will receive one red, one orange, and one yellow sheet of paper. Have a volunteer hand those out. Have another volunteer put out markers, crayons, and colored pencils at each table group.
5. Demonstrate how to make the book that they will be making individually. Use the directions contained on the attached handout (from Dinah Zike's Big Book of Books) to make the book.
6. When the book has been made, explain that each page in the book represents a part of the earth.
7. Ask the class how many layers of the earth there are (5 layers). Explain that since there are 6 pages, we've got to use one page to help us introduce what we are talking about in our book.
8. Have the class tell where the introduction page in the book should go. Label that on the demonstration book. Have the class tell what information should go on that page, write that on the demonstration book as well.
9. Repeat the process for each following page. Page 2 will be the crust, page 3 the Upper Mantle, page 4 Lower Mantle, page 5 Outer Core, page 6 Inner Core.
10. Students must have an illustration on each page, at least 3 facts about that part of the eart, and when the book is finished, they must be able to show that they have met all of the objectives.

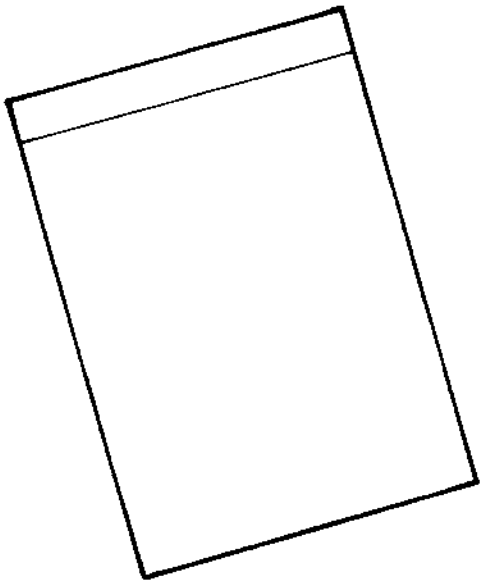
11. At the end of the lesson, have individual students share their books with their classmates.

Assessment:

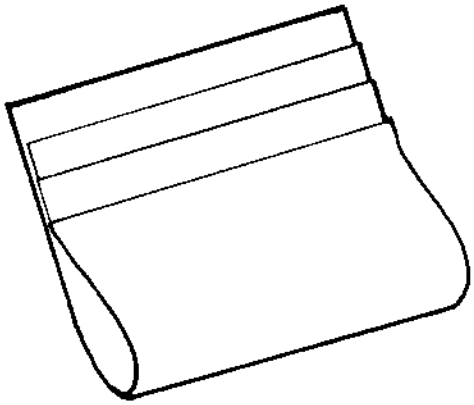
Students will have met objectives 1-3 if they contained that information in their books.

Layered Look Book

1. Stack two sheets of paper (8 1/2 x 11), and place the back sheet one inch higher than the front sheet.

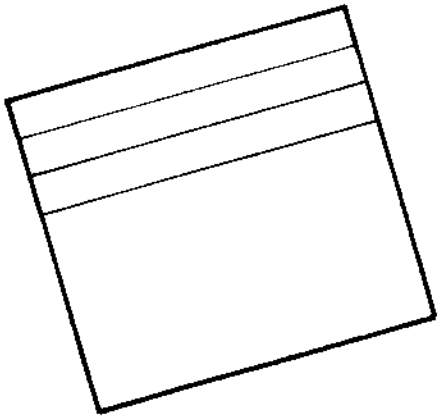


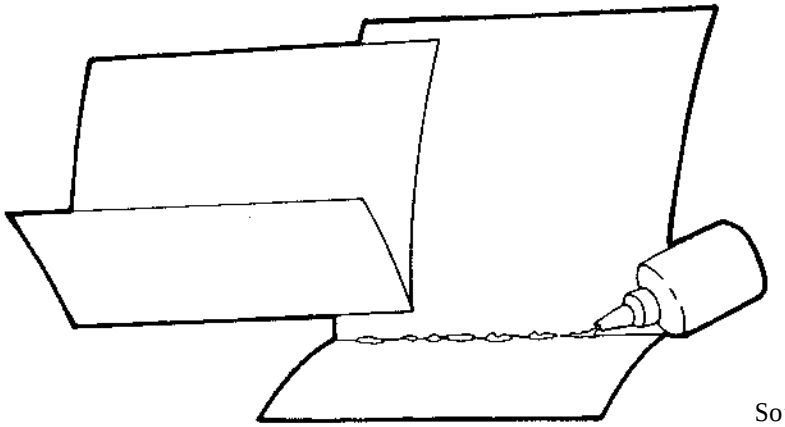
2. Bring the bottom of both sheets upward and align the edges so that all the layers or tabs are the same distance apart.



3. When all tabs are an equal distance apart, fold the papers and crease well.

4. Open the papers and glue them together along the valley/center fold.





Source: Dinah Zike's Big Book of Activities, 1992

Dynamic Earth-Lesson 4
Pangaea to the Present

By, Scott Johnson, Lincoln Elementary School, Grand Forks, North Dakota

http://volcano.und.edu/vwdocs/vwlessons/lessons/lesson.html

Objectives:

The students will be able to:

1 Demonstrate how the Earth's plates have moved.
2 Describe the processes that cause plate movement.

Materials:

1 One copy of Lesson #2 Content Sheets for each student

Hands-On Materials:

1 Two maps (Pangea, World today) for the students to study.
2 Two "World Cut Up" maps for each student pair to cut into the seven moving continental plates.
3 Two pieces of blue construction paper (9 X 12) that will represent the oceans of the world.
4 Glue
5 Scissors
6 Colored Markers

Procedure:

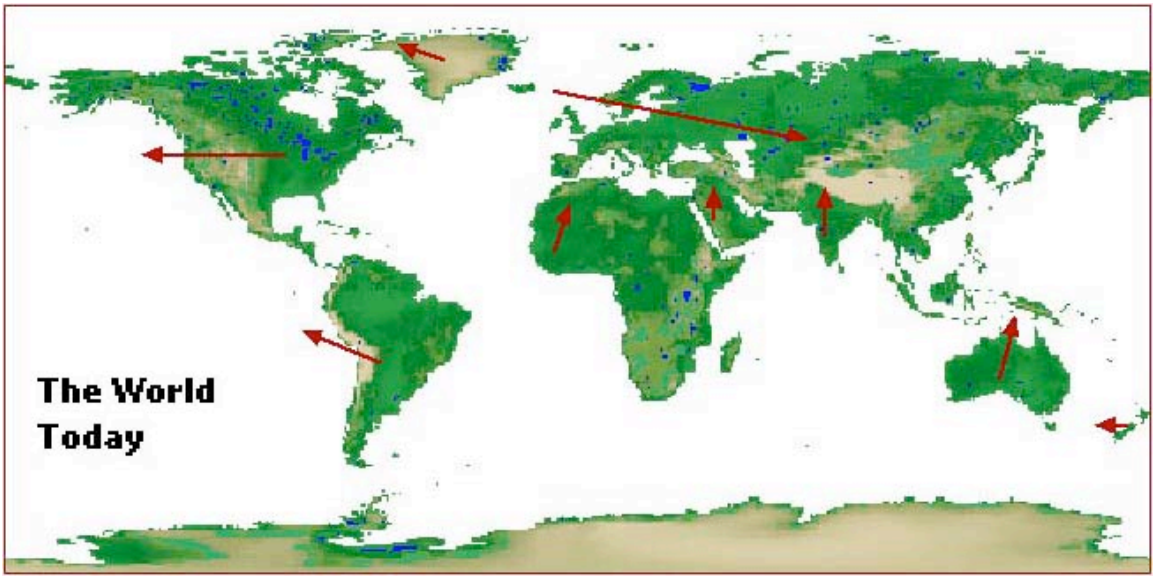
1. Review the objectives of the lesson with the students. Explain that they will be studying how our earth went from being one great big landmass to several small landmasses called continents.
2. Ask the class if they've ever heard of the word "Pangea" before. Call on any students with their hands raised to explain their understanding of the word.
3. List any ideas about what Pangea is on a piece of chart paper or on the board.
4. Have students get on the computers (either in the classroom or in the computer lab) and go to http://volcano.und.edu/vwdocs/vwlessons/lessons/Pangea/Pangea1.html.
5. Students will watch and read along with the slides telling them about Pangea.
6. While they are reading each slide, circulate and ask questions of each student.
7. At the end of the slide show, have them answer the questions in their science notebooks.
8. When all students are finished answering the questions at the end, review the answers. Have students raise their hands if they got the question correct.
9. Have a volunteer explain to the class why they came up with the answer they did for the question. Guide the discussion using their answers.
10. Add the information from their answers to the KWL chart (started in Lesson 1). Guide the discussion further by asking the students about Laurasia and why it was important. Ask other questions about what scientists think the earth will look like in 50 million years and what is currently happening with the continents.
11. Ask the discussion progresses, continue to add the new information provided by the students to the KWL chart.

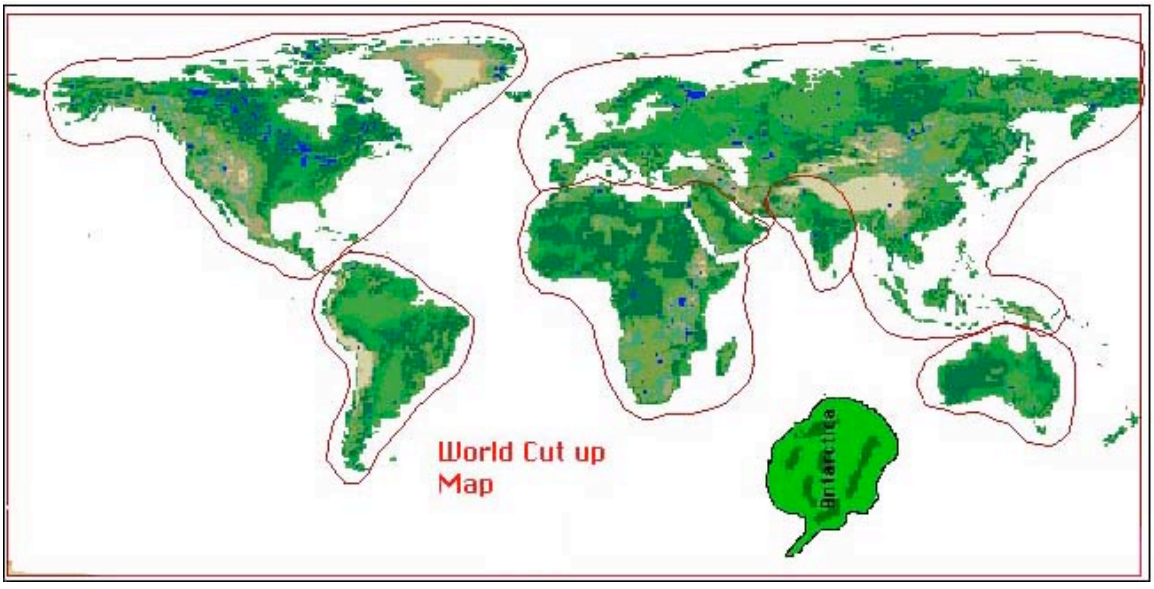
12. Next, have volunteers hand out the materials, maps, construction paper, glue, scissors and markers.
13. Instruct the students to cut the two "World Cut Up" maps on the red lines.
14. The students will then place and paste the continents at the position that they were located 250 million years ago in the great ocean called Panthassla.
15. The students will then make a prediction of what the world will look like in 100 million years. The students should use the "World Map Today" in making their predictions.
16. Instruct the students to place the remaining continent cutouts and paste them onto the other piece of blue construction paper.The students should also predict where new mountains will form and where new volcanoes will erupt by marking them on their prediction maps using markers.
17. Have the students write in their science notebooks what their reasons were for placing the continents where they did.

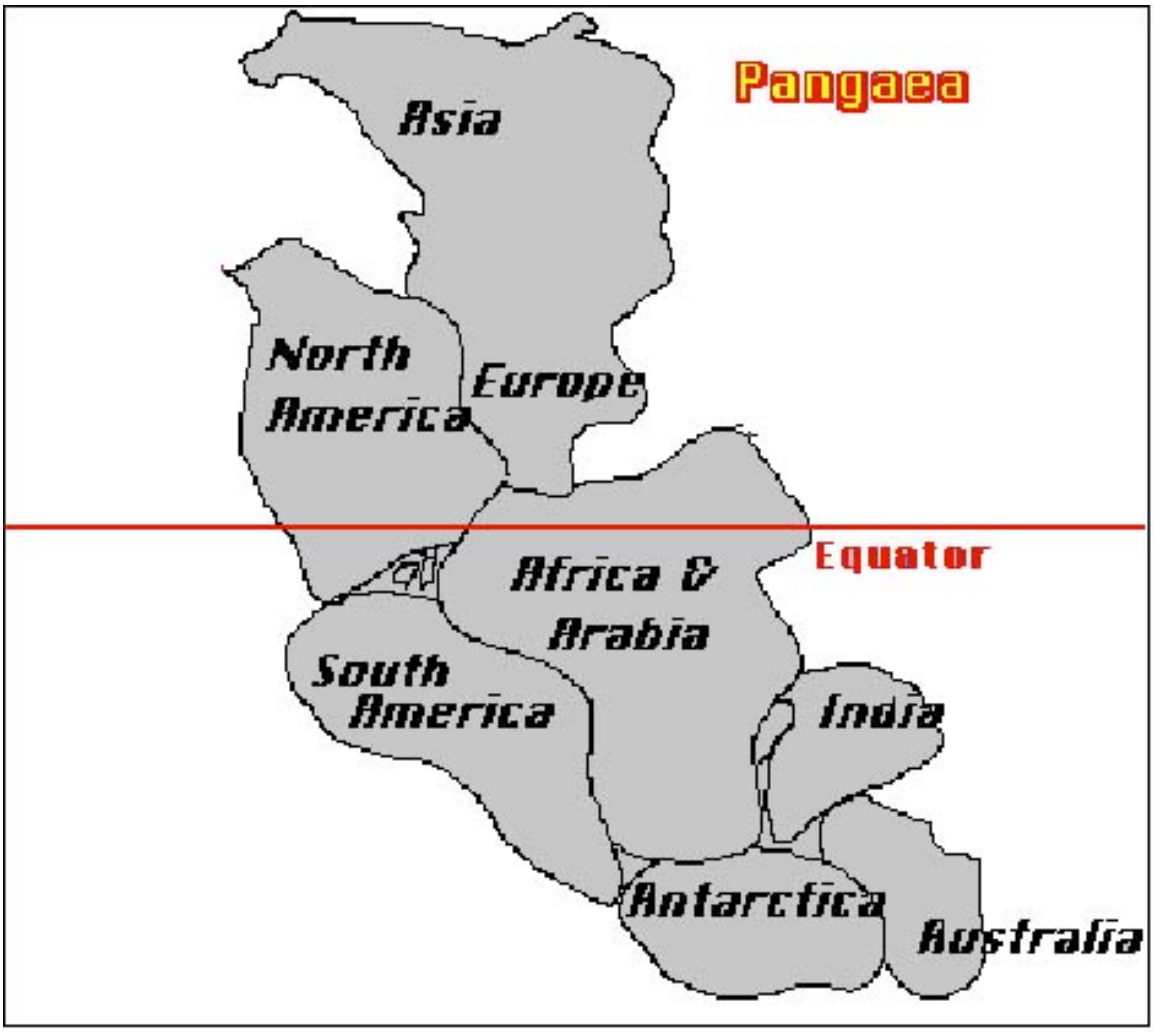
Assessments:

1. The students will be assessed on Objective 1 by using the cut up map to demonstrate where the continents were 250 million years ago, and where they think they might be in 50 million years.
2. The students will be assessed on Objective 2 through the end of slide show questions. Students will have met this objective if they answered both questions correctly.

Student Handout:






Pangaea
Asia
North America
Europe
Equator
Africa & Arabia
South America
India
Antarctica
Australia

Dynamic Earth-Lesson 5
How the earth's plates move

By, Scott Johnson, Lincoln Elementary School, Grand Forks, North Dakota

http://volcano.und.edu/vwdocs/vwlessons/lessons/lesson.html

Objectives:
Students will:

1 Become familiar with and be able to demonstrate the process of folding;
2 Become familiar with the process of convection current movement in the asthenosphere;
3 Become familiar with processes that produce convergent, divergent, and transform plate boundaries.

Materials:

1. Two colors of modeling clay
2. Two wooden blocks 4 in. x 6 in. x 4 in. or larger
3. computers (at least1 for every 3-4 students)

Procedure:

1. Begin by reviewing the objectives of the lesson.
2. Review the KWL chart. Discuss some of the new information that has been learned and logged on the chart.
3. Ask the students what they know about how the plates move. Use the board or a piece of chart paper to write down their answers.
4. Discuss the answers that the students gave. Ask the class which ones sound most like what they have been learning about. Seek out further explanation on those answers that sound like they've got some background knowledge on plate tectonics. Add new background information to KWL chart (under the K section).
5. Ask the class what questions they have about the plates on the earth and how they move. Log those questions under the W section.
6. Have students get on the computers (either in the classroom or in thecomputer lab) and go to http://volcano.und.edu/vwdocs/vwlessons/lessons/Plates/Plates1.html.
7. Students will watch and read along with the slides telling them about plate tectonics.
8. As the students are following along with the slide show, circulate and ask questions about what they're learning about.
9. When the slide show is finished, have the students answer the questions at the very end in their science notebooks.
10. When every student is finished with the questions, discuss as a class the answers that everyone got for each question. Ask individual volunteers to explain to the class how they came up with their answer.
11. Add the new information that the students learned from the slide show to the L section of the KWL chart.
12. Explain to the students that they are going to use clay to represent the layers of the earth on a plate.
13. Next students will place two blocks, one at each end, of the plate and push them together. Have the students predict what they think will happen and log it in their science notebooks.
14. Demonstrate how to build the clay plate and how to position the blocks. Then have some volunteers hand out the clay and blocks.

15. Allow students some time to build their plate and then stop the class for the directions.
16. Next have the students push the blocks towards eachother.
17. Stop the class and ask them what happened when they pushed the blocks towards eachother (the clay folded up into a big hum). What would that be on the earth's surface? (a mountain range)
18. Next see if they can make their clay turn into a U shape without pushing on it in the middle. When they have accomplished that stop the class.
19. Ask the class what that would be on the earth's surface (a valley).
20. Finally, tell the class to make a mountain again and cut across the clay peaks.
21. Then have them try to put the layers back together again looking for similarities between the layers.
22. Explain that this is how scientists proved the plate tectonics theory of plate movement.
23. Take 5 minutes to clean up all supplies and have students return back to their desks.
24. Review what was learned during the lesson and add any new information to the KWL chart. Have students write a few sentences about what they thought they learned in their Science notebooks.

Assessments:

Students will be assessed on the objectives through the end of slide show questions and their ability to demonstrate how a valley and a mountain are made. Students will have met the objectives if they can articulate their understanding of what created the mountains and the valleys.

End of Slide Show questions:

Write the answers to the following questions in complete sentences on a piece of paper. Use the page titles located directly under the questions to move your way through the lesson to locate the answers. When you finish the questions click on the Earth icon to return the program to the beginning.

1. In your own words explain what happens at a subduction zone.
2. In your own words explain what happens at a mid-ocean ridge.
3. At a subduction zone what causes magma to rise?

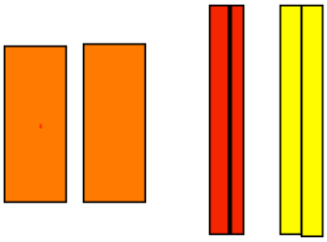
Hands-on Center
(How Plates Move)
Lesson #3

Building Mountains
Modified and adapted from John Farndon's book
How the Earth Works
Materials:

1. Four strips of foam rubber 4 inches by 30 inches and about 1 inch thick. The foam rubber should be made of different colors. These strips will represent layers (strata) in the crust of the earth.

The students will set the strips in alternating layers as shown above. They will push the four layers from each end causing the layers to fold into an upside down U shape. This will represent the folding process. The upside U will represent a geologic feature called an anticline (mountain peak).
The students will also push the layers from each end causing the four layers to fold into a U shape. This U shape will represent a geological feature called a syncline (valley).
The teacher will explain that this is a simplified version of how folded mountains are formed and that the anticlines are the peaks and the synclines are the valleys of the mountain range.

Building Mountains II
Modified and adapted from John Farndon's book "*How the Earth Works*"

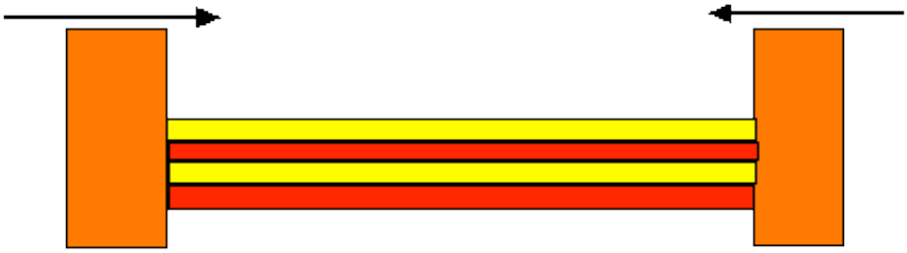


Materials:

1. Two colors of modeling clay
2. Two wooden blocks 4 in. x 6 in. x 4 in. or larger

The students will lay the modeling clay flat in alternating layers. These layers of clay will represent

layers (strata) in crust of the Earth. The wooden blocks will be placed one at each end of the clay layers. the students will push the blocks toward each other very, very slowly. This pushing of the blocks will represent the movement of the continental plates. The students will see the folding process in action as they build their own mountain (Anticline).



After the students have built their mountains they could cut the clay mountains in the middle, this represents plates moving apart at a fault zone. This is what happened to South America and Africa. The students should put them back together looking for the similarities between the layers. The teacher will tell the students that this is exactly how geologists tried to prove the plate tectonics theory of plate movement.

 Other Lessons 

To VolcanoWorld

Eyewitness-Volcanoes
Dynamic Earth-Lesson 6

Objectives:
The students will…
1. Demonstrate comprehension of the way volcanoes shape the earth by gathering information from a video, making observation, asking questions, drawing conclusions, and then charting those questions and observations on a T-Chart.

Materials:
Science notebooks
Eyewitness-Volcano video

Procedure:

1. Introduce the objective for the lesson and go over the plan for the science period.
2. Review with the class what was learned about volcanoes and how they formed through the previous lessons on plate tectonics and plate movement.
3. Review the layers of the earth and have the class explain where volcanoes are usually found (in a hotspot on the earths crust where magma pushes through).
4. Have the students, in the science notebooks, create two columns on their paper, questions and observations.
5. As a class, brainstorm questions the kids would like to find the answers to during the movie. Write those on the board or a piece of chart paper. Have the students log those questions and any others they create in their notebooks.
6. Explain to the class that any answers they find, interesting facts they learn, or observations they make will go into the observations column.
7. Show the video to the class and stop every 5-10 minutes to ask the class some of the information they logged into the observations column of their page. List some of their observations on the chart on the board (or paper).
8. Ask the class to share what conclusions they can draw about volcanoes. List those conclusions on the board. Guide the discussion by asking questions about what the effects of volcanoes are on the land, and on people

Assessments:

1. The students will have met the objective if they charted questions and observations on a T-chart (in their science notebook) and shared with the class.

Name #_____

Date_____

1. Why is it that volcanos create even as they destroy?
2. By the 17th century, scientists believed that the earth had what?
3. Were they right or wrong? Explain.
4. What causes the continents to drift?
5. What is it that causes an earthquake?
6. In 1980, what caused the forceful eruption of Mt. Saint Helens?
7. What is one type of gas that a volcano leaks?
8. About how many under sea volcanoes erupt each year?
9. What created our planet?
10. What is a hot spot volcano?
11. What are some good things about volcanic ash?
12. What do Japan and California have in common
13. What have Chinese observers noted before an earthquake?
14. What is the instrument called that takes the measure of an earthquake?
15. Why do you think scientists have robots like Dante studying volcanoes?
16. Why do you think that volcanoes are under our watchful eye?

Name #_____

Date_____

1. Why is it that volcanos create even as they destroy? *They destroy buildings and property, but create new land.*
2. By the 17th century, scientists believed that the earth had what? _____ *(a molten core)* Were they right or wrong? Explain. *They were right, because later scientists proved that the earth had a molten core.*
3. What causes the continents to drift? *The magma under the earth's surface.*
4. What is it that causes an earthquake? *The plates rubbing against eachother.*
5. In 1980, what caused the forceful eruption of Mt. Saint Helens? *Gas dissolved into Lava escaping with force.*
6. What is one type of gas that a volcano leaks? *Sulfer Dioxide*
7. About how many under sea volcanoes erupt each year? *250*
8. What created our planet? *Seismic forces*
9. What is a hot spot volcano? *A volcano that punches through a weak point in the earth's crust.*
10. What are some good things about volcanic ash? *It is very fertile.*
11. What do Japan and California have in common*? Both have a lot of earthquakes and both are along the ring of fire..*
12. What have Chinese observers noted before an earthquake? *That a panda will hold its head, a turtle jumped out of the water and tigers stopped in their tracks.*
13. What is the instrument called that takes the measure of an earthquake? *The richter scale*
14. Why do you think scientists have robots like Dante studying volcanoes? *So humans don't risk their lives, robot may be more accurate.*
15. Why do you think that volcanoes are under our watchful eye? *Many people live near volcanoes and they are potentially very deadly. Need to protect people and property.*

Dynamic Earth-Lesson 7
Volcano webquest

Objectives:
The student will..
1. Demonstrate comprehension of collecting, analyzing and organizing data by doing research, gathering data and organzing it into a bar graph using appropriate scale.

Materials:
Computers
Graph paper
How Stuff Works-Volcano handout
http://express.howstuffworks.com/pdf/wq_volcano_st_material.pdf

Procedure:

1. Review the objective for the lesson with the class.
2. Explain that next the students will be divided into groups. They will be using the computer to read about volcanoes.
3. Next explain that the students will be expected to use the computer, in groups, to find out the heights of different volcanoes. They will need to list the heights of the volcanoes in the chart and graph those volcanoes, on graph paper, using a bar graph.
4. Put the following URL onto the board: http://express.howstuffworks.com/wq-volcano.htm and give each group of students 1-2 minutes to make sure they have successfully reached the site.
5. Allow the students 30-45 minutes to complete the activity. Circulate while they are working.
6. When the students are finished, ask the students to share any new observations they want to add to the class observation column. Add any new information.
7. Collect the graphs from the students.

Assessments:
The students will be assessed on the objective by successfully organizing data into a bar graph, using appropriate scale.

Name:_____ Date:_____ Period:_____

HowStuffWorks **Express**

MOUNTAINS OF FIRE

After reading the article, complete the following sections.

I. Match the terms to their description or definition.

_____**1.**	**vesicles**	**a.** the surface of the Earth
_____**2.**	**plates**	**b.** large, moving chunks of the Earth's crust
_____**3.**	**caldera**	**c.** pools of hot, melted rock under the surface
_____**4.**	**crust**	**d.** suspended in magma; can determine the type of eruption
_____**5.**	**magma chambers**	**e.** small gas bubbles in magma
_____**6.**	**magma**	**f.** ability to resist flow
_____**7.**	**viscosity**	**g.** hot molten rock under the Earth's surface
_____**8.**	**volcano**	**h.** the structure surrounding the central vent of a volcano
_____**9.**	**edifice**	**i.** any place where magma reaches the Earth's surface
_____**10.**	**dissolved gases**	**j.** large crater-shaped basins often filled with water

II. Identify the eruption type from the following descriptions. Use these terms.

PLINIAN HAWAIIAN STROMBOLIAN VULCANIAN HYDROVOLCANIC FISSURE

ERUPTION TYPE	DESCRIPTION
	Occur near wet areas; can cause mudslides and major flooding
	People usually have plenty of time to escape this non-explosive eruption
	Magma flows through cracks during this type of eruption
	Very dangerous due to extremely fast moving lava flows
	Generally not dangerous; lava is thrust into the air in short bursts
	Generally not associated with lava flows; football-sized bombs are launched by the short explosions

III. From the descriptions, sketch the basic shapes of the 3 types and provide a brief description.

	STRATOVOLCANO	SCORIA CONE	SHIELD
Sketch			
Description			

IV. Using this Web site (http://volcano.und.nodak.edu/), find the elevation (in feet) of the following volcanoes. Arrange a list of the volcanoes in order from the shortest to the tallest. Using this list, create a bar graph of the volcanoes with the horizontal axis representing the 18 volcanoes and the vertical axis representing the height of each volcano.

VOLCANO	HEIGHT/ELEVATION (feet)
Mt. Fuji, Japan	**12,388 feet**
Ararat, Turkey	
Mt. Bachelor, Oregon	
Baitoushan, Asia	
Concepcion, Nicaragua	
Mt.Elbrus, Russia	
Etna, Italy	
Mt. Harcourt, Antarctica	
Mt. Hood, Oregon	
Mt. Kilimanjaro, Tanzania	
Mauna Kea, Hawaii	
Soufriere Hills, Montserrat	
Mt. St. Helens, WA	
Stromboli, Italy	
Wonchi, Ethiopia	
Yasur, Southwest Pacific	
Zukwala, Ethiopia	

The Rolling Earth

By, Scott Johnson

Goals:

To familiarize students with the processes that cause earthquakes.

Objectives:

The students will:

1. Demonstrate comprehension of the causes of earthquakes and demonstrate how earthquake waves are produced.

Materials:

1 One copy of the Content Lesson #4 for each student
2 Plastic Table
3 Three cups of sand
4 Rubber Mallet
5 Jump Rope
6 Slinky
7 Computers (at least one for every 2-3 students)

Procedure:

1. Go over the objective with the class. Explain that at the end of the lesson, they will have to prove that they have met those objectives.
2. Review with the class the KWL chart, specifically the information that they know already about earthquakes.
3. Explain that they will use the internet to learn some more about earthquakes and their causes.
4. Have the students go to http://volcano.und.edu/vwdocs/vwlessons/lessons/Rolling_earth/Rolling_earth1.html (write this URL on the board). Give 1-2 minutes for every student or student pair to get their browser to the page.
5. Review with the students that they will read each of the slides together and write the questions and their answers in their science notebooks (on the page with today's date).
6. Allow 15-20 minutes for each of the students to read through the slide show and answer the questions at the end. When all students are done, review with them the questions and their answers. Allow any student to explain how they came up with their answer.
7. If in the computer lab, you may wish to stop the lesson at this point for the day, otherwise gather the students in a circle on the floor of the classroom.
8. Have a plastic table in the center. Have a student come up and pour 3 cups of sand in it. Show the students the mallot, and have them make predictions about what they think will happen if the table is tapped with the mallot.
9. Thestudent will tap the table lightly with the rubber mallet. When they tap the table lightly they will see the sand "jump" into the air.
10. Explain that as rocks snap and break at the focus of an earthquake shock waves are sent out in all directions. The "jumping sand" represents the release of the energy from the hammer through the plastic table.

11. Next, put a jump rope in the center of the circle and get two volunteers to hold either side of the jump rope, waving it up and down.
12. Explain that the S waves of an earthquake look like the waves produced by the shaking of the jump rope. These are secondary waves.
13. Finally, have two volunteers hold a slinky at the two ends pulling and stretching it slightly.
14. Explain that the waves produced with the Slinky are like Compression or Primary waves of an earthquake.
15. Divide the class into 3 groups allowing each group 5 minutes to explore each center.
16. At the end of the allotted time, 15-20 minutes, call all students back to their desks and discuss what they found out. Ask the students to explain what happened when they shoved the sand further out on the table and tapped it.
17. Discuss what that means about the epicenter in an earthquake and how strongly you feel the quake.
18. Next ask the students about the jump rope, what did they learn about S waves. Ask for volunteers to explain about S waves.
19. Finally, have student volunteers explain compression waves to the class. What effect do these waves have on the earth?
20. With remaining time, hand out Content Center #4 http://volcano.und.edu/vwdocs/vwlessons/lessons/Ch2CM/Content4Earthquakes.html. Read over the questions at the end with the students and ask them if they need any of them clarifying for them.
21. At the end of class time, collect the handouts.

Assessments:

The students will have met Objective #1 if they were able explain the causes of earthquakes and demonstrate how earthquake waves are produced.

End of slide show questions:

Write your answers to the questions below in complete sentences on a piece of paper. Use the page titles directly under the questions to move through the lesson to find the answers for the questions. When you are finished click on the Earth icon so that the next group can begin the lesson.

How are earthquake waves produced?

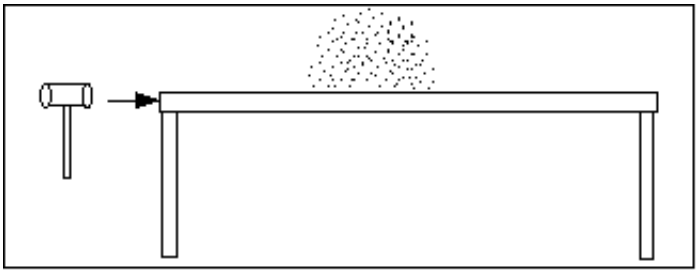
What does a Richter Scale show?

What are the differences between compression, shear, and surface waves?

Hands-On Center
(Earthquakes-The Rolling Earth)
Lesson #4
Earthquake Waves
Shock Waves

Materials:

1. Plastic Table
2. Three cups of sand
3. Rubber Mallet



1. The students will pour three cups of sand on the top of a plastic table near the edge.
   They will tap the table lightly with the rubber mallet. When they tap the table lightly they will see the sand "jump" into the air.
   The teacher should explain that as rocks snap and break at the focus of an earthquake shock waves are sent out in all directions. The "jumping sand" represents the release of the energy from the hammer through the plastic table.
2. The students should move the sand farther away from the point of contact and see what happens.
   The farther away the sand is from the source of energy (tapping of rubber mallet) the less the sand jumps. This represents the fact that the farther you are from
   the epicenter the less you will feel the earthquakes shock waves.
3. The students should move the sand to the opposite side of the table and tap lightly. They should observe a very small movement of the sand.
4. Shear Waves
   Materials: Jump Rope
   Two students will hold the ends of the jump rope and raise their hands up and down shaking the jump rope and producing S waves. The waves in the jump rope will have an up and down motion.

The teacher will explain that the S waves of an earthquake look like the waves produced by the shaking of the jump rope. These are secondary waves and they will learn more about these in the lesson "Earthquakes-The Rolling Earth" on the computer.

Compression Waves
Materials:

1. Slinky

Two students will hold the Slinky at the two ends pulling and stretching it slightly. One student will push the Slinky
slowly watching the Compression wave as it rolls from one end of the Slinky to the other. The teacher will explain that the waves produced with the Slinky are like Compression or Primary waves of an earthquake. The students will learn more about compression waves in the lesson "Earthquakes- The Rolling Earth" on the computer.

 Other Lessons 

To VolcanoWorld

Dynamic Earth-Lesson 9
1964 Alaska Earthquake

Objectives:

The student will..

1. Demonstrate knowledge of dates, times, places, and causes of the 1964 Alaskan earthquake by creating and answering four comprehension questions on the movie.

Materials:

Paper
Pencils
1 copy of "The Alaskan earthquake 1964" movie
1 copy each student of the movie handout
1 copy, on transparency, of the movie handout

Procedure:

1. Review with the class what they learned about earthquakes from the previous lesson and write on the board.
2. Next ask the class what they know already or have heard about the 1964 Alaskan earthquake. Write the information the students share on the board.
3. Review the lesson objective with the class and explain that at the end of the class, they will each write four questions about the movie that ask the answerer to recall information about dates, times, places, and causes of the earthquake. Also explain that they will trade questions at the end of the movie, with a partner, and answer someone elses questions.
4. Handout the movie handout and explain that this is to be filled out while the students watch the movie. The answers they get on the handout will help them write their four questions.
5. Show the movie, stopping every 5 minutes to review what the students have learned and to review some of the questions.
6. At the end of the movie, go around the class, using the transparency copy of the handout, and have students help fill in the answers for each question.
7. Discuss during the "fill in the blanks" time how the students knew that their answer was right and what the movie taught them.
8. After the handout has been filled in on the overhead, allow the students to spend 15-20 minutes creating four comprehension/"quiz" style questions. Be sure to circulate as they are writing, guiding them away from very obvious questions and very abstract questions.
9. At the end of the 20 minutes, have the students trade their questions with a partner.
10. Give the students another 5-10 minutes to answer the questions (using their movie handout as a reference).

11. After 10 minutes, collect the papers from the students, make sure they have put both the names of the person who created the questions, and the person answering the questions on the paper.

Assesment:

The students will be assessed on the objectives by creating four questions that address dates, times, places, and causes of the 1964 earthquake, and answering four other questions, with at least 75% accuracy.

1964 Alaska Earthquake

1. Where can earthquakes occur?
2. Where do most earthquakes occur?
3. What causes earthquakes?
4. What is the quake producing zone called?
5. What are the names of the three principal faults in Alaska?
6. What is it that the plates do that causes an earthquake?
7. Intensity of damage is related to the distance from the _____ and the _____ _____.
8. The earthquake produced significant damage to an area of _____ square miles.
9. What did the earthquake do to the ice on the lakes?
10. _____ and _____ affected an area of 34,000 miles.
11. What were the effects of the earthquake on places like Anchorage? What caused the damage?
12. What caused the damage at Turnagain Heights
13. Why wasn't Whittier damaged as bad as Anchorage?
14. What was it that crippled Valdez and how did it happen?
15. Valdez was built on _____ _____.
16. Did Valdez remain in its current location? Why?
17. The tsunamis created by the earthquake traveled at _____ miles per hour.
18. Did the tsunam,i generated by the earthquake, affect the rest of the United States? Name two states that were affected by the tsunami.

_____ and _____

19. The damage to the Alaska Railroad was caused by _____ and _____.

1964 Alaska Earthquake

1. Where can earthquakes occur? (Anywhere)
2. Where do most earthquakes occur? (Along faults)
3. What causes earthquakes? (The same forces that create mountains.)
4. What is the quake producing zone called? (The circumpacific belt or The ring of fire)
5. What are the names of the three principal faults in Alaska? (The fair-weather, the Castle Mountain-Lake Clark fault, Denali fault)
6. What is it that the plates do that causes an earthquake? (collide with each other, slip past eachother, or dive underneath each other)

7. Intensity of damage is related to the distance from the _____ and the _____ _____. (epicenter, geologic environment)
8. The earthquake produced significant damage to an area of _____ square miles. (50,000)
9. What did the earthquake do to the ice on the lakes? (buckled it)
10. _____ and _____ affected an area of 34,000 miles. (uplift and subsidence)
11. What were the effects of the earthquake on places like Anchorage? (Homes and buildings collapsed, streets buckled and cracked.)
12. What caused the damage? (Seismic shock and landslides)
13. What caused the damage at Turnagain Heights? (The land underneath broke into blocks and slid towards the ocean.)
14. Why wasn't Whittier damaged as bad as Anchorage? (It was built on bedrock)
15. What was it that crippled Valdez and how did it happen? A large wave, caused by a huge piece of land falling into the water, washed ashore demolishing the port, the harbor and much of the waterfront)
16. Valdez was built on _____ _____. (Landslide blocks)
17. Did Valdez remain in its current location? Why? (No, because it was at risk for major damage in another earthquake.)

18. The tsunamis created by the earthquake traveled at _____ miles per hour. (400)
19. Did the tsunam,i generated by the earthquake, affect the rest of the United States? (yes) Name two states that were affected by the tsunami. (Hawaii and California)
20. The damage to the Alaska Railroad was caused by _____ and _____. (Seismic shock and landslides)

Dynamic Earth-Lesson 10
Glacier Power

Objectives:
The students will..
1. Demonstrate comprehension of the way glaciers shape the earth by gathering information from the Glacier Power website, making observation, asking questions, drawing conclusions, and then charting those questions and observations on a T-Chart.

Materials:
Science notebooks
Computers
Pencils

Procedure:

1. Review the lesson objective with the class.
2. Review the KWL chart with the class, discuss some of the questions the students had and add any new information that the class wants to share about the previous lesson.
3. Explain to the class that they will be starting a new section of the unit on glaciers.
4. Ask the class to share what they know already about glaciers. Chart that knowledge on the KWL chart (do not chart repeats, but acknowledge them).
5. Next, ask the class what they are wondering about when it comes to glaciers or what about glaciers they would like to know. Chart their questions on the KWL chart.
6. Divide the class into groups of two and explain that they are going to check out a website called Glacier Power. http://asf.alaska.edu/educational/glacier_power/intro_begin.html
7. In their groups, have each of them divide a page in their science notebooks (with today's date on the top) into questions and observations. Have them write down the questions that they shared with the class, and any other questions that they may have on the questions side.
8. Explain that they will be looking through the Glacier Power website trying to answer their own questions and gather new information to share with the class.
9. Ask if they've got any questions before allowing them to start on the computer.
10. Circulate around the class talking with each pair of students. Discuss with them what they are learning about glaciers from their tour of the website. Remind them to list the questions they still have about glaciers on their page, as well.
11. When the whole class is finished with their tour, spend 10-15 minutes allowing them to share the new information that they've learned and questions that they still have about glaciers. Guide the discussion by asking them what effects glaciers have on the land. Also ask what effects glaciers might have on humans.
12. Collect the science notebooks.

Assesments:

The students will have met the objective if they charted their questions and observations on a T-chart in their notebook, and shared new information and questions with the class.

Dynamic Earth-Lesson 11

What does a Glacier do to the land?

http://school.discovery.com/lessonplans/programs/livingearth/

Objectives:

The student will..

1. Demonstrate comprehension of how glaciers shape the earth by creating a glacier and modeling how it erodes the surface.

Materials:

Paper and pencils
Newsprint and markers
Ice cube tray
Water
Sand
Two plastic cups for each group
Teaspoon
Paper towels
Science notebooks
Chart paper

Procedure:

Note: Before beginning the lesson, prepare the ice trays for the student activity. Make enough ice so that each group has two clear ice cubes and two that have been frozen with sand on the bottom. Then put the other materials in a central place so students are ready to begin immediately following the opening discussion.

1. Begin by reviewing the objective with the students.
2. Review the KWL chart and the information that has been added about glaciers.
3. Ask the class if they have any new questions or information about glaciers to add to the KWL chart. Be sure to log any new questions or information.
4. Next, ask the class what a glacier is. Write down all ideas on chart paper or on the board.
5. When every student has shared, ask the students to try to come up with one definition for the word glacier. Write down all suggestions.
6. Explain to the students that glaciers are a large body of ice pushing down a mountain slope pushing rocks and sand as it travels.
7. Explain to the class that they will be participating in a demonstration that will help them understand the changes that glaciers can make on the surface of the earth.
8. Divide students into their groups or 3-4 students each. Have one volunteer from each group gather the materials. Place 2 clear ice cubes and 2 sandy ice cubes in each cup.

9. Have each student take a paper towel and pick up one of the sandy ice cubes. Have the students rub the ice cube against the cup (the earth's surface) several times. Have the students write down their observations in their science notebooks.
10. Next, have each student take a paper towel and pick up one of the clear ice cubes. Repeat the same process as above and have the students write down their observations in their science notebooks.
11. Discuss with the class what observations they made when they rubbed the sandy ice cube against the cup. Then discuss what happened when they rubbed the clear ice cube against the cup.
12. Ask the students why they think the sandy ice cube created all the scratch marks in the cup. Explain that because glaciers carry with them sand and rock as they travel, the earth gets scraped up and shaped by the moving glacier. The glacier creates deep gouges in the earth, which are valleys.
13. To wrap up the discussion, ask the students to brainstorm other natural forces that shape the earth (water, wind, etc.). Record their ideas on a piece of chart paper and add to it as the students come up with more ideas.

Assessment:

3 points: Students participated actively in class discussions; worked well with their groups to complete the activity; and drew conclusions from the results of the activity.

2 points: Students participated in class discussions; worked with their groups to complete the experiment; and drew some conclusions from the results of the activity.

1 point: Students participated only minimally in class discussions; did not work well with their groups and did not complete the activity; and had difficulty drawing conclusions from the results of the activity.

Dynamic Earth-Lesson 12
Create an earthquake, glacier or volcano

Objective:

1. The students will demonstrate comprehension of the causes of rapid changes on the earth's surface by creating a model of an earthquake, glacier, or volcano and modeling their effects.

Time: 2 class periods

Materials:

Volcano:

- Old aluminum pie tin (or baking pan or paper plate)
- Lots of old newspaper
- Baking soda (about 3-4 tablespoons)
- Vinegar (about 1/2 cup)
- A few drops of liquid dishwashing detergent
- Small plastic bottle (like a small pop bottle)
- Modeling clay
- Funnel
- Measuring spoon and measuring cup
- Red food coloring
- Glitter (optional) plastic shoe box

Glacier:

- one 16-oz box of cornstarch
- one to two cups of water
- one 2-qt mixing bowl
- 5 wooden toothpicks
- 5-6 large pebbles
- one 5" x 7" inch index card
- pencil

Earthquake:

- Box with smooth bottom, at least 25-cm wide X 20-cm long
- Sugar cubes
- Bouillon cubes
- Gelatin cubes (Follow instructions on box to make, but use 1/3 as much water as the recipe calls for. Use a pan or ice cube tray. Chill until very firm and cut into small cubes, about the size of sugar and bouillon cubes).
- Pencil
- Ruler
- (Optional: wood and plastic cubes as additional building materials)

Procedure:

1. Review with the students the objective for the lesson.
2. Review the KWL chart and discuss all of the things that the students have learned (in the L column).
3. Ask the students if there is any new information they would like to add to the KWL chart. If they have any new information, add to the KWL chart.

4. Explain to the students that they will be building a model of an earthquake, a glacier, or a volcano. By building these models, they will be trying to figure out how these cause changes on the earth's surface.
5. Divide the students into groups of 4 (if possible) using any appropriate method. You will more than one group for each experiment.. (ie: class of 27: 3 groups-volcano, 3 groups-earthquakes, 3-groups glaciers)
6. Hand out the directions sheet for each group. Review the directions for each experiment in order.
7. Make sure to emphasize that the students will be responsible for looking up the specific experiment online and gathering the supplies (from the classroom supply center-parents would be a good avenue to stock this). They will need to delegate a person or persons to gather the supplies. *note: Kagan Cooperative Learning strategies would be really useful here.
8. While students are looking up their experiment and gathering their supplies, circulate through the classroom.
9. Once the students have their materials, they will need to begin the experiment, building the model or using the ingredients to make what will be their model.
10. At the point where the students have combined their ingredients (as in the case of the earthquakes groups) or built their model (in the case of the volcano and glaciers group). Set all materials and models in their appropriate places and stop for the day.

* Note: The earthquake gelatin will need to set up overnight.

11. At the beginning of the next class period, have the students gather up their materials again, along with a digital camera.
12. Explain to the students that they will be performing the experiments (making their model city quake, the volcano blow up, or the glacier advance). While performing the experiments, they will need to take video and pictures of the results.
13. Also explain that at the end of the experiment, they will need to be able to come up with one way that their force of nature affects the earth's surface.
14. Allow the students 30-45 minutes to perform their experiments and take video and pictures of it.
15. At the end of the 45 minutes, call the students back to attention and give them 10 minutes to put away all their materials and models.
16. Go around and ask the groups what they did and what happened. Allow them time to explain to their classmates what they did.
17. Next, ask the students how their force affected the surface of the earth. The students should say something like, "The earthquake caused the surface to crack and buckle" or "The glacier's movement caused deep gouges in the earth."
18. After the discussion is finished, remind the students that all of their forces of nature are what makes the distinctive features we find on the earth, valleys, beaches, and mountains.

19. Finally, give the students 10 minutes to finish up anything else they need to complete in their science notebooks.

Assesments:

Build an Earthquake City

In this project, you will be required to build a city using gelatin, bouillon cubes, and sugar cubes and simulate an earthquake. Follow the steps in this project guide to successfully complete the experiment. You will need a notebook, something to write with, a computer and a digital camera.

1. Discuss as a group what you know about earthquakes already. Write this information that your group shares in your notebook.
2. In your group, talk about what an earthquake is and what the epicenter of an earthquake is. Write down your groups thoughts in your notebook.
3. Go to http://www.prek-12engineering.org/data/d40/EarthquakeCity.pdf and read the directions for the experiment. Go to the science supply center and gather up your supplies.
4. Prepare the gelatin and give to the teacher to put in the freezer. Lay out the grid on the box lid.
5. What do you think will happen when you perform this experiment? What will happen to the sugar cubes nearest to where you are tapping? What will happen to the sugar cubes farthest from where you are tapping? Write down your hypotheses in your notebook.
6. Build your sugar cube skyscrapers and begin the experiment. Have one member of your group take digital pictures and digital video. Record the information about the location of the building, epicenter, type of vibration, and number of taps before the building fell, in your science notebook.
7. What happened to the sugar cubes nearest to where you tapped? What happened to the ones farthest from where you tapped? How does this compare with your hypotheses? Why do you think that is? Write down the answers to these questions in your notebook.
8. Create buildings of different sizes and perform the experiment again? What happened to the bigger buildings? What happened to the smaller ones? Why? What was it that determined which buildings survived and didn't survive? Why? Write down your answers to these questions in your notebook.
9. As a group, discuss which cubes were most earthquake resistant. Why? Write down your group's answers in your notebook.
10. What happens when the top of a skyscraper is heavier than the bottom, or the when the bottom is heavier than the top? Write down your group's answers in your notebook.
11. Print out the performance assessment rubric (one for each member of your group) and score yourself on it. Tape it into your notebook. Write two sentences about why you gave yourself the scores you did.
12. Write down 3-4 sentences about what you learned from performing this experiment. What was the most interesting part of the experiment? Why? What do you think adults could learn from doing this same experiment?

Create a Glacier

For this project you are going to need a notebook, the computer, a digital camera and other supplies. Go to http://www.pbs4549.org/antarcti/glaciers.htm and read over the lesson.

Follow these steps and record your drawings, thoughts, conclusions, and questions in your notebook.

1. Discuss as a group what you know about glaciers already, write this information in your notebook.
2. Discuss as a group how you think scienctists can tell if glaciers have moved over the land. What would happen to the land over which a glacier travels? What evidence would a glacier leave behind.
3. Follow the directions for making a glacier listed on the PBS website.
4. After the glacier is made, discuss as a group what you think will happen when you perform the experiment. Write your hypotheses down in your notebooks, along with any observations you've made about the glacier.
5. Perform the experiment with the glacier. Take pictures and video as you perform the experiment (you will use this later). What happened when you scraped the glacier along the wood? How would this compare to patterns made on the land by real glaciers? Write these questions and your answers in your notebook.
6. Sketch the patterns that the glacier made, on the wood, in your notebook. Write a paragraph explaining what you can figure out about the way real glaciers affect the landforms over which they move.
7. As a group, discuss what you think you can figure out about how the climate has changed in a particular area over time. If there is evidence of glacial scraping found in an area that is too warm for glaciers to exist, what do you think that means? What can we figure out about how the climate has changed over a long period of time. Record your thoughts in your notebook.

Name_____

Earthquake City Testing

Location of Building	Location of Earthquake Epicenter	Hard or Soft Vibrations?	After how many taps did the building fall?

What type of building was the hardest to knock down by the earthquake?

Make a Volcano

For this activity you will need your science notebook, pencils, a computer and a digital camera.

Have you ever wondered how a volcano erupts or what makes it erupt? This activity will help you understand the answers to these questions.

Procedure:

1. Go to http://www.enchantedlearning.com/crafts/nature/volcano/ read, and print out the lesson from the webpage.
2. In your science notebook, list everything you know about volcanoes, and any questions you still have about volcanoes.
3. Gather the materials you will need for the activity. Use the classroom science materials center and any materials you can find at home.
4. Use the materials you have to begin making your volcano.
5. Draw and label a detailed diagram of your volcano in your science notebook. Use a search engine like Google or Yahooligans if you need help.
6. What will happen when you mix the baking soda and vinegar together? Why? Write down your thoughts in your science notebook.
7. Mix vinegar and baking soda and pour it into your volcano. Take video and still pictures of your volcano as you do this. What happened? Write down your answers in your notebook.
8. Draw a detailed diagram of your volcano after it has erupted.
9. If this were a real volcano, what would have happened to plants and animals if they were in the path of the lava? Why?
10. What happens to the earth as the lava cools and hardens? Write down your thoughts in your notebook
11. Clean up your supplies and put your volcano in a safe place.
12. How is the baking soda and vinegar reaction similar to what takes place inside a volcano? Explain.
13. What type of volcano is your volcano? Use the books in the classroom or the internet search engines (www.google.com, www.yahooligans.com, www.ajkids.com) to help you find this out. Write down what type of volcano yours is, and information about that type of volcano, in your science notebook.
14. Write down any questions you still have about volcanoes in your notebook,, and use the internet to answer those questions. Write this information down in your notebook.
15. Hand in your notebook.

Rubric Made Using:
RubiStar (http://rubistar.4teachers.org)

Model earthquake, glacier, or volcano

Teacher Name: **Mrs. Rawlins**

Student Name: _____

CATEGORY	1	2	3	4
Participation	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.
Listening and cooperation	Is always talking--never allows anyone else to speak. Usually argues with teammates and usually wants to have things their way.	Usually doing most of the talking--rarely allows others to speak. Sometimes argues and often sides with friends instead of considering all views.	Listens, but sometimes talks too much. Rarely argue and usually considers all views.	Listens and speaks a fair amount. Never argues with teammates and always helps team to reach a fair decision.

Following directions	Does not read or follow the directions on the handouts. Does not ask for clarification and requires the teacher to repeat the directions several times.	Reads and follows few of the directions on the handouts. Does not ask for clarification and requires teacher to repeat directions.	Reads and follows most of the directions listed on the handout. Does not ask for clarification and requires teacher to repeat directions.	Reads and follows all of the directions listed on handout. Asks for explanation when needed. Requires no repetition from the teacher.
Real life connections	Cannot connect the results of the experiment to real life. Observations are inaccurate and contain many misunderstandings.	Has difficulty connection the results of the experiment to real life. Observations are mundane and contain some misunderstandings.	Connects the results of experiment with real life. Observations are accurate, but ordinary.	Accurately connects results of experiment with real life. Makes insightful observations.
Quality of Model	Model building directions were not followed. Experiment was not successful.	Model building directions were followed, but several steps were missed. Experiment was successful after teacher intervention.	Model building directions were followed, but some steps were missed. Experiment was successful after backtracking.	Model building directions were accurately followed and experiment was successful.
Explanation	Student was unable to explain how their force of nature shapes the earth's surface, despite teacher prompting.	Student was able to explain how their force of nature shapes the earth's surface, with teacher prompting.	Student was able to accurately explain how their force of nature shapes the earth's surface.	Student was able to accurately and insightfully explain how their force of nature shapes the earth's surface.

Date Created: **August 07, 2006**

Dynamic Earth-Lesson 13
Instructional iMovie

Objective:

1. The student will demonstrate the ability to synthesize science generalizations about earthquakes, volcanos and glaciers and their technology skills in creating media presentations by producing an original iMovie to answer the essential question of "How do geologic forces affect land and me?"

Materials:

Computers-1 for every 3-4 students
Copies of storyboard template-At least 1 for every 3-4 students (extras should be made available).
Digital camera or digital video camera
Blank CD-R disks
Firewire drive (optional)

Time: 3 weeks (depending upon how technologically savvy your students are)

Procedure:

1. Review with the students the objective of the lesson.
2. Review the KWL chart with the class and ask if any of them have any new information to share with the class. Record new information on the KWL chart.
3. Have a volunteer handout the project requirements to each of the students. Read the project requirements out loud to the students. When finished, ask if they have any questions. Answer any questions they have.
4. After reviewing the project requirements, which will need to be signed by parents, review the rubric. Explain how they will be graded at the end of the project and answer any questions they have.
5. Explain to the students that they will be working in the groups they had for the previous lesson. Explain that each group will have to have roles that each group member can do to help create the iMovie.
6. Brainstorm together roles that each group member (or team of two group members) can do (editor, narrator, photographer, story board artist).
7. Remind the students that just like in the last lesson, they will be responsible for working together as a group, even though people will have their jobs to do. Everyone will need to pitch in to help eachother, even if it isn't their job.
8. Ask the class if they have any other questions.
9. Dismiss the class to work together in their groups. Circulate to help. Students will be brainstorming what they will talk about in their movie and the roles that the students will play in the creation of the movie.
10. Every day provide students time to work in class on creating the movie. Frequently check in with them to see how they are doing. Conference with the students when the storyboard is due. Give constructive feedback about what you think is a good idea and what needs improving.
11. At every checkpoint day, make time to conference with the groups. Encourage them to share with you their struggles and their successes.

12. On movie due day. Celebrate with the class that they created a movie all by themselves successfully. Bring in popcorn and have each group show their movie to the class. Optional: Have a parent "Opening Night" for each group to share their movie with their parents.
13. After the movie screenings are done, have each student bring in a CD-R. Burn their movie to their CD-R and send home with them to share with their families. Collect and review the student self-assessments.
14. After each group has been graded, hold a conference with them. Review their self-assessments with them. Find out from them where they thought they thought they were really strong, and where they thought they needed to improve. Conference with them about what they learned from completing this project. Their final grade will be the average of their self-assessment scores, and your assessment scores.

Assessment:

See rubric.

Dynamic Earth Multimedia project.

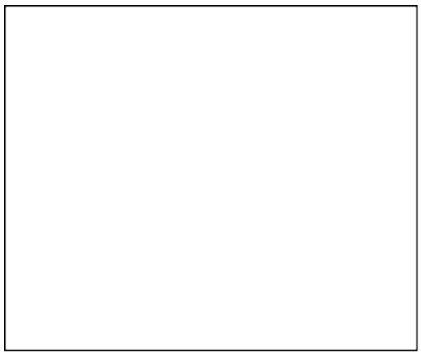
This project that you are about to tackle will be the finale of your studies on the forces of nature. During this time you've learned about earthquakes, glaciers, and volcanoes, and why they do what they do.

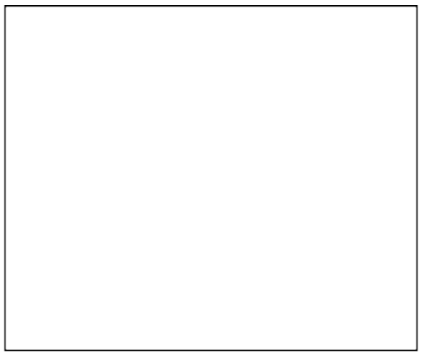
For this project, you and your group members are the experts. You will be creating an instructional iMovie that teaches the rest of the class about the force of nature that you have chose, earthquakes, glaciers or volcanoes. Below, you will find a list of requirements for this project. Be sure to pay attention to the due dates as these checkpoints will be a part of your final grade.

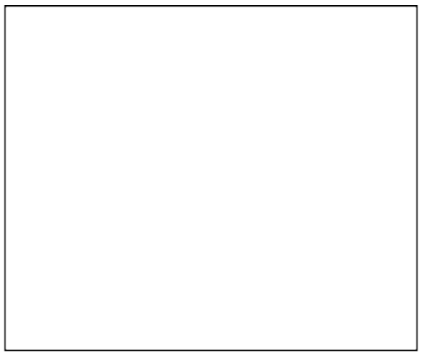
Your iMovie will need to be no longer than 2 minutes, have a combination of still images and video, have both narration and background music, have an introduction slide and a conclusion slide (with the credits). Your movie will also have to have transitions that effectively lead from one scene to another. Above all, you must answer the essential question in your movie, how do the forces of nature affect the land and affect yourself?

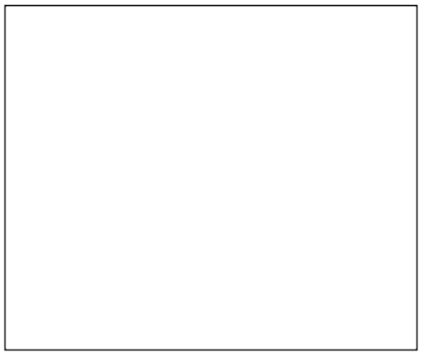
Checkpoint	Description	Due Date
1.	Rough outline of iMovie, must show where the movie is going from beginning to end.	11/3/06
2.	Storyboard complete with thumbnail sketches of each scene from movie.	11/27/06
3.	Images and video added to the movie.	12/1/06
4.	Narration added to the video	12/15/06
5.	Unedited movie is completed with background music.	1/12/07
6.	Transitions added to the movie.	1/19/07
7.	Final movie due	1/26/07

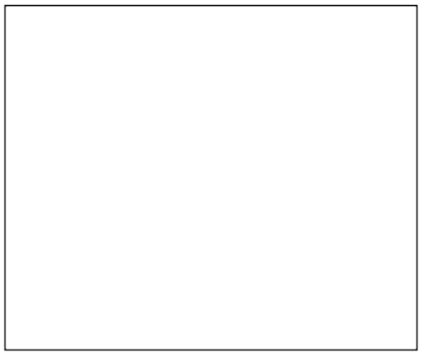
Sample Storyboard Template

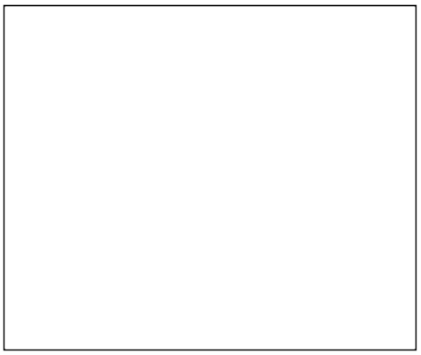












Rubric Made Using:
RubiStar (http://rubistar.4teachers.org)

Multimedia Project : Science iMovie

Teacher Name: **Mrs. Rawlins**

Student Name: _____

CATEGORY	4	3	2	1
Requirements	All requirements are met and exceeded.	All requirements are met.	One requirement was not completely met.	More than one requirement was not completely met.
Rough Draft	Rough draft brought on due date. Student shares with peer and extensively edits based on peer feedback.	Rough draft brought on due date. Student shares with peer and peer makes edits.	Provides feedback and/or edits for peer, but own rough draft was not ready for editing.	Rough draft not ready for editing and did not participate in reviewing draft of peer.

Workload	The workload is divided and shared equally by all team members.	The workload is divided and shared fairly by all team members, though workloads may vary from person to person.	The workload was divided, but one person in the group is viewed as not doing his/her fair share of the work.	The workload was not divided OR several people in the group are viewed as not doing their fair share of the work.
Sources	Source information collected for all graphics, facts and quotes. All documented in desired format.	Source information collected for all graphics, facts and quotes. Most documented in desired format.	Source information collected for graphics, facts and quotes, but not documented in desired format.	Very little or no source information was collected.
Transitions, Titles, and Effects	Many transitions, etc. were used and they worked well and were effective.	Many transitions titles, and effects were used. Most were correct and effective.	Two or three were used. Or several present but poorly used.	Not evident or minimal use
Attractiveness	Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.	Makes good use of font, color, graphics, effects, etc. to enhance to presentation.	Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.	Use of font, color, graphics, effects etc. but these often distract from the presenation content.

Movie quality	Movie was completed. Had all required elements, engaged audience, and was original, creative, and unique.	Movie was completed, and contained all required items. Editing was not done as well as it should have been. Idea was not engaging or unique.	Movie was made but contained little evidence of a theme, had little editing, and did not engage the audience.	Movie was not completed.
Content	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal OR there are several factual errors.
Essential Questions	Accurately and insightfully described the effects that earthquakes, glaciers and volcanoes have on people and the land.	Accurately described the effects that the forces have on the land and people.	Described the effects that the forces have on the land and the people with some inaccuracies and misinformation.	Effects that the forces have on the land and the people were not described or were inaccurate.
Causes	Accurately defined and explained the forces inside, and on the earth's surface, that cause earthquakes, glaciers, and volcanoes.	Defined and explained the forces inside, and on the earth's surface, that cause earthquakes, glaciers, and volcanoes.	Defined and explained the forces that cause earthquakes, glaciers, and volcanoes. 1-2 factual errors.	Causes and forces were not defined or explained OR there are many factual errors.

Date Created: **August 14, 2006**