

Lesson #6
Quarter- 1

TITLE: “Game Day”-*Plate tectonics, Volcanoes, Earthquakes and Erosion*

OVERVIEW:

In the previous lessons, students have seen how the Earth undergoes change through fast and slow processes. They have studied how *plate tectonics* and *erosion* make changes to the Earth slowly, over time. They have also studied how *earthquakes* and *volcanoes* can change the land very quickly. In this lesson, students will reflect on all the information they have learned and play a game called, BRAINPOWER. They will also take all of their knowledge and use it to make an ABC book about slow and fast processes.

KEY CONCEPTS:

1. The Earth has undergone many slow changes since its inception.
2. The Earth has undergone many fast changes since its inception.
3. The changes that Earth undergoes are due to *plate tectonics, volcanoes, earthquakes and erosion.*

LESSON DURATION: Two to Three 45 minute periods

STANDARDS AND BENCHMARKS:

Science:

Standard 8: Physical, Earth, and Space Sciences: EARTH AND SPACE SCIENCE:
Understand the Earth and its processes, the solar system, and the universe and its contents
SC 4.8.1 Describe how slow processes sometimes shape and reshape the surface of the Earth

SC 4.8.2 Describe how fast processes sometimes shape and reshape the surface of the Earth

TEACHER BACKGROUND:

The Earth today looks vastly different than it did millions of years ago. The Earth will also look different a million years from now. Some changes happen slowly, while other changes happen quickly. *Plate tectonics* and *erosion* produce changes over time. On the other hand, *volcanoes* and *earthquakes* can change the Earth’s landscape quickly. Although we know that Earth looked different millions of years ago, the Earth looked different as recently as a few years ago because of *volcanoes* and *earthquakes*.

VOCABULARY:

- *Earthquakes*- The sudden shaking of the ground; occurs due to movement beneath the Earth’s crust.

- *Erosion*- The movement of dirt, sand, dust and debris by wind or water to another place
- *Plate Tectonics*-Plate movements
- *Volcanoes*- An opening in the Earth’s surface which allows molten rock and ash to escape from the mantle

MATERIALS NEEDED:

Per group of 4 to 8 students:

- * Lesson #6 Worksheet #1 “BRAIN POWER score cards”
- * Lesson #6 Handout #1 BRAIN POWER instruction sheet
- * Set of BRAIN POWER game cards prepared by teacher

Per student:

- * Markers or Crayons
- * Paper for constructing the ABC Book
- * Lesson #6 Worksheet #2 “Final Assessment for Unit”

PROCEDURE:

Activity 1: Review Game- BRAIN POWER

1) Tell students that they have will review the unit they’ve been studying on *plate tectonics, volcanoes, earthquakes* and *erosion*. Allow students to play the game in groups of four to eight. Pass out the BRAIN POWER instruction sheet, a set of BRAIN POWER game cards and a BRAIN POWER score card per group of students. Go over directions for the game as well as behavioral expectations. **Note to Teacher: The BRAIN POWER game cards are meant to print front and back. That way, you can just cut out one set of cards. You should print on heavy cardstock or laminate the cards. Also, it may be helpful to play a sample round with the class.**

Activity 2: Write an ABC Book on Fast and Slow Processes

2) Have students construct an ABC Book reviewing the unit. Have them think of a word or phrase relating to the unit that corresponds to each letter in the alphabet. Have them take 26 pieces of paper. On each paper, have them write a letter from A to Z. On each page, have them think of a word that relates to the slow and fast processes that the Earth has undergone or is continuing to undergo. Then, have students illustrate the word or phrase. For example, for the letter A, students could write, “Areas where *earthquakes* happen.” Then they could draw plate boundaries. Here are some samples for teacher to use or suggest if students get stuck.

A-Active *volcanoes*, Aftershocks

- B- Buildings collapse in *earthquakes*
- C- Crust, Convergent Boundaries, Continental Drift, Composite *Volcanoes*
- D- Divergent Boundaries
- E- Earth, *Earthquakes*, Epicenter, *Erosion*
- F- Fault Lines, Focus
- G- Grand Canyon, Glaciers
- H- Hills, Hawaii is made of *volcanoes*, Hot Spot
- I- Ice, Island Formation
- J- Jiggle – The Earth jiggles during an *earthquake*
- K- Kilauea, Ko‘olau Mountains
- L- Lo‘ihi, Landslides, Lava
- M- Mountains, Mantle, Mudflow, Magma
- N- New Land Formation
- O- Oceans lie on plates
- P- *Plate tectonics*, Pangaea
- Q- Quick Processes, Quick Changes
- R- Rivers, Richter Scale
- S- Subduction Zone, Shield *Volcanoes*, Seismologist
- T- Tree roots exposed due to *erosion*
- U- Underwater *Volcanoes*
- V- Valleys, *Volcanoes*, Vibrations
- W- Wind, Water, Waterfalls, Wai‘anae
- X- Cracks in the Earth look like X’s
- Y- Yesterday the Earth looked different than it does today
- Z- Zigzags in mountains

Again, these are only suggestions. Have students be creative if they complain that they can’t think of anything for a particular letter. If it is too time consuming for each student to compose a book, perhaps the whole class can work together to make one, instead. A laminated copy would be a proud addition to the classroom library.

Activity 3: Final Assessment

3) Pass out the Final Assessment Worksheet (Lesson #6 Worksheet #2). Have students complete.

ASSESSMENT:

Rubric Assessment for Lesson #6				
Title: Game Day				
Benchmark	Advanced	Proficient	Partially Proficient	Novice
SC 4.8.1 Describe how slow processes sometimes shape and reshape the	Student describes how slow processes sometimes shape and reshape the	Student describes how slow processes sometimes shape and reshape the	Student partially describes how slow processes sometimes shape and reshape the	Student is starting to describe how slow processes sometimes shape and reshape the

surface of the Earth	surface of the Earth and gives multiple examples	surface of the Earth	surface of the Earth	surface of the Earth, however, with inaccuracies
SC 4.8.2 Describe how fast processes sometimes shape and reshape the surface of the Earth	Student describes how fast processes sometimes shape and reshape the surface of the Earth and gives multiple examples	Student describes how fast processes sometimes shape and reshape the surface of the Earth	Student partially describes how fast processes sometimes shape and reshape the surface of the Earth	Student is starting to describe how fast processes sometimes shape and reshape the surface of the Earth, however, with inaccuracies

EXTENDED ACTIVITIES

* Students may make up their own cards for BRAIN POWER and have other groups use them in their games.

RESOURCES

Print:

Bramwell, M. (1986). *Volcanoes and Earthquakes*. New York: Franklin Watts.

Clifford, N. (1996). *Incredible Earth*. New York: DK Publishing Book

Dixon, D. (1992). *The Changing Earth*. New York: Thomson Learning.

Fagan, M. (1987). *Science Today: Planet Earth*. New York: Gloucester Press.

Llewellyn, C. (1997). *Our Planet Earth*. New York: Scholastic, Inc.

Lye, K. (1991). *The Earth*. Brookfield: The Millbrook Press.

Rutland, J. (1987). *The Violent Earth*. New York: Random House.

Sattler, H.R. and Maestro, G. (1995). *Our Patchwork Planet*. New York: Lothrop, Lee and Shepard Books

Silverstein, A., et al. (1998). *Plate tectonics*. Brookfield: Twenty-First Century Books.

Winner, C. (1999). *Erosion*. Minneapolis: Carolrhoda Books, Inc.

BRAIN POWER Instruction Sheet

Divide your group into two teams. Write the names of each person on each team on the score card. Take the cards and shuffle them, taking care to keep the answers facing down. Place the stack of cards in the middle between the two teams. Whichever team has the person whose birthday is closest to the current date goes first. Each team takes turns reading the question or task to the other. If the task is done correctly or the question answered correctly then that team is given one point. Each team takes turns reading questions to the other team. Teams alternate reading/answering questions until all of the cards are gone.

For example, Team A will draw a card from the stack and read the task or question to Team B. If the task is to draw or act out, Team B will designate one person from the team to read the card and do the task. If it's a Factoid, Team B may discuss amongst themselves for up to one minute before answering. If Team B answers correctly, they can give themselves one tally mark on their score sheet. If they do not answer correctly, they will not get a point. Team B will then take the next card from the stack and ask the question of Team A. Teams will go back and forth for a set amount of time determined by the teacher or until the cards are gone.

Brain Power Cards -Questions Page #1 (front page)

<p align="center">Word Fun Hint: How continents move Fill in the blanks. P_a _ _ t_c_o _ _c_</p>	<p align="center">Word Fun Hint: Hold on tight. Fill in the blanks _a _ _ _q_a _ _</p>
<p align="center">Word Fun Hint: Meeting places Fill in the blanks. D_v _ _g_n _ b_u _ _a _ _ _</p>	<p align="center">Word Fun Hint: Continent movement Fill in the blanks _l_w _h_n _ _s</p>
<p align="center">Word Fun Hint: Meeting Places Fill in the blanks. C _ _ _e_g _ _ _ B_u _ _ _r _ _ _</p>	<p align="center">Word Fun Hint: Meeting place Unscramble. Frstmnaor odiauebhrs</p>
<p align="center">Word Fun Hint: Measuring tool Fill in the blanks. R_c _ _ _r _c_l_</p>	<p align="center">Word Fun Hint: Island Unscramble Oiih'</p>
<p align="center">Word Fun Hint: Water Fill in the blanks T_u _ _m_</p>	<p align="center">Word Fun Hint: Volcano Formation Unscramble Tho ptso</p>
<p align="center">Word Fun Hint: Moving dirt Fill in the blanks _r_s _ _n</p>	<p align="center">Word Fun Hint: Continent long ago Unscramble Eagpnaa</p>

Brain Power Cards- Solutions Page #1 (back page)

Earthquake	Plate tectonics
Slow Changes	Divergent Boundaries
Transform boundaries	Convergent Boundaries
Lo'ih	Richter Scale
Hot spot	Tsunami
Pangaea	Erosion

Brain Power Cards- Questions Page #2 (front page)

<p>Word Fun Hint: Happens quickly Unscramble Atfs shacgne</p>	<p>Word Fun Hint: You don't eat on these Unscramble Lepsta</p>
<p>Word Fun Hint: Where earthquake starts Unscramble Pieectnr</p>	<p>Word Fun Hint: This has nothing to do with bread Unscramble Rtcus</p>
<p>Word Fun Hint: SHAKE! Unscramble Iatvirbon</p>	<p>Word Fun Hint: BRRRRRR... Cold Unscramble Igaelrcs</p>
<p>Word Fun Hint: You don't ride this Unscramble Hoskc awve</p>	<p>Word Fun Hint: Hot and liquid like Unscramble Laav</p>
<p>Word Fun Hint: Our Home Unscramble Areht</p>	<p>Word Fun Hint: Under the crust Unscramble Gamma</p>
<p>Word Fun Hint: Eruptions! Unscramble Oavclno</p>	<p>Word Fun Hint: Moving land Unscramble Nctnoetlina ridtf</p>

Brain Power Cards -Solutions Page #2 (back page)

Plates	Fast Changes
Crust	Epicenter
Glaciers	Vibration
Lava	Shock Wave
Magma	Earth
Continental Drift	Volcano

Brain Power Cards- Questions Page #3 (front page)

<p>Word Fun Hint: On Big Island Unscramble Ilekaau</p>	<p>Act Out Crust</p>
<p>Act Out Earthquake</p>	<p>Act Out Tsunami</p>
<p>Act Out Vibration</p>	<p>Act Out Divergent boundaries</p>
<p>Act Out Volcano</p>	<p>Draw Composite Volcano</p>
<p>Act Out Earth</p>	<p>Draw Shield Volcano</p>
<p>Act Out Water</p>	<p>Draw Mountain</p>

Brain Power Cards- Questions Page #4 (front page)

<p>Draw</p> <p>Cliff</p>	<p>Draw</p> <p>Lo'ihl</p>
<p>Draw</p> <p>Tsunami</p>	<p>Draw</p> <p>O'ahu</p>
<p>Draw</p> <p>Convergent boundaries</p>	<p>Draw</p> <p>Glacier</p>
<p>Draw</p> <p>Divergent boundaries</p>	<p>Draw</p> <p>River</p>
<p>Draw</p> <p>Transform boundaries</p>	<p>Draw</p> <p>Vibration</p>
<p>Draw</p> <p>Kilauea</p>	<p>Draw</p> <p>Lava</p>

Brain Power Cards- Questions Page #5 (front page)

<p>Draw</p> <p>Earth's Crust</p>	<p>Factoid</p> <p>The place where two plates are coming together is...</p>
<p>Draw</p> <p>Earth's mantle</p>	<p>Factoid</p> <p>The place where two plates are moving apart is...</p>
<p>Draw</p> <p>Earth's Core</p>	<p>Factoid</p> <p>The place where two plates are moving alongside each other is..</p>
<p>Draw</p> <p>Pangaea</p>	<p>Factoid</p> <p>Do plate tectonics change the Earth quickly or slowly?</p>
<p>Draw</p> <p>Fault Line</p>	<p>Factoid</p> <p>Kilauea is located on which island?</p>
<p>Factoid</p> <p>Plate movements are called...</p>	<p>Factoid</p> <p>Which volcano is currently still erupting on the Big Island?</p>

Brain Power Cards- Solutions Page #5 (back page)

Convergent boundary	Have your group guess your word
Divergent boundary	Have your group guess your word
Transform boundary	Have your group guess your word
Slowly	Have your group guess your word
Big Island	Have your group guess your word
Kilauea	Plate Movements

Brain Power Cards- Questions Page #6 (front page)

<p>Factoid</p> <p>What is the name of the new island forming underwater?</p>	<p>Factoid</p> <p>Is Mt. Rainier is a shield or composite volcano</p>
<p>True /False</p> <p>Volcanoes can add on to land and ash can act as a good fertilizer.</p>	<p>Factoid</p> <p>Is Mauna Loa a shield or composite volcano?</p>
<p>True/False</p> <p>Volcanoes can cause loss of life and property.</p>	<p>Factoid</p> <p>A slow moving river of ice is a ____</p>
<p>Factoid</p> <p>What is the name of a scientist who studies earthquakes?</p>	<p>Factoid</p> <p>What kind of volcano makes up the Hawaiian Islands?</p>
<p>Factoid</p> <p>What instrument measures the magnitude of an earthquake?</p>	<p>True/False</p> <p>Hawaii has earthquakes, occasionally.</p>
<p>Factoid</p> <p>What is the name of the place where an earthquake originates under the Earth?</p>	<p>True/False</p> <p>All volcanoes are dangerous and bad for the land.</p>

Brain Power Cards- Solutions Page #6 (back page)

Composite	Lo'ih
Shield	True
Glacier	True
Shield	Seismologist
True	Richter Scale
False	Focus

Brain Power Cards- Questions Page #7 (front page)

<p>True/False</p> <p>All earthquakes cause major damage.</p>	<p>True/False</p> <p>Volcanoes all look the same.</p>	
<p>True/False</p> <p>Wind, Water and Rain are the only things that cause erosion.</p>	<p>True/False</p> <p>Divergent boundaries are located where two plates are moving apart</p>	
<p>True/False</p> <p>The Earth will look the same 100 million years from now.</p>		
<p>True/False</p> <p>About 200 million years ago, Pangaea starting breaking up.</p>		
<p>True/False</p> <p>When magma surfaces, it is called lava.</p>		
<p>True/False</p> <p>The two types of volcanoes are composite and warrior</p>		

Brain Power Cards Solutions Page #7 (back page)

False	False
True	False
	False
	True
	True
	False

Final Assessment

Answer the following questions:

Name two slow processes.

1)

2)

Name two fast processes.

1)

2)

What are plate tectonics?

What is erosion?

How does erosion change the Earth?

How do plate tectonics change the Earth?

What causes earthquakes?

How do earthquakes change the Earth?

How are volcanoes formed?

What are the two kinds of volcanoes?

1)

2)

What are the differences between the two kinds of volcanoes?

What kind of volcanoes are the Hawaiian Islands made of?

Final Assessment

Answer the following questions:

Name two slow processes.

1) Plate tectonics

2) Erosion

Name two fast processes.

1) Earthquakes

2) Volcanoes

What are plate tectonics?

Plate movements

What is erosion?

Water, wind and glaciers move bits of Earth and rock from one place to another

How does erosion change the Earth?

It can carve out mountains and valleys. It can shape rocks. It can chip away at cliffs.

How do plate tectonics change the Earth?

Plate movements are slow, but constant. They can move the oceans and continents that lay on them, so the Earth will look different in the future.

What causes earthquakes?

Earthquakes are caused by slipping plates.

How do earthquakes change the Earth?

Earthquakes can cause cracks in the Earth and cause the landscape to change in a matter of moments.

What are the two kinds of volcanoes?

1) Composite

2) Shield

What are the differences between the two kinds of volcanoes?

Composite volcanoes look like upside down cones and are usually very destructive because the lava usually flows very violently and quickly.

Shield volcanoes look like a warrior's shield (very broad shaped), have a slower more gentle flow and do not cause as much damage.

What kind of volcanoes are the Hawaiian Islands made of?

Shield volcanoes