# Plate Tectonics

**Grade:** Six
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**Length of Unit**: 13 days

## I. ABSTRACT

This is a unit written for sixth grade on Plate Tectonics. It covers the entire section of "Plate Tectonics" in the *Core Knowledge Sequence.* It is essential to understand that our world is in constant motion, thus an ever-changing place. Through lecture, creative writing, Internet simulations, cooperative group work, teacher demonstrations, and creative expression, students will be exposed to plate tectonics. Since a field trip to the center of the earth is not possible, the demonstrations and simulations provide a meaningful opportunity to experience this information first hand.

## II. OVERVIEW

A. Concept Objectives
   1. Understand our world is an ever-changing place
   2. Understand the temperature of the earth is varied
   3. Understand the earth is in constant motion

B. Content from the *Core Knowledge Sequence* (page 152)
   1. Surface of the earth
      a. Surface of the earth is in constant movement
      b. Current features of earth come from its ongoing history
      c. Continents were once joined (Pangaea)
   2. Layered structure of the earth
      a. Crust
      b. Mantle
      c. Outer Core
      d. Inner Core
   3. Crust movements
      a. Surface of the earth is made up of rigid plates in motion
      b. Plates move because molten rock rises and falls
      c. Plates move at speeds ranging 1-4 inches per year
   4. Earthquakes
      a. Usually occur where stress has been built up by plates moving in opposite directions against each other
      b. Earthquakes cause waves which have a focus and an epicenter
      c. Energy release is measured in the Richter scale
   5. Volcanoes
      a. Usually occur where plates are pulling apart or coming together
      b. Some occur at holes (hotspots)
   6. Evidence for long term movement of plates
   7. Alfred Wegner

C. Skill Objectives
   1. Apply background knowledge for completion of activities
   2. Create an original mythological piece about the origins of earthquakes and/or volcanoes
   3. Respond critically to open-ended questions

4. Predict the future location of landmasses on earth, considering evidence of past continental movement
5. Interpret and apply key vocabulary words
6. Take teacher presented information and transfer it into a comparison chart
7. Work cooperatively in groups
8. Review previous unit material
9. Scan Internet sites for specific data
10. Differentiate between the four types of crustal movements
11. Analyze the relationship between plate boundaries and the occurrence of earthquakes and volcanoes
12. Compare and contrast
13. Use longitude and latitude
14. Actively watch and listen
15. Categorize words
16. Compose an acrostic based on content knowledge
17. Apply cumulative knowledge of plate tectonics

## III. BACKGROUND KNOWLEDGE

A. For Teachers
1. *Volcanoes and Earthquakes* 0-7835-4764-1
2. *Earthquakes and Volcanoes* 1-58037-044-6
3. *Geology: The Active Earth* 0-07-046511-8
4. *Hands-On: General Science Activities* 0-87628-751-8
5. *Earth Science for Every Kid* 0-471-53010-7

B. For Students
1. First Grade Core Knowledge
   a. Inside the Earth
   b. Volcanoes
2. Fourth Grade Core Knowledge
   a. Crust, mantle, outer core, inner core
   b. Movement of crustal plates
   c. Earthquakes
   d. Volcanoes
   e. Theories: Pangaea and Continental Drift

## IV. RESOURCES

A. *Volcanoes and Earthquakes* by Time Life Books 0-7835-4764-1
B. http://www.ucmp.berkeley.edu/geology/tectonics.html
C. http://www.pbs.org/aso/tryit/tectonics/crush.html
D. http://www.pbs.org/aso/tryit/tectonics/convergent.html
E. http://www.pbs.org/aso/tryit/tectonics/divergent.html
F. http://www.pbs.org/aso/tryit/tectonics/transform.html
G. http://www.seismo.unr.edu/ftp/pub/louis/class/100/mercalli.html
H. http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html
I. http://lasker.princeton.edu/cgi-bin/yearlist.cgi?2001
J. *Nature's Fury* National Geographic Video

## V. LESSONS

**Lesson One: Earthquake and Volcano Myths (1 day)**

A. *Daily Objectives*
   1. Concept Objectives
      a. Understand our world is an ever-changing place
   2. Lesson Content
      a. Mythology as related to the origin of earthquakes and volcanoes
   3. Skill Objectives
      a. Apply background knowledge for completion of activities
      b. Create an original mythological piece about the origins of earthquakes and/or volcanoes

B. *Materials*
   1. Ten sticky notes for each student
   2. Appendix A – Earthquake and Volcano Myth Rubric
   3. *Volcanoes and Earthquakes* 0-7835-4764-1

C. *Key Vocabulary*
   1. Myth – an imaginary story, explanation, or person

D. *Procedures/Activities*
   1. To brainstorm previous knowledge, pass out about 10 sticky notes to each student. Using the categories Plate Tectonics, Earthquakes, and Volcanoes, have the students write one "I think I know" item per sticky note relating to these topics. Students will place these up on the board according to the categories. Teacher will read aloud.
   2. Pose the question: **What do you think ancient cultures thought about the origins of earthquakes and volcanoes?**
   3. *Creative Writing Activity:* Students will write a brief myth from an ancient cultural perspective about the origins of earthquakes and/or volcanoes. Remind students to keep in mind the specific time periods of these ancient cultures. Students may use information from any Core Knowledge grade level.
   4. Close the class time by sharing the existing myths from Ancient Greek, Hawaiian, Hindu, and Siberian cultures regarding earthquakes and volcanoes. Read orally from the book *Volcanoes and Earthquakes* pages 16-17.

E. *Assessment/Evaluation*
   1. Collect completed myths and use the rubric in Appendix A to grade the finished product.

**Lesson Two: It's All About Theory (1 day)**

A. *Daily Objectives*
   1. Concept Objectives
      a. Understand our world is an ever-changing place
      b. Understand the earth is in constant motion
   2. Lesson Content
      a. Surface of the earth is in constant movement
      b. Current features of earth come from its ongoing history
      c. Continents were once joined (Pangaea)
      d. Evidence for long-term movement of plates
      e. Alfred Wegner
   3. Skill Objectives
      a. Respond critically to open-ended questions
      b. Considering evidence of past continental movement, predict the future location of landmasses on earth
      c. Interpret and apply key vocabulary words

B. *Materials*

1. Resources on Continental Drift Theory simulation: http://www.ucmp.berkeley.edu/geology/tectonics.html
2. *Volcanoes and Earthquakes* 0-7835-4764-1

C. *Key Vocabulary*

1. Theory – an explanation generally accepted as truth, but not yet proven
2. Pangaea – a super continent meaning "all land" in Greek
3. Continental Drift Theory – theory stating that Pangaea split up and the pieces drifted into their present day location and will continue to move

D. *Procedures/Activities*

1. Ask the students to jog in place for 60 seconds. Ask: **How tired are you? For how long could you jog in place?** Inform students that our earth is in constant movement. **Could you *always* be moving?**
2. Write the word *theory* on the board. Elicit a discussion on the meaning of theory and write student ideas on the board. Give the definition of theory to students.
3. Introduce Continental Drift Theory, Pangaea, and Alfred Wegner.
   - Alfred Wegner was a German scientist who authored a book on the Continental Drift Theory in 1915, which many scientists rejected.
   - This theory states that all of the earth's landmasses were once joined. This supercontinent is known as Pangaea. As time passed, the landmass split up and pieces drifted apart.
   - At first, the landmass split into two major continents known as Gondwanaland in the south and Laurasia in the north.
   - Each of these continents continued to split forming the continents as we are familiar with them today.
4. Refer to *Volcanoes and Earthquakes* pages 8-9 for a Pangaea visual.
5. Show the students a simulation of the Continental Drift Theory and the movements of Pangaea, which can be found at: http://www.ucmp.berkeley.edu/geology/tectonics.html
6. Discuss evidence that supports continental drift. Include the following ideas:
   - Numerous continents look as though they fit together like puzzle pieces.
   - South American and African mountain ranges are made up similar rock types.
   - Fossils from Glossopteris, an ancient fern, were found in South America, Africa, Australia, and Antarctica. The seed being too heavy to have blown across the ocean indicates that the continents were once connected.
   - Fossils from Lystrosaurus, an ancient land reptile, were found in Africa, South America, and Antarctica. This animal being unable to swim the oceans indicates the continents were once connected.

E. *Assessment/Evaluation*

1. Propose: **If landmasses of the earth have changed once before, will they continue to change? What is your prediction for how the earth will look 10 million years from now?** Students must use the key vocabulary words theory, Pangaea, and continental drift in their written journal response.

   **Note to Teacher: This journal question will also be asked at the end of the unit to demonstrate the knowledge growth on this concept. Save these original copies for Lesson Seven.**

**Lesson Three: Layers of the Earth (2 days)**

A. *Daily Objectives*
   1. Concept Objectives
      a. Understand our world is an ever-changing place
      b. Understand the temperature of the earth is varied
      c. Understand the earth is in constant motion
   2. Lesson Content
      a. Crust
      b. Mantle
      c. Outer Core
      d. Inner Core
   3. Skill Objectives
      a. Take teacher presented information and transfer it into a comparison chart
      b. Work cooperatively in a group to create a song.

B. *Materials*
   1. Apple
   2. Paring knife
   3. *Volcanoes and Earthquakes* 0-78 35-4764-1
   4. Appendix B – Earth Layer Comparison Chart
   5. Appendix C – Group Song Checklist

C. *Key Vocabulary*
   1. Crust – the outermost and thinnest layer of the earth composed of rocky matter less dense than the mantle below
   2. Mantle – an earth layer composed of magma, a solid that flows like a liquid, that surrounds the spherical mass at the center of the earth
   3. Outer Core – the outer section of a spherical mass at the center of the earth composed of liquid iron and nickel
   4. Inner Core – the inner section of a spherical mass at the center of the earth composed of solid iron and nickel

D. *Procedures/Activities*
   1. *Teacher Demonstration*: Cut an apple in half to represent the layers of the earth. Even though an apple is not to scale, it provides a visual of the general layering of earth. Discuss the following layers of the apple:
      - Skin = crust
      - Flesh = mantle
      - Seed casing = outer core
      - Seed = inner core
   2. Show students the layers of the earth picture from *Volcanoes and Earthquakes* page 6. Be sure to touch on key vocabulary words.
   3. Present details on the temperature, thickness, composition, and state of matter of each specific layer. Students will transfer this information into a comparison chart found in Appendix B.
   4. Students will use Appendix B for note taking. Present the following facts on the **crust**:
      - Temperature = 930 degrees Fahrenheit
      - Thickness = 5 to 25 miles
      - Composition = granite and basalt
      - State of matter = solid
   5. Students will use Appendix B for note taking. Present the following facts on the **mantle**:

- Temperature = 4,000 degrees Fahrenheit
- Thickness = 1,800 miles
- Composition = magma
- State of matter = solid that flows like a liquid

6. Students will use Appendix B for note taking. Present the following facts on the **outer core**:
   - Temperature = 9,000 degrees Fahrenheit
   - Thickness = 1,400 miles
   - Composition = nickel and iron
   - State of matter = liquid
7. Students will use Appendix B for note taking. Present the following facts on the **inner core**:
   - Temperature = 12,600 degrees Fahrenheit
   - Thickness = 800 miles thick
   - Composition = iron and nickel
   - State of matter = solid
8. To further comprehension and synthesis of information, students will create a song using the key vocabulary words in cooperative groups. The song must contain at least two facts about each layer. The song can be sung as a common tune, a rap, or an original piece.
9. Allow the groups to present their musical renditions to the entire class.

E. *Assessment/Evaluation*

1. Check Appendix B for accuracy of notes.
2. Use the checklist in Appendix C while students are presenting their songs.

**Lesson Four: Crustal Movement: Pass Your Plates Please (2 days)**

A. *Daily Objectives*

1. Concept Objectives
   a. Understand our world is an ever-changing place
   b. Understand the temperature of the earth is varied
   c. Understand the earth is in constant motion
2. Lesson Content
   a. Surface of the earth is made up of rigid plates in motion
   b. Plates move because molten rock rises and falls
   c. Plates move at speeds from 1-4 inches per year
3. Skill Objectives
   a. Review previous unit material
   b. Scan Internet sites for specific data about each of the four types of crustal movements
   c. Differentiate between the four types of crustal movements

B. *Materials*

1. Hard-boiled egg
2. Resources for animated crustal movement activities, vocabulary words, and definitions:
   a. http://www.pbs.org/aso/tryit/tectonics/crush.html
   b. http://www.pbs.org/aso/tryit/tectonics/convergent.html
   c. http://www.pbs.org/aso/tryit/tectonics/divergent.html
   d. http://www.pbs.org/aso/tryit/tectonics/transform.html
3. Student-brought materials for assessment activity

C. *Key Vocabulary*

1. Plate Tectonics – study of how earth's plates move

2. Collisional Boundary – occurs when two continental plates collide
3. Convergent Boundary – occurs when an oceanic plate either moves under a continental plate or another oceanic plate
4. Divergent Boundary – occurs when two plates move away from each other
5. Transform Boundary – occurs when two plates move against each other

D. *Procedures/Activities*

1. Using a favorite review technique, discuss the following topics: theory, continental drift, Pangaea, crust, mantle, outer core, and inner core.
2. *Teacher Demonstration:* Crack the shell of a hard-boiled egg. Ask**: Does the cracked egg remind you anything related to plate tectonics?** If not given as a response, inform students the egg represents the earth, the shell represents the crust divided into plates, the white represents the mantle, and the yolk represents the core.
3. Remind students that plates are in constant motion. Molten rock within the mantle rises and falls beneath the crust causing movement of the plates. Plates move at a speed of 1 to 4 inches per year. The study of the movement of plates is called plate tectonics. Familiarize the students with this information.
4. Using the Internet simulations listed in the materials section for this lesson, show and discuss the following types of crustal movement:
    - Collisional Boundaries
    - Convergent Boundaries
    - Divergent Boundaries
    - Transform Boundaries

E. *Assessment/Evaluation*

1. With a partner, students will creatively replicate the four types of crustal movement. Ideas for this assessment include, but not limited to: drawing, body movement, play acting, or use of movable materials.

**Lesson Five: Earthquakes: There's a Whole Lot of Shakin' Goin' On (3 days)**

A. *Daily Objectives*

1. Concept Objectives
    a. Understand our world is an ever-changing place
    b. Understand the earth is in constant motion
2. Lesson Content
    a. Earthquakes usually occur where stress has been built up by plates moving in opposite directions against each other
    b. Earthquakes cause waves which have a focus and an epicenter
    c. Energy released is measured in the Richter scale
3. Skill Objectives
    a. Analyze the relationship between transform boundaries and earthquakes
    b. Scan Internet sites for specific data about intensity scales
    c. Compare and contrast the Mercalli and Richter scales
    d. Respond critically to open-ended questions
    e. Use longitude and latitude to plot earthquake epicenters
    f. Work cooperatively in groups to create a quake proof structure

B. *Materials*

1. Resource on Transform Boundaries: http://www.pbs.org/aso/tryit/tectonics/transform.html
2. Resource on the Mercalli and Richter scales: http://www.seismo.unr.edu/ftp/pub/louis/class/100/mercalli.html http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html

3. Classroom-sized world map with longitude and latitude lines
4. Push pins
5. Resource on earthquake epicenter longitude and latitude data: http://lasker.princeton.edu/cgi-bin/yearlist.cgi?2001
6. Fifty mini marshmallows for each group
7. Box of toothpicks for each group
8. Paper plate for each group
9. Ruler for each group

C. *Key Vocabulary*

1. Transform Boundary – occurs when two plates move against each other
2. Seismograph – instrument used to measure earthquake magnitude
3. Richter scale – magnitude/intensity measurement of an earthquake from 1 to 10
4. Mercalli scale – damage measurement of an earthquake from I to XII
5. Focus – point below the surface where the earthquake occurs
6. Epicenter – point on the surface above the focus

D. *Procedures/Activities*

1. Ask for volunteers to share their examples of transform boundaries created in the previous lesson. Ask: **What type of activity do you think occurs at this type of boundary?** If not provided, emphasize that at a transform boundary, plates are moving against each other causing great tension. In order for this tension to be released, earthquakes occur. Refer students to http://www.pbs.org/aso/tryit/tectonics/transform.html to once again view this visual representation of a transform boundary.
2. Ask: **How do you think scientists know when an earthquake has occurred or will occur?** Lead a class discussion using the following points:
    - Earthquakes cause waves known as vibrations. These vibrations are measured using an instrument called a seismograph.
    - Seismologists measure earthquakes on two separate scales.
        - One scale measures the magnitude or intensity of the earthquake. This is known as the Richter scale and is measured on a basis of 1 to 10. For each unit increase the energy released is tenfold.
        - Another scale measures the damage done to people and structures. This is known as the Mercalli scale and is measured on a basis of I to XII.
3. Either as a whole class or individually, instruct the students to the following websites that show the Richter and Mercalli scales. Students should closely examine each scale.
   http://www.seismo.unr.edu/ftp/pub/louis/class/100/mercalli.html
   http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html
4. Ask the students to make comparisons and contrasts between these two scales. Pose the following scenario: **If there was an earthquake that measured 8.6 on the Richter scale on an isolated island and an earthquake that measured 5.6 in a major city, which earthquake would have the higher Mercalli rating?** It is important for students to know that the Mercalli scale measures the impact on people and structures, so more damage would be done within the major city.
5. Introduce the terms focus and epicenter.
    - Focus – point below the surface where the earthquake occurs
    - Epicenter – point on the surface above the focus
6. Using a classroom-sized world map, students will plot the longitude and latitude for earthquake epicenters that occurred in the year 2001. Students will place

pushpins at appropriate epicenter locations. Website for longitude and latitude coordinates can be found at: http://lasker.princeton.edu/cgi-bin/yearlist.cgi?2001

7. Once classroom map is completed, ask the students if they see any patterns. Remind students of the Pacific Rim and Ring of Fire as discussed in previous grades. This is an active plate boundary for earthquakes and volcanoes.
8. Earthquakes cause great damage to structures as evidenced by the Mercalli scale. It is important for buildings to be designed to be quake resistant. To further explore this topic, students will design a quake proof structure.
    - Divide students into cooperative groups.
    - Each group will need the following materials: 50 mini marshmallows, toothpicks, ruler, and a paper plate.
    - Using the marshmallows and toothpicks, groups will design a structure on a paper plate at least 15 inches in height. Students will design the structure so that it can withstand a simulated earthquake.
    - Once completed, groups will place structures on a table or desk. The teacher will simulate a 30 second earthquake for each group.
9. After all earthquakes have been completed, lead a discussion including the following questions: **Which structures withstood the earthquake? Why do you think this is so? Which structures were destroyed? Why do you think this is so? How can architects benefit from this information?**

E. *Assessment/Evaluation*

1. Monitor the students as they work on their plotting activity. Provide assistance with longitude and latitude as needed.
2. Monitor the students as they work cooperatively on their quake proof structures.

**Lesson Six: Volcanoes (1 day)**

A. *Daily Objectives*

1. Concept Objectives
    a. Understand our world is an ever-changing place
    b. Understand the earth is in constant motion
2. Lesson Content
    a. Volcanoes usually occur where plates are pulling apart or coming together
    b. Some volcanoes occur at holes (hotspots)
3. Skill Objectives
    a. Analyze the relationship between convergent and divergent boundaries and volcanoes
    b. Actively watch and listen during a video
    c. Categorize words

B. *Materials*

1. Resources on convergent and divergent boundaries:
   http://www.pbs.org/aso/tryit/tectonics/convergent.html
   http://www.pbs.org/aso/tryit/tectonics/divergent.html
2. *Volcanoes and Earthquakes* 0-7835-4764-1
3. *Nature's Fury* National Geographic Video (60 minutes)
4. Blank paper

C. *Key Vocabulary*

1. Hot spot – a hole in the middle of plates directly above a source of magma

D. *Procedures/Activities*

1. Pose the question: **At what type of boundaries do you think volcanoes can occur?** Inform students that volcanoes can occur at either a convergent or divergent boundary. Refer students to the following websites to once again view the Internet simulations:
   **http://www.pbs.org/aso/tryit/tectonics/convergent.html**
   **http://www.pbs.org/aso/tryit/tectonics/divergent.html**
2. Inform the students that volcanoes can also occur at hot spots, which are not located at plate boundaries. The Hawaiian Islands are an example of a hot spot island chain. Refer students to *Volcanoes and Earthquakes* pages 14-15 for further discussion and illustration.
3. Show *Nature's Fury*. While students are viewing the video, they are to create a word collage. On a blank piece of paper, students are to write down any words that come to their minds about the images or narrative.
4. After the video, pose the questions: **Did you write down words relating to beauty? Did you write down words relating to destruction? Did you write down words relating to plate tectonics?** Students will share word collages as the teacher puts these words into categories.
   - **Note to Teacher: Although this seems to be a non-analytical lesson, there are times we need to stand back to appreciate the aesthetic beauty of nature.**

E. *Assessment/Evaluation*
1. Observe the students during the video for active listening and independent completion of word collages.

**Lesson Seven: It All Comes Together (1 day)**

A. *Daily Objectives*
1. Concept Objectives
   a. Understand our world is an ever-changing place
   b. Understand the temperature of the earth is varied
   c. Understand the earth is in constant motion
2. Lesson Content:
   a. Plate Tectonics
3. Skill Objectives
   a. Considering evidence of past continental movement, predict the future location of landmasses on earth
   b. Compare and contrast first and second journal responses
   c. Compose an acrostic based on content knowledge

B. *Materials*
1. Journal response from Lesson Two
2. Appendix D – Acrostic

C. *Key Vocabulary* - All

D. *Procedures/Activities*
1. Ask the students to once again reflect and write upon the following: **If landmasses of the earth have changed once before, will they continue to change? What is your prediction for how the earth will look 10 million years from now?** Students must use at least five key vocabulary words from the unit.
2. After written assignment is completed, pass back student entries from Lesson Two. Allow students the opportunity to compare their current and previous responses. Provide the time to share responses with classmates and teacher.

Pose the question: **How have your views changed as a result of further investigation of plate tectonics?**

3. Using the words PLATE TECTONICS, EARTHQUAKES, or VOLCANOES, students will create an acrostic. See Appendix D for a completed example.

E. *Assessment/Evaluation*

1. Collect both journal responses (Lessons Two and Seven) to examine knowledge growth and correct use of vocabulary. **Are students using vocabulary in the correct context? Did students mention that 10 million years from now the landmasses would <u>not</u> be in the same location?**
2. Collect acrostics. **Did students accurately recall plate tectonic content?**

## VI. CULMINATING ACTIVITY: Jeopardy and Unit Test (2 days)

In cooperative groups, students will play *Jeopardy* for a review of all plate tectonics content. Appendix E contains questions and answers. Appendix F is a game board. Give students the *Plate Tectonics Unit Test*. Appendix G contains a copy of the test.

## VII. HANDOUTS/WORKSHEETS

A. Appendix A: Earthquake and Volcano Myth Rubric
B. Appendix B: Earth Layer Comparison Chart
C. Appendix C: Group Song Checklist
D. Appendix D: Acrostic
E. Appendix E: Jeopardy Questions and Answers
F. Appendix F: Jeopardy Game Board
G. Appendix G: Plate Tectonics Unit Test

## VIII. BIBLIOGRAPHY


A. Books

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B. Internet Sources

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3. *Geology: Plate Tectonics.* University of California at Berkeley. 18 June 2002 <http://www.ucmp.berkeley.edu/geology/tectonics.html>.
4. *Modified Mercalli Scale of Earthquake Intensity.* University of Nevada Seismological Laboratory. 18 June 2002 <http://www.seismo.unr.edu/ftp/pub/louis/class/100/mercalli.html>.
5. *PEPP Event List for 2001.* Princeton Earth Physics Project. 18 June 2002 <http://lasker.princeton.edu/cgi-bin/yearlist.cgi?2001>.

6. *Sea Floor Spread.* Science Odyssey. 18 June 2002 <http://www.pbs.org/aso/tryit/tectonics/divergent.html>.
7. *Slippin and Slidin.* Science Odyssey. 18 June 2002 <http://www.pbs.org/aso/tryit/tectonics/transform.html>.
8. *What is Richter Magnitude.* University of Nevada Seismological Laboratory. 18 June 2002 <http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html>.

C. Video

1. *Nature's Fury*. National Geographic. Columbia Tri-Star Home Video, 1996.

# Earthquake and Volcano Myth Rubric

## Topic

4 – The piece followed the topic and provided plentiful information and details.

3 – The piece followed the topic, but did not give enough information or details.

2 – The piece drifted away from the topic.

1 – The piece drifted from the topic and needed more details and information.

## Mechanics

4 – The piece contains no spelling or grammatical errors.

3 – Most of the piece contains no spelling or grammatical errors

2 – Spelling and grammatical errors decrease the readability of the piece.

1 – Spelling and grammatical errors completely detract from the readability of the piece.

## Total Points:

# Earth Layer Comparison Chart

Name_____

| Earth Layers | Temperature | Thickness | Composition | State of Matter |
|---|---|---|---|---|
| Crust | | | | |
| Mantle | | | | |
| Outer Core | | | | |
| Inner Core | | | | |

# Group Song Checklist

Group Members _____

| Earth Layers | First Fact | Second Fact |
|---|---|---|
| Crust | | |
| Mantle | | |
| Outer Core | | |
| Inner Core | | |

## Acrostic

(Example)

P angaea
L aurasia
Volcanoes are A esthetically pleasing!
T ransform boundary
Richt E r Scale

Earth T emperature varies
Alfred W E gner
C ontinental Drift
Ear T h is in constant motion
Seism O graph
Epice N ter
Fossil ev I dence
C rust
Hot S pots

# Jeopardy Questions and Answers

**Plate Movements**

**Q:** This occurs when two plates move away from each other.
**A:** What is a divergent boundary?

**Q:** This occurs when two plates move against each other.
**A:** What is a transform boundary?

**Q:** This occurs when two continental plates collide.
**A:** What is a collisional boundary?

**Q:** This occurs when an oceanic plate moves under another plate.
**A:** What is a convergent boundary?

**Q:** When molten rock rises and falls beneath the earth's crust it causes movement of these.
**A:** What are plates?

**Theories**

**Q:** This is the name for the supercontinent.
**A:** What is Pangaea?

**Q:** This theory stated that Pangaea split and the pieces drifted into their present day location and will continue to move.
**A:** What is Continental Drift Theory?

**Q:** Name one item of evidence supporting the idea of continental drift.
**A:** What is the earth looking like a puzzle, rock evidence, or fossil evidence?

**Q:** This German scientist authored a book on the Continental Drift Theory.
**A:** Who is Alfred Wegner?

**Q:** These are the names for the two continents that Pangaea split into.
**A:** What are Laurasia and Gondwanaland?

**Appendix E: Culminating Activity (Continued)**
**Jeopardy Questions and Answers**

**Layers of the Earth**

**Q:** This is the hottest layer.
**A:** What is the inner core?

**Q:** This is the thinnest layer of earth.
**A:** What is the crust?

**Q:** This layer is made of a solid that flows like a liquid.
**A:** What is the mantle?

**Q:** This layer is liquid iron and nickel.
**A:** What is the outer core?

**Q:** This is the cause of the inner core being solid iron and nickel.
**A:** What is pressure?

**Earthquakes**

**Q:** An instrument used to measure earthquakes.
**A:** What is a seismograph?

**Q:** The point below the surface where the earthquake occurs.
**A:** What is the focus?

**Q:** Earthquakes are measured for magnitude and damage on these two scales.
**A:** What are the Richter and Mercalli scales?

**Q:** The point on the surface above the focus.
**A:** What is the epicenter?

**Q:** Earthquakes occur at this type of boundary.
**A:** What is a transform boundary?

**Appendix E: Culminating Activity (Continued)**
**Jeopardy Questions and Answers**

**Volcanoes**

**Q:** These formed the Hawaiian Islands.
**A:** What are hot spots?

**Q:** The type of boundary that creates a volcano when an oceanic plate moves under another plate.
**A:** What is a convergent boundary?

**Q:** The type of boundary that creates a volcano when two plates move away from each other.
**A:** What is a divergent boundary?

**Q:** These are created as a plate continually moves over a hot spot.
**A:** What are volcanic chains?

**Q:** This is the god of fire.
**A:** Who is Hephaistos or Vulcan?

**Final Jeopardy**

**Q:** The earth is constantly doing this.
**A:** What is moving?

**Q:** This is the study of the movement of plates.
**A:** What is plate tectonics?

**Appendix F: Culminating Activity (Continued)**
**Jeopardy Game Board**

# Jeopardy Game Board

| Plate Movements | Theories | Layers of the Earth | Earthquakes | Volcanoes |
|---|---|---|---|---|
| $100 | $100 | $100 | $100 | $100 |
| $200 | $200 | $200 | $200 | $200 |
| $300 | $300 | $300 | $300 | $300 |
| $400 | $400 | $400 | $400 | $400 |
| $500 | $500 | $500 | $500 | $500 |

## Appendix G: Culminating Activity – Plate Tectonics Unit Test

**PLATE TECTONICS TEST** **Name _____**

**Matching: Match the vocabulary words with the appropriate definitions.**

| | |
|---|---|
| convergent boundary _____ | 1. occurs when two plates move against each other |
| transform boundary _____ | 2. occurs when two plates move away from each other |
| divergent boundary _____ | 3. occurs when two continental plates collide |
| collisional boundary _____ | 4. occurs when an oceanic plate either moves under a continental plate or another oceanic plate |

**Data Recall: Provide at least two facts about each of the following layers of the earth.**

| Crust | Mantle | Outer Core | Inner Core |
|---|---|---|---|
| | | | |

**Short Answer: Provide an appropriate response for each question.**

1. What occurs to the temperature of the earth as one gets closer to the core?

2. What is the meaning of plate tectonics?

3. What is the earth always doing?

4. What is the relationship between the *focus* and *epicenter* of an earthquake?

5. At what two types of boundaries can volcanoes occur?

## Appendix G – Culminating Activity (Continued)
## Plate Tectonics Unit Test

**Essay: Provide a detailed answer to the following questions using at least one complete sentence.**

1. Using the word *hot spot*, explain how island chains are formed.

2. How is it possible for an earthquake to measure relatively **high** on the *Mercalli scale*, but measure **low** on the *Richter scale*?

3. How is it possible for an earthquake to measure relatively **low** on the *Mercalli scale*, but measure **high** on the *Richter scale*?

4. Explain the *Continental Drift Theory*. Use *Pangaea* and *Alfred Wegner* in your response.

5. Why do earthquakes typically occur at transform boundaries?