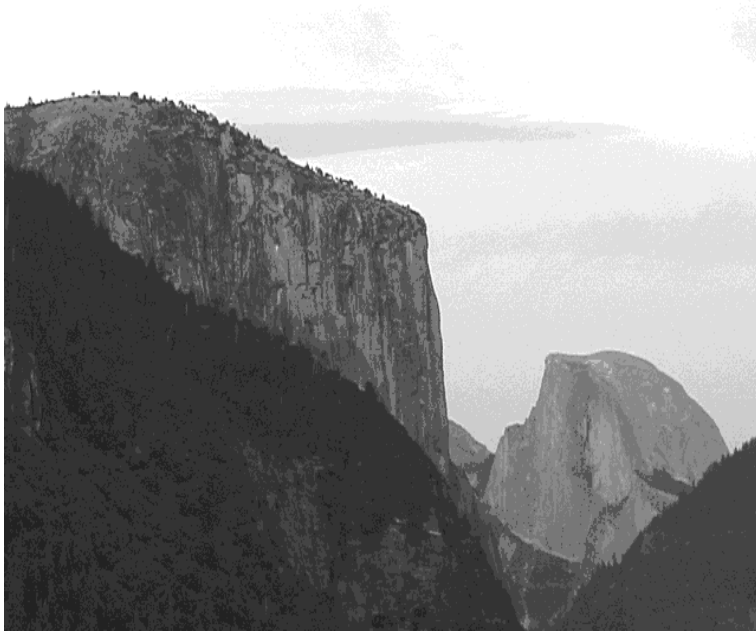


Topography and the Earth

Teacher's Guide Middle School



Editors:
Brian A. Jerome, Ph.D.
Stephanie Zak Jerome

Assistant Editors:
Heidi Berry
Anneliese Brown

Visual Learning Company
Brandon, Vermont
1-800-453-8481
www.visuallearningco.com



Use and Copyright:

The purchase of this video program entitles the user the right to reproduce or duplicate, in whole or in part, this teacher's guide and the blackline master handouts for the purpose of teaching in conjunction with this video, *Topography and the Earth*. The right is restricted only for use with this video program. Any reproduction or duplication, in whole or in part, of this guide and student masters for any purpose other than for use with this video program is prohibited.

The video and this teacher's guide are the exclusive property of the copyright holder. Copying, transmitting or reproducing in any form, or by any means, without prior written permission from the copyright holder is prohibited (Title 17, U.S. Code Sections 501 and 506).

Copyright © 2002

ISBN 1-59234-049-0



Table of Contents

	<u>Page</u>
A Message From our Company	5
National Standards Correlations	6
Student Learning Objectives	7
Assessment	8
Introducing the Video	9
Video Viewing Suggestions	9
Video Script	11
Answers to Student Assessments	16
Answers to Student Activities	17
Assessment and Student Activity Masters	18



Viewing Clearances

The video and accompanying teacher's guide are for instructional use only. In showing these programs, no admission charges are to be incurred. The programs are to be utilized in face-to-face classroom instructional settings, library settings, or similar instructional settings.

Duplication rights are available, but must be negotiated with the *Visual Learning Company*.

Television, cable or satellite rights are also available, but must be negotiated with the *Visual Learning Company*.

Closed circuit rights are available, and are defined as the use of the program beyond a single classroom but within a single campus. Institutions wishing to utilize the program in multiple campuses must purchase the multiple campus version of the program, available at a slightly higher fee.

Discounts may be granted to institutions interested in purchasing programs in large quantities. These discounts may be negotiated with the *Visual Learning Company*.



A Message from our Company ...

Dear Educator:

Thank you for your interest in the educational videos produced by the *Visual Learning Company*. We are a Vermont-based, family owned and operated business specializing in the production of quality educational science videos and materials.

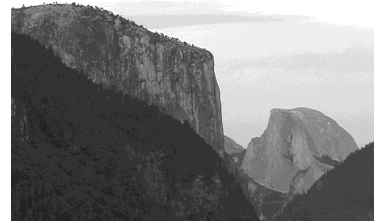
We have a long family tradition of education. Our grandmothers graduated from normal school in the 1920's to become teachers. Brian's mother was an elementary teacher and guidance counselor, and his father was a high school teacher and superintendent. This family tradition inspired Brian to become a science teacher, and to earn a Ph.D. in education, and lead Stephanie to work on science educational programs at NASA.

In developing this video, accompanying teacher's guide, and student activities, our goal is to provide educators with the highest quality materials, thus enabling students to be successful. In this era of more demanding standards and assessment requirements, supplementary materials need to be curricular and standards based - this is what we do!

Our videos and accompanying materials focus on the key concepts and vocabulary required by national and state standards and goals. It is our mission to help students meet these goals and standards, while experiencing the joy and thrill of science.

Sincerely,

Brian and Stephanie Jerome



Standards Correlations

National Science Education Standards

(Content Standards: 5-8, National Academy of Sciences, c. 1996)

Earth and Space - Content Standard D:

As a result of their activities in grades 5-8, all students should understand that:

- The solid earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core.
- Landforms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.

Benchmarks for Science Literacy

(Project 2061 - AAAS, c. 1993)

The Physical Setting - Processes that Shape the Earth (4C)

By the end of the 8th grade, students should know that:

- The solid crust of the earth- including both the continents and the ocean basins- consists of separate plates that ride on a denser, hot, gradually deformable layer of the earth. The crust sections move very slowly, pressing against one another in some places, pulling apart in other places. Ocean-floor plates may slide under continental plates, sinking deep into the earth. The surface layers of these plates may fold, forming mountain ranges.



Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students should be able to do the following:

- List the seven major continents: North America, South America, Asia, Europe, Africa, Australia, and Antarctica;
- Understand that topography describes the shape of the earth's surface;
- Differentiate between the three major landforms: plains, plateaus, and mountains;
- Define *relief* and explain that the three major landforms differ from one another based on relief;
- Explain that individual mountains combine to form mountain ranges, mountain systems, and mountain belts;
- Understand that the earth is divided into three layers based on chemical properties - crust, mantle, and core;
- Differentiate between the physical properties of the lithosphere and asthenosphere;
- Explain that the temperature and density of materials within the earth's interior increase with depth; and
- Briefly describe the characteristics of the crust, mantle, and core.



Assessment

Preliminary Test:

The Preliminary Test, provided in the Student Masters section, is an assessment tool designed to gain an understanding of student preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Video Review:

The Video Review, provided in the Student Masters section, can be used as an assessment tool or as a student activity. There are two main parts. The first part contains questions titled “You Decide” that can be answered during the video. The second series of ten questions consists of a video quiz to be answered at the conclusion of the video.

Post-Test:

The Post-Test, provided in the Student Masters section, can be utilized as an assessment tool following student completion of the video and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.



Introducing the Video

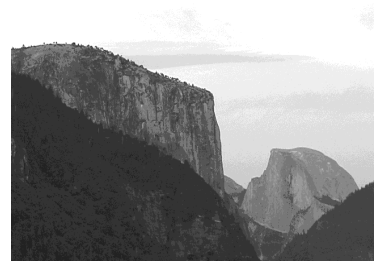
Before viewing this video, divide students into groups of three or four. Provide each group with two large pieces of drawing paper and colored pencils or markers. Tell the groups to draw a picture of what the earth looks like where they live, and then present their pictures to the class. Explain that they have drawn a picture of the *topography* of the area where they live. Ask the class to describe different types of landforms (mountains, plateaus, and/or plains) that they have visited or seen in photos. Next, ask the groups to draw a cross-section of what they think the interior of the earth looks like. Again, have each group present their drawings to the class. Explain that the earth's interior is divided into different layers based on physical and chemical properties. Tell them to pay close attention to the video to learn more about the surface of the earth and the earth's interior.

Video Viewing Suggestions

The Student Master "Video Review" is provided for distribution to students. You may choose to have your students complete this Master while viewing the program or to do so upon its conclusion.

The program is approximately 20-minutes in length and includes a ten-question video quiz. Answers are not provided to the Video Quiz on the video, but are included in this teacher's guide. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.



Student Assessments And Activities

Assessment Masters:

- Preliminary Test
- Video Review
- Post-Test

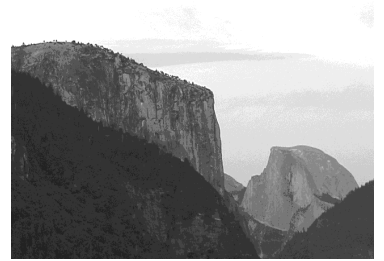
Student Activity Masters:

- Earth's Peaks
- Modeling the Earth
- Topography of North America
- The Earth Puzzle
- Vocabulary of *Topography and the Earth*



Video Script: *Topography and the Earth*

1. From space, earth looks like a smooth, round marble.
2. But the view of earth here at ground level gives quite a different impression.
3. Here the earth looks sharp and jagged.
4. What's the surface of the earth like where you live,...
5. ...and how does this affect your everyday life?
6. What's the earth like beneath your neighborhood,...
7. ...and what's it like several kilometers below the surface?
8. During the next few minutes, we're going to explore these questions, and many more,...
9. ...as we explore some of the surface features of the earth...
10. ...and the characteristics of earth's interior.
- 11. Graphic Transition – The Land**
12. You might already know that over 70% of the earth is water.
13. But what makes up the rest of the earth?
14. Land. Small pieces of land scattered in oceans are referred to as islands.
15. Larger areas of land are divided into regions called continents.
16. There are seven major continents: North America, South America, Asia, Europe, Africa, Australia, and Antarctica.
17. Antarctica and Australia are isolated, and are not connected to other continents.
18. But North America and South America are connected to one another by a narrow strip of land in Central America.
19. And Europe and Asia appear as one complete landmass,...
20. ...often referred to as Eurasia.
- 21. Graphic Transition – Topography**
22. If you get car sick, this racecar is not the place for you.
23. Weaving around corners and bobbing up and down may make you feel queasy.
24. What's responsible for the different ways this vehicle is moving?
25. Topography is responsible for the different ways these cars are travelling.
26. Topography is the shape of the surface of the earth.
27. The topography of the earth is made up of different landforms.
28. The contours of a particular area make up an overall landform.
- 29. You Decide!** How would you describe the landform of this area?
30. This area is relatively flat and is called a plain – a large, flat, expansive landform.
31. There are three major landforms – plains, mountains, and plateaus.
32. Let's take a closer look at these landforms.



Script (cont.)

33. Graphic Transition – Plains

34. This beautiful sea of grass is located in Iowa.
35. This group of plants and animals make up the tallgrass prairie.
36. Prairies are also referred to as plains.
37. Plains are landscapes that only have slight changes in height or elevation.
38. Elevation is the distance of a location above sea level.
39. The elevation here in Iowa is about 625 feet, or about 200 meters, above sea level.
40. Relief is the difference of elevation within a region.
41. Plains don't have a great deal of relief because there is only a slight difference between the high points and low points.
42. This plain in Iowa is part of the interior plain located in the central part of North America.
43. The interior plain stretches for thousands of kilometers with little relief.
44. Much of the interior plain of North America possesses fertile soils, which once supported fantastic wildlife, such as the American bison,...
45. ..and elk.
46. Today, a large portion of the interior plain has been tilled to grow corn, wheat, and other crops.
47. Large expanses of plains can also be found along the coast.
48. These plains are called coastal plains.
49. Coastal plains make up a large portion of the eastern coast of North America.
50. Parts of the eastern coastal plain were once covered by large expanses of forest, ...
51. ... which provided habitat for a wide variety of animals, such as this woodpecker.
52. In many areas the soil is fertile, giving rise to vegetables, cotton, and other crops.
53. The coastal plain is also the site of many large cities that are inhabited by millions of people.

54. Graphic Transition – Plateaus

55. Plateaus are a second type of landform.
56. Whereas plains are expansive regions with relatively low elevations,...
57. ...plateaus are high, flat regions with elevations of over 600 meters.
58. The Colorado Plateau is one of the most dramatic plateaus in North America, stretching for hundreds of kilometers.
59. Here in Bryce Canyon National Park in Utah, these unusual column-like features have been cut out of the Colorado plateau.
60. Over many years water has eroded away the upper portion of the plateau, while more resistant rocks remain.
61. The Colorado River cuts deeply into the Colorado Plateau, forming the Grand Canyon.
62. Here many layers of rock are visible. In some places they're nearly 1.5 kilometers, or 1 mile, deep.



Script (cont.)

63. Graphic Transition – Mountains

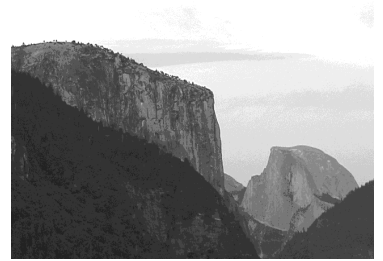
64. Mountains are one of the most exciting and interesting landforms.
65. People spend their vacations skiing down mountain slopes, . . .
66. . .fishing in mountain streams,...
67. . . and hiking on mountain trails.
68. Mountains are landforms that have narrow tops, steep slopes, and reach high elevations.
69. Some mountains, such as the Rocky Mountains seen here, are quite jagged,...
70. . .whereas other mountains, such as the Chic Choc Mountains in Quebec, Canada, are more rounded.
71. Thousands of years of weathering have rounded the Adirondack mountains in New York. These mountains were once quite tall and jagged.
72. **You Decide!** What's the elevation of North America's tallest mountain?
73. Mt. McKinley, also called Denali, is North America's tallest mountain. It's 6,194 meters tall – that's over 3 and a half miles high!
74. Denali, and most other mountains, exist in groups called mountain ranges.
75. The mountains seen here are part of the White Mountain Range in New Hampshire.
76. And these mountains in Vermont are part of the Green Mountain Range.
77. These different mountain ranges are part of a larger mountain system.
78. They are part of the Appalachian Mountain System, which stretches from Georgia all the way up into Quebec, Canada.
79. In some cases, mountain systems are part of a very large chain of mountains called a mountain belt.
80. For example, the Sierra Nevada Mountains are part of the Circum-Pacific belt, which encircles the Pacific Ocean.
81. Now that we've explored the surface of the earth, let's take a look inside the earth.

82. Graphic Transition – Inside the Earth

83. You've probably seen big holes such as this quarry dug in the earth. But relatively speaking, this hole is actually quite shallow.
84. We live and play on top of the earth. Beneath us are layers of materials that extend for thousands of kilometers to the center of the earth.
85. If you were to dig a giant hole to see the earth's center, what would you see?
86. You'd observe several changes. First, you would notice that the chemical composition of the materials inside the earth change as you dig deeper.
87. Second, you'd notice that the density of the materials increases with depth.
88. And the third thing you would notice is that pressure and temperature increase as you get closer to the earth's center.

89. Graphic Transition – Earth's Layers Based on Physical Properties

90. The part of the earth we live on is approximately proportional in thickness to the skin on this apple.



Script (cont.)

91. The outermost layer is the lithosphere. The lithosphere is the relatively cool, rigid part of the earth on which we live.
92. The lithosphere is between 50 and 100 kilometers thick, extending downward into the earth.
93. At least seven major plates make up the lithosphere.
94. For example, the North American plate holds the North American continent and also extends half way across the Atlantic Ocean.
95. Beneath the lithosphere is a physical layer called the asthenosphere.
96. The asthenosphere is 130 to 160 kilometers thick.
97. The asthenosphere is warmer than the lithosphere and has a thick, gooey texture similar to hot fudge.
98. The hot molten material in the asthenosphere rises and sinks in circular flows called convection currents.
- 99. Graphic Transition – The Crust**
100. Another way to look at the inside of the earth is based on the materials that make up the earth. Based on mineral composition there are three main layers of the earth – the crust, the mantle, and the core.
101. The crust is the outer layer, the mantle is the middle layer, and the core is the layer at the center of the earth.
102. You can think of these layers like the layers of a baseball, with the covering being the crust, the wound string being the mantle, and the rubber center being the core.
103. Let's first take a look at the crust.
104. We live our lives on top of the crust. The ground we walk on is hard and dense, as is most of the crust.
105. Compared to the rest of the earth, the crust is actually quite thin, similar in thickness to the skin of this apple.
106. The crust is between 8 and 32 kilometers thick.
107. You cannot see most of the crust because it is covered with trees and grass.
108. But in some places, like here in Death Valley, you can actually see the rocks that make up the top part of the crust.
109. The crust is composed primarily of silicates, which are rocky materials made up of silica and oxygen.
110. Common silicates found in the crust are rich in aluminum, iron, calcium and magnesium.
111. The crust's thickness varies from an average of 32 kilometers thick on land . . .
112. . . to around 8 kilometers thick under the oceans.
- 113. Graphic Transition – The Mantle and the Core**
114. Beneath the crust lies the mantle. No person has ever seen the mantle, but scientists have a good idea of what it's made of.
115. The mantle makes up most of the volume of the earth, over 80%.



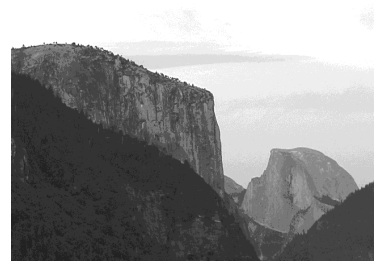
Script (cont.)

116. It extends to a depth of around 2,900 kilometers below the surface.
117. By studying rock samples from volcanoes and from the floor of the ocean, scientists believe that the mantle is made predominantly of the elements silicon, oxygen, magnesium, and iron.
118. The mantle has two main parts – the upper mantle and the lower mantle.
119. The temperature is cooler in the upper mantle at around 870 degrees Celsius, but in the lower mantle the temperatures rise to 2,200 degrees Celsius.
120. At these temperatures, rock becomes molten or liquid and has the ability to flow and change form.
121. Beneath the mantle, at a depth of 5,150 kilometers beneath the surface of the earth, is the very dense core.
122. Iron and nickel are common elements in the core.
123. The presence of iron deep in the core is believed to be a possible cause of magnetic fields, which surround the earth.
- 124. Graphic Transition – Summing Up**
125. During the past few minutes, we've explored the major topographical landforms that make up the earth, . . .
126. . . . including large, relatively flat plains;
127. high, flat regions called plateaus;...
128. . . . and tall steep sloped mountains
129. We also took an in-depth look at the different parts of the earth; . . .
130. . . . including the crust, which makes up the outer portion of the earth;...
131. ...the mantle which makes up the majority of the volume of the earth;...
132. ...and the very dense core which is believed to contribute to earth's magnetic field.
133. So the next time you look at the surface of the earth around your neighborhood, . . .
134. . . . or dig into the ground, . . .
135. . . . think about some of the characteristics of our planet.
136. You just might look at the earth a little differently.

Video Quiz

Fill in the correct word when you hear this tone. Good luck, and let's get started.

1. _____ is the shape of the earth's surface.
2. _____ are large, relatively flat landforms.
3. _____ is the distance of a location above sea level.
4. _____ is the difference in elevation in a place.
5. Plateaus are _____ flat, regions.
6. A group of mountains is called a mountain _____.
7. At least _____ major plates make up the lithosphere.
8. The _____ is the outer layer of the earth.
9. The mantle makes up most of the _____ of the earth.
10. The material in the core is very _____.



Answers to Student Assessments

Preliminary Test

1. water
2. seven
3. prairies
4. increase
5. relief
6. mantle
7. crust
8. topography
9. plain
10. mountains
11. false
12. true
13. true
14. false
15. true
16. false
17. true
18. true
19. false
20. true

Video Review

You Decide:

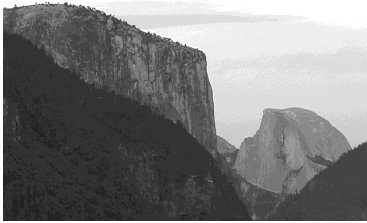
1. The area is relatively flat and is called a plain.
2. At 6,194 meters high, Mt. McKinley, also called Denali, is North America's tallest mountain.

Video Quiz:

1. topography
2. plains
3. elevation
4. relief
5. high
6. range
7. seven
8. crust
9. volume
10. dense

Post Test

1. true
2. false
3. false
4. true
5. true
6. true
7. true
8. true
9. false
10. false
11. increase
12. topography
13. mantle
14. mountains
15. prairies
16. crust
17. seven
18. plain
19. relief
20. water



Answers to Student Activities

Earth's Peaks

Peak	Location	Range	Height
Aconcaqua	Chile	Andes	6,960 m
Anapurna	Nepal	Himalayas	8,078 m
Kilimanjaro	Tanzania	Pare Mts.	5,895 m
Mont Blanc	France	French Alps	4,807 m
Mt. Cook	New Zealand	Southern Alps	3,764 m
Mt. Everest	Nepal	Himalayas	8,848 m
Mt. McKinley (Denali)	Alaska	Brooks Range	6,194 m
Mt. Washington	New Hampshire	White Mts.	1,917 m
Mt. Whitney	California	Sierras	4,418 m
Vinson Massif	Antarctica	Sentinel Range	4,897 m

Modeling the Earth

	<u>Distance</u>	<u>% of radius</u>	<u>Thickness on 20 cm sphere</u>
Crust	30 km.	less than 0.5%	0.1 cm
Mantle	2,900 km.	45%	9.0 cm
Outer Core	2,200 km.	34%	6.9 cm
Inner Core	1,250 km.	20%	4.0 cm

Topography of North America

1. Check an atlas for the general location of landforms.
2. The Rocky Mountain Range is the longest mountain range.
3. Most states and provinces in central North America are located on the plains.
4. The Sierra Nevada Mountains are found in California.
5. The Brooks range is found in Alaska.

6. The White Mts., Green Mts., and Blue Ridge Mts are all part of the Appalachian Mt. System.
7. Overall, the Rocky Mts. are higher.

The Earth Puzzle

Part I:

1. D
2. C
3. D
4. C

Part II:

5. Wegner was not able to explain why Pangea split apart.
6. Map makers noticed that the coasts of Africa and South America fit together like the pieces of a puzzle.
7. Du Toit supported Wegner's theory and believed that Pangea first broke into 2 continents - Laurasia and Gondwanaland.
8. Evidence of the theory of plate tectonics includes the existence of similar fossils, plants, and animal species on separate continents. Mountain ranges on different continents also line up if continents are aligned. Plates have been observed to be actually moving on the surface of the earth.

Vocabulary:

1. d, plateau
2. i, elevation
3. a, continents
4. g, crust
5. c, relief
6. j, plain
7. e, mountain
8. b, topography
9. f, core
10. h, mantle

Assessment and Student Activity Masters





Preliminary Test

Directions: Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

1. About 70% of the earth's surface is covered with _____.
2. There are _____ major continents.
3. Plains are also referred to as _____.
4. Temperature and pressure _____ as you get closer to the earth's center.
5. Plains have little _____.
6. The _____ makes up the majority of the volume of the earth.
7. The _____ is the thin layer of the earth on which we live.
8. _____ refers to the shape of the earth's surface.
9. Many large cities are built on the coastal _____ in Eastern North America.
10. _____ are tall landforms with narrow tops.

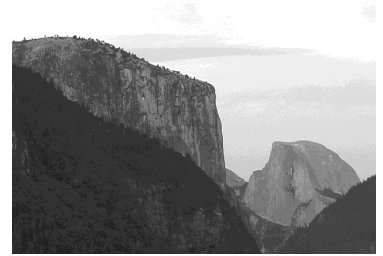
prairies	topography
plain	seven
crust	mantle
mountains	relief
core	increase
water	decrease



Preliminary Test

Directions: Decide whether the answer is True (T) or False (F).

- | | | |
|---|---|---|
| 11. Plains have a great deal of relief. | T | F |
| 12. There are three main layers of the earth. | T | F |
| 13. The earth's core is mostly made up of iron and nickel. | T | F |
| 14. Plateaus are low, flat regions on the earth's surface. | T | F |
| 15. Elevation is the distance of an area above sea level. | T | F |
| 16. The temperature in the center of the earth is very cold. | T | F |
| 17. We live on the crust. | T | F |
| 18. No person has ever seen the mantle. | T | F |
| 19. The three major landforms are plains, coast, and mountains. | T | F |
| 20. The Grand Canyon cuts through the Colorado Plateau. | T | F |



Video Review

Directions: During the course of the program, answer the “You Decide” questions as they are presented in the video. Answer the Video Quiz questions at the end of the video.

You Decide:

1. How would you describe the landscape of this area? Answer _____
2. What is the elevation of North America’s tallest mountain? Answer _____

Video Quiz:

1. _____ is the shape of the earth’s surface.
2. _____ are large, relatively flat landforms.
3. _____ is the distance of a location above sea level.
4. _____ is the difference in elevation in a place.
5. Plateaus are _____, flat regions.
6. A group of mountains is called a mountain _____.
7. At least _____ major plates make up the lithosphere.
8. The _____ is the outer layer of the earth.
9. The mantle makes up most of the _____ of the earth.
10. The material in the core is very _____.



Post Test

Directions: Decide whether the answer is True (T) or False (F).

1. Elevation is the distance of an area above sea level. T F
2. The three major landforms are plains, coast, and mountains. T F
3. Plains have a great deal of relief. T F
4. We live on the crust. T F
5. No person has ever seen the mantle. T F
6. There are three main layers of the earth. T F
7. The Grand Canyon cuts through the Colorado Plateau. T F
8. The earth's core is mostly made up of iron and nickel. T F
9. The temperature in the center of the earth is very cold. T F
10. Plateaus are low, flat regions on the earth's surface. T F



Post Test

Directions: Fill in the blank with the correct word. Choose from the list of possible answers at the bottom of the page.

- 11. Temperature and pressure _____ as you get closer to the earth's center.
- 12. _____ refers to the shape of Earth's surface.
- 13. The _____ makes up the majority of the volume of the earth.
- 14. _____ are tall landforms with narrow tops.
- 15. Plains are also referred to as _____.
- 16. The _____ is the thin layer of the earth on which we live.
- 17. There are _____ major continents.
- 18. Many large cities are built on the coastal _____ in Eastern North America.
- 19. Plains have little _____.
- 20. About 70% of the earth's surface is covered with _____.

- | | |
|-----------|------------|
| prairies | topography |
| plain | seven |
| crust | mantle |
| mountains | relief |
| core | increase |
| water | decrease |



Earth's Peaks

Objective: In this lab, students will learn about the location and size of some of earth's tallest peaks.

Background: Mountains are one of the most exciting landscapes on the earth's surface. Mountains are not only beautiful to look at, but also provide humans with many forms of recreation, including skiing, hiking, mountain biking, and rock climbing. As you have learned, individual mountains are usually part of a larger group of mountains, known as mountain ranges. Mountain ranges are found throughout the world, and often differ greatly from one another. Some are very tall and exist at high elevations, while others are located closer to sea level. Mountains also differ in appearance - some have sharp, jagged peaks, while others appear more rounded. Regardless of their appearance and location, mountains continue to fascinate people across the world.

Directions: Below is a table containing a list of some of the world's tallest and most famous peaks. Using library and internet resources, research each peak. Determine its height, location, and the range it is part of. If the peak is located in the United States, be sure to include the state in which it is found.

Peak	Location	Range	Height
Aconcoqua			
Anapurna			
Kilimanjaro			
Mont Blanc			
Mt. Cook			
Mt. Everest			
Mt. McKinley (Denali)			
Mt. Washington			
Mt. Whitney			
Vinson Massif			



Modeling the Earth

Objective: In this activity students will make a model of the earth using a styrofoam ball cross-section or on paper to get a relative idea of the interior structure of the earth.

Background: The earth is composed of many layers, each having different characteristics. The innermost layer of Earth is called the **inner core**. At a depth of about 5,150 km, the inner core endures an enormous amount of pressure. The elements iron and nickel are the dominant materials, exceeding temperatures of 5000^o Celsius! Surrounding the inner core is the **outer core**, found at a depth of 2,900 km. Surrounding the outer core is the **mantle**. This layer makes up about 80% of Earth’s volume! The mantle is broken up into two different parts the upper mantle which is closer to Earth’s surface, and the lower mantle, which is closer to the center of the earth. Finally, the outermost layer of the earth is the **crust**. The crust is relatively thin compared to the other layers of the Earth.

Materials:

- calculator
- half of styrofoam ball (at least 20 cm. diameter) or paper
- markers

Procedure:

1. The styrofoam sphere will represent a cross-section of the earth. Measure the diameter of the styrofoam sphere. Then divide the diameter by 2 to obtain the radius of the sphere.
2. Let the radius represent 6,400 kilometers from the earth’s surface to the center.
3. You will now need to make some calculations to relate the radius of your sphere to the approximate thicknesses of the earth’s layers.
4. After completing the calculations, mark the boundaries of each layer. If you do not have a sphere, then mark the layers on a piece of paper.
5. Color each of the layers with a different color.

	Thickness in kilometers	% of radius	Thickness on 20 cm. sphere
Crust	30 km		
Mantle	2,900 km		
Outer Core	2,200 km		
Inner Core	1,250 km		



Topography of North America

Objective: In this activity, students will explore the topography of North America by identifying various landforms.

Background: The topography of North America consists of a variety of landforms. In fact, all three major landforms can be found on the North American continent. **Plains** or **prairies** are areas of relatively flat land with little change in relief and are found at low elevations. For example, Iowa is part of the **Interior Plain**. **Plateaus** are flat areas found at high elevations. The **Colorado Plateau** is a very large plateau. **Mountains** have narrow tops, steep slopes and reach high elevations. There are numerous mountain ranges in North America.

Materials:

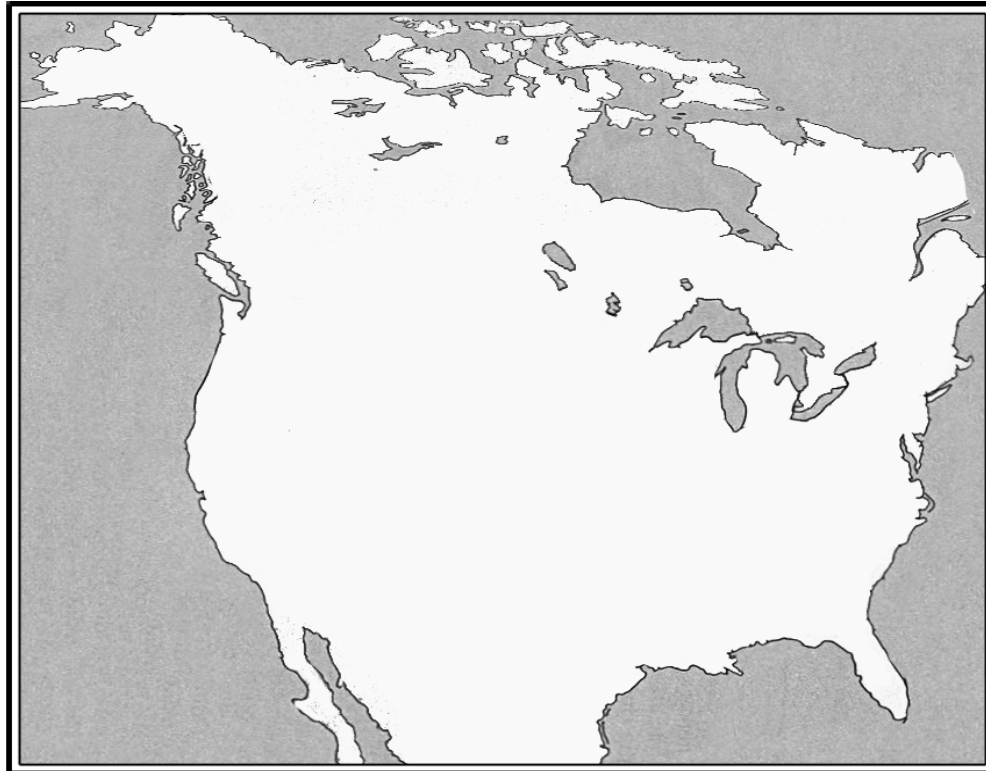
colored pencils
atlas, or physical map of North America

Procedure:

1. Obtain a physical map of North America. An atlas usually contains a physical map.
2. Using the physical map as a reference, locate the following landforms: **Rocky Mountains, Appalachian Mountains, Eastern Coastal Plain, Interior Plain, Colorado Plateau, Cascade Mountains, Sierra Nevada Mountains, and the Brooks Range.**
3. On the following page, color the boxes next to each landform. Use a different separate color for each box.
4. Using the map on the following page, shade the general area where each listed landform is located.
5. Answer the questions that follow.



Topography of North America



- | | |
|--|--|
| <input type="checkbox"/> Rocky Mountains | <input type="checkbox"/> Brooks Range |
| <input type="checkbox"/> Appalachian Mountains | <input type="checkbox"/> Colorado Plateau |
| <input type="checkbox"/> Eastern Coastal Plain | <input type="checkbox"/> Sierra Nevada Mountains |
| <input type="checkbox"/> Interior Plain | <input type="checkbox"/> Cascade Mountains |

Questions:

1. On what type of landform do you live?
2. Which mountain system is the longest?
3. Name three states or provinces located on the Interior Plain?
4. Where are the Sierra Nevada Mountains located?
5. Which mountain range is not found in Continental United States?
6. Provide some examples of specific mountain ranges not noted on the map.
7. Which mountain range has an overall higher elevation - the Rocky Mountains or the Appalachian Mountains?



The Earth Puzzle

As you may know, there are seven continents on the Earth's surface. However, this was not always the case. Scientists believe that the individual continents were once part of one "supercontinent" called Pangea. Pangea, which means "all lands" in Greek, is thought to have formed 300 million years ago.

The idea that the continents were once connected began in the 19th century. Map makers began to notice that it looked like the coasts of Africa and South America fit together, much like the pieces of a puzzle! Around the same time, scientists began to notice similarities between animals that lived on continents that were separated by thousands of miles of ocean. Realizing that these animals would not be able to swim across the ocean, they hypothesized that the animals must have lived on one giant continent that later split apart. In 1915, German scientist Alfred Wegner introduced the theory of continental drift. The continental drift theory states that the "super continent" split into individual continents, which "drifted" to their current position. Alexander Du Toit, one of Wegner's colleagues and supporters, believed that Pangea first divided into two large continents - Laurasia to the north and Gondwanaland to the south. Wegner had strong evidence to support his theory of one landmass, but was not able to explain why Pangea split apart. It wasn't until the 1960s that Wegner gained popular support. Scientists built on Wegner's ideas to develop the theory of plate tectonics and explain the movement of continents. This theory states that the earth's surface, known as the lithosphere, is divided into numerous plates. These plates float on top of the asthenosphere, which allows the plates to move.

If Pangea broke up approximately 200 million years ago, how do we know that the continents were once connected? There are many pieces of evidence. One is that the same fossils and plant species exist on continents separated by huge oceans. Another is that certain mountain ranges, located on different continents, would line-up if the continents were brought together. For example, the Appalachian Mountains are found in North America and Scandanavia, which are located thousands of miles apart. The theory of plate tectonics is supported by the actual observed movement of plates. They are currently moving at an average rate of 2 to 10 centimeters per year. Who knows what the earth's surface will look like 200 million years from now!



The Earth Puzzle (cont).

Directions: Answer the following questions.

Part I: Multiple Choice

1. Scientists believe that Pangea was formed over _____ years ago.
A. 150 million C. 200 million
B. 180 million D. 300 million
2. What does “Pangea” mean?
A. supercontinent C. all lands
B. great land D. all continents
3. Who developed the theory of continental drift?
A. Alexander Du Toit
B. Albert Einstein
C. a team of American scientists
D. Alfred Wegner
4. Which theory states that the earth’s surface is divided into moving plates?
A. continental drift
B. Pangea theory
C. plate tectonics
D. puzzle pieces theory

Part II. Short Answer

5. What was Wegner not able to explain with his theory of continental drift?
6. What was the first piece of evidence that caused people to think that the continents may have once been connected?
7. Describe Alexander Du Toit’s contribution to Wegner’s theory.
8. Provide some examples of evidence that supports the theory of plate tectonics.



Vocabulary of Topography and the Earth

___ 1) laputae _____

___ 2) oeeiantlv _____

___ 3) cstnninteo _____

___ 4) rtscu _____

___ 5) eflrie _____

___ 6) aipln _____

___ 7) inomautn _____

___ 8) gphstroyoap _____

___ 9) rceo _____

___ 10) nlamte _____

a. seven large landmasses on Earth

b. the shape of Earth's surface

c. the difference of elevation within a region

d. a flat high landform

e. landform found at high elevations consisting of steep slopes and a narrow top

f. the innermost layer of Earth

g. the part of Earth on which we live

h. the part of Earth that makes up most of Earth's volume

i. the distance of a location above sea level

j. large, relatively flat landform with little relief