Virtual Field Trip

Standard II:

Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

Objective 1:

Describe how weathering and erosion change Earth's surface.

Objective 2:

Explain how volcanoes, earthquakes, and uplift affect Earth's surface.

Objective 3:

Relate the building up and breaking down of Earth's surface over time to the various physical land features.

Intended Learning Outcomes:

1. Use Science Process and Thinking Skills.
2. Manifest Scientific Attitudes and Interests.
4. Communicate Effectively Using Science Language and Reasoning.

Content Connections:

Language Arts I-I; VIII-5

Science Standard II

Objective 1, 2, &3

Connections

Background

Students should have been previously exposed to the concepts that are being presented. This is an additional learning experience for them. There will be a brief background before you start each activity for each location.

Summary: Students will use this activity to reinforce knowledge that they have learned in previous classes. The virtual tour is a time where the students are able to meet with groups and have fun with one another while seeing small experiments showing how landforms are changed and made in their home area. Students will have the chance to learn more about their home area without even leaving the school boundaries. These activities can also be used as class presentations, to teach the various landform objectives.

Research Basis

Anderson, R. (1984). "Role of reader's schema in comprehension, learning, and memory." In R. Anderson j. Osbourne, &: >R.Tiemey, (Eds.), *Learning to read in american schools.* Hillsdale, NJ: Lawrence Erlbaum Assoc.

Atwell, N. (1987, 1999). *In the middle: Writing, reading and learning with adolescents.* Portsmouth, NH: Heinemann.

Minsky, M. (1975.) A framework for representing knowledge. *In the psychology of computer vision,* Winston, P.H. (Ed.). New York, NY: McGraw-Hill.

Murray, D.M. (1984.) *Write to learn.* New York, NY: Holt, Rhinehart and Winston.

Materials

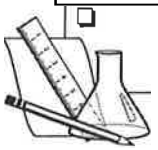
- Virtual Field Trip journals
- Pictures of different landforms in your area
- Poster presentation boards
- Separate materials will be listed for each individual activity.

Owen. D, (1987). Math discovery. *In plain talk: About learning and writing across the curriculum.* Self, J (Ed.) Virginia Department of Education

journaling is a great tool in the learning process; being able to write about what you have learned increases retention immensely. That is why scientists and mathematicians take such in depth notes. Building on prior knowledge is another great way to help students learn the things more quickly that you would like them to. If the students don't have any background information about the new material you are presenting, then they will have nothing to relate it with. Therefore building on prior knowledge is also a great tool.

Materials

- Lemon juice
- Vinegar
- Medicine droppers
- Small chunks (two or three each) limestone, marble, quartz, calcite, and chalk
- Magnifying glass
- Paper towels



Instructional Procedures

Students will be put into groups of about four to six, depending on your class size. This will take place either in the gym or out on a large part of the playground where other students will not disrupt your class. Students will rotate from each station every10-15 minutes. There are 8 stations for the virtual tour. Have parents, teacher aides, or college students volunteering at each station. You could easily set up more or fewer stations as needed. Students should have a field trip journal to be used at each location; pictures, drawings, and an explanation will be expected from each student.

It may be a good idea to join with the other teachers in your grade level. This way you will be able to use the teachers at your school to help instead of having to find as many volunteers.

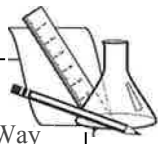
Location #1 - Chemical Weathering

1. Put a couple of drops of lemon juice on each of the rocks.
2. Put a couple drops of vinegar on each of the rocks. Don't put the drops on the same rock you will need at least two of the same kind of rock; one for the lemon juice and one for the vinegar.
3. Watch and listen to see what happens when you add either the lemon juice or the vinegar.

What should happen:

Both lemon juice (citric acid) and vinegar (acetic acid) are weak acids. Explain to the students that water often contains weak acids (approximately ph=S.8) that dissolve rocks that contain calcium carbonate. You should have heard fizzing and saw bubbling from the limestone, marble, chalk, and calcite. The quartz and granite would not have been affected because they don't contain calcium carbonate.

Location #2 - Candy Bar Crunch



Materials

- ❑ One small Milky Way Candy Bar
- ❑ Towels for clean up

1. Give each student a candy bar.
2. Tell the students to carefully unwrap the candy bar. When they have it unwrapped tell them to use their fingernail to put cracks in the middle portion of the bar. This represents the Earth's crust.
3. Have the students hold the edges of the bar and pull it apart into two pieces. The chocolate should separate exposing the caramel which represents magma.
4. Now have the students push the candy bar back together. When the chocolate collides it may crumble or form mountains just as the earth does.
5. Once the students realize what is going on with the plates have them pull the bar totally apart. Notice that there has been no weathering or erosion yet, so the chocolate is rugged on the edges where it has been broken.
6. The students are now able to eat the candy if that is what the teacher instructs them to do.

Questions to think about:

1. Describe what you observed when you pulled the candy bar apart. What might you expect to see on Earth when you see two plates moving apart?
2. What happened when the stretched candy bar was pushed together? What might you expect to see when two plates on the Earth are being pushed together?
3. What happens along boundaries between plates?

Locations #3 - Abrasion

Materials

- ❑ Fingernail file
- ❑ Six-sided pencil

1. Rub the file back and forth across the ridges on the pencil.
2. Observe the surface of the pencil.

What should happen?

The ridges of the pencil should be cut down. The file has a rough, grainy surface. Tiny pieces are cut from the pencil as the file moves back and forth across it. Surfaces can be pitted and polished by sand grains carried by wind. The grains of sand act like the file as they strike and weather surfaces. The wind carries the particles cut away from the surface to other areas. This type of erosion is called abrasion.

Materials

- ❑ Two crayons
- ❑ 25 cm piece of string
  A beaker, 50-100 ml.
- ❑ Scissors
- ❑ 300 ml paper cup
- ❑ Plaster of Paris
- ❑ Hot plate
- ❑ Spoon
- ❑ Pan
- ❑ Water
- ❑ Tongs
- ❑ Safety glasses
- ❑

Location #4 - Volcanoes and Magma

Part 1 (Complete prior to the activity)

1. Remove the paper from the crayons. Break one into pieces and put the pieces in the beaker. Put on the safety glasses and warm the beaker on the hot plate until the crayon melts.
2. Hold the string at one end and use the spoon to push it onto the melted wax until it is completely coated. Then remove the string and let cool. (You may remove your glasses when this is done.)
3. Break the other crayons into three or four pieces and bundle the pieces together using the wax-covered string. Leave at least five centimeters of string extending from the bundle.
4. Mix the plaster of Paris and water in the paper cup. The mixture should be about the consistency of soft ice cream and should fill 1/2 – 1/3 of the cup.
5. Use the spoon to push the crayon bundle into the plaster of Paris mixture. The bundle should be completely covered and should not be touching the bottom or sides of the cup. Loop the string around a pencil or straw to support the bundle and keep it from sinking to the bottom of the cup.
6. Holding the pencil or straw, tap the cup so that the bundle does not hit the bottom; tap the cup on the table to make any air bubbles rise to the top.
7. Clean your work area and let the plaster of Paris harden overnight. To remove wax from the beaker, melt it with hot water, pour out water, and wipe out the beaker before the wax hardens again.

Part 2

8. After the plaster has hardened and you are ready to erupt the volcano, tear away the paper cup from around the hardened plaster.
9. Cut off the string close to the surface of the plaster.
10. Put on your safety glasses and wear them throughout the rest of the activity. Use tongs to place the plaster in a pan of boiling water with the string end up. For the best results, the surface of the plaster should be about 1.5 centimeters above the surface of the water.
11. Observe and consider what happens as the wax "magma" inside the plaster "volcano" melts.

12. When the "eruption" is completed, turn off the burner and allow the water to stop boiling before attempting to remove the volcano. Once the water has stopped boiling, use the tongs to carefully remove the volcano from the pan. Discard the volcano, empty the remaining water from the pan, and clean any remaining wax from the pan, tongs, and burner. Make sure the burner has had enough time to cool before attempting to clean it.

Questions to think about

1. Why did the wax from the crayons inside the model volcano rise to the surface when the volcano was placed in the pan of boiling water?
2. What causes magma to rise to Earth's surface in a real volcano? How effective are the wax crayons in the plaster of Paris model in portraying the action of real magma?
3. When the volcano model was prepared, air bubbles were removed from the plaster. What would have happened if there had been air spaces still in the plaster-surrounding bundle of wax crayons?
4. What might have happened if there had been no waxed string (no opening to the surface) in the plaster to relieve the pressure from the expanding crayon? Is this situation (the absence of a vent for magma and steam pressure) possible in a real volcano? What would be the result?

Location #5 - Tilting

Materials

- ❑ Pencil
- ❑ Two five-ounce paper cups
- ❑ Drinking straw
- ❑ Modeling clay
- ❑ Shallow baking pan
- ❑ Tap water

1. Use a pencil to make a hole through the side of each paper cup near the bottom edge. The hole must be small enough that the straw will fit tightly.
2. Insert about one-half inch of one end of the straw into each hole and seal with the clay.
3. Set the pan on a table and place two connected cups in the center of the pan.
4. Fill both cups half full with water.
5. Lift one end of the pan so that it is about two inches above the table. Observe the contents of each cup.

What should happen?

Raising the pan causes the amount of water to decrease in the elevated cup and increase in the lower cup.

The cups are a model of a voltmeter (an instrument that measures the tilting of the ground). Volcanologists (scientists who study volcanoes) place the tiltmeter on a volcano with one end pointing toward the swelling in the volcano. The swelling is detected when the water content in the end pointing toward the cone decreases. An unusually large swelling in a short period of time tells scientists that an eruption is most likely on the way.

Location #6 - Shield Volcano

Materials

- ❑ Pencil
- ❑ Half-empty tube of toothpaste

1. Use the point of a pencil to make a hole in the tube near the cap.
2. Hold the toothpaste tube in you hands.
3. With the cap screwed on tight, push against the tube to force the toothpaste toward the capped end.

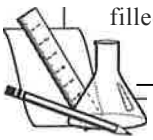
What should happen?

The toothpaste slowly emerges from the hole and flows down the side of the tube. The pressure from your fingers forces the liquid toothpaste out the opening. Tremendous pressure with.in the Earth forces magma out of cracks or weak spots in the Earth's surface. The liquid rock is called magma when it is within the Earth, but it is called lava once it reaches the surface. The lava cools and hardens on the surface, forming a mound of rock around the opening. A new layer is added to the mound with each eruption. This layered mound of lava is called a shield volcano.

Location #7- Quick Water

Materials

- ❑ Pencil
- ❑ Paper cup
- ❑ Scissors
- ❑ Drinking straw
- ❑ Modeling clay
- ❑ Cookie sheet
- ❑ Ruler
- ❑ One-gallon plastic jug, filled with tap water



1. Use the pencil to make a hole in the side of the paper cup near the bottom.
2. Cut the straw in half and insert one of the pieces into the hole in the cup. Seal around the hole with clay.
3. Lay the cookie sheet on the ground and raise one end about two inches by putting soil under it.
4. Cover the sheet with a thin layer of soil. Set the cup on the sheet as shown.
5. Hold your finger over the end of the straw as you fill the cup with water.
6. Release the end of the straw and observe the movement of the water.
7. Repeat steps four through six, raising the end of the sheet about six inches.

What should happen?

More soil is washed away when the slope of the cookie sheet is increased. As the slope increases, the water flows more quickly. The faster the water moves, the more energy it has, and thus the more soil it pushes forward. The process of being worn away by water is called erosion.

Location #8 - Weathering

1. Place three tablespoons of dirt in the bowl.
2. Stir in enough glue to make a stiff mixture.

4. Wipe the glass bowl clean with a paper towel and place the

5. Place the glass bowl in a sunny area and allow the dirt balls to harden for several days.
6. Fill each plastic bowl half full with water.
7. Add one teaspoon of gravel to one of the plastic bowls.
8. Place one dirt ball in each bowl and secure the lid.
9. Shake each bowl vigorously 10 times.
10. Open the lids and observe the shape of each dirt ball.
11. Close the lid. Shake and observe three more times.

What should happen?

The shape of both balls changes, but the ball in the bowl with the gravel changes faster. Land can be worn down by moving water. This change in the land is called weathering (the breaking down of rocks and other land features). The dirt balls (homemade rocks) in the bowls were weathered by the water and the bowl hitting against them. The gravel sped up the weathering process by scraping against the surface of the dirt ball.

Materials

- ❑ Dirt
- ❑ Small glass bowl
- ❑ Spoon
- ❑ White glue
- ❑ Paper towel
- ❑ Two plastic bowls of equal size with lids
- ❑ Tap water
- ❑ Aquarium gravel

Assessment Suggestions

- The main assessment that will be of value is the journal that the students have to take with them on the field trip. You will be able to see if they were able to understand and grasp the concepts that you were trying to reinforce. Pictures that have been drawn and questions that have been answered should easily tell you if they understand different processes happening with the land around us.

Curriculum Extensions/Adaptations/ Integration

- If you know that you have students that are advanced learners you may choose to pair them with other students who are struggling. By doing this the advanced learners will be able to solidify their knowledge and provide alternative explanations for their peers.
- Have the students give examples that they know of where weathering and erosion area taking place.
- An adaptation may be to create a packet that has already been made to assist those that have difficulty with writing.
- You may have advanced students who would benefit from being a "teachers assistant" at any one of the locations on the virtual field trip. They can have an alternate journaling activity that is associated with their individual teaching assignment.
- A great extension of this activity would be a group scrapbook. If your class is able to take a landforms fieldtrip, it would be a good idea to divide your class into small groups. Each group would be provided with a disposable camera to take pictures of various landforms and examples of weathering and erosion. In the classroom, the students can use their developed pictures to create a landform scrapbook. This would incorporate concepts from the Language Arts, Visual Arts, and Science Core curriculum.

Family Connections

- The next time they get a Milky Way candy bar or a candy bar that is similar, challenge the students to explain to a family member how an earthquake changes Earth's surface.
- Students can easily walk around their neighborhood and come back with examples of weathering and erosion. Remember most weathering and erosion starts out small and later becomes very noticeable.

Additional Resources

Books

201 Awesome, Magical, Bizarre, and Incredible Experiments, by Janice VanCleave ; ISBN 0-471-26593-4