Structure of the Earth

Throughout the guide, teaching tips are in red.

Activity Description & Estimated Class Time

In this 2-day activity, students try to place subterranean events at appropriate depths within the Earth. Each team has a model of Earth's interior with a scale indicating depth. On the model, the team places cards describing events such as: "temperatures reach 9,800 degrees Fahrenheit," "where diamonds form," "maximum depth of earthquakes," "where liquid iron is found," etc. Students speculate about depths of these events and record their reasoning in notebooks. At this point, students read about the structures of the earth to reveal where the events occur and create summaries.

Correlations to NC Science Standards

ESS.6.2.1 Use models to summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density.

Learning Target

Students will demonstrate knowledge and understanding of:

- the different layers of the earth
- how to collect information to summarize important characteristics of the structure of the earth.

Brief Science Background

If we moved downward from the surface of the Earth toward its center, we would go through a series of layers with different properties. First, we would go through a solid, brittle, rocky outer crust. Under that would be molten rock, ranging in consistency from syrup to barely flowing. Below that, we would reach the outer core, which is much more fluid. At the center would be a solid inner core. Because scientists cannot observe these layers directly, they have built this picture by studying topography, the ocean floor, rock outcrops, material erupted by volcanoes, and seismic waves passing through the Earth. They also measure gravitational and magnetic fields and test rocks at pressures and temperatures found deep in the Earth.

Part 1 - What Do You Think is Happening Below Our Feet?

Materials

Materials for the whole class

- Ability to project Earth's Interior Diagram (SD 1)

Materials for groups of 2 students

- 1 - 11" x 17" Earth's Interior Diagram
- 1 event strip of 10 Earth's Interior Events (from Earth's Interior Events, SD 3)
- Transparent tape
- Scissors
- Structure of the Earth Student Activity Sheet (SD 4), 1 per student

Preparation

1. Prepare to project Earth's Interior Diagram, SD 1.
2. Copy Earth's Interior Events, SD 3, E and cut into strips,1 strip per pair of students.
3. Copy Structure of the Earth Student Activity Sheet, SD 4, for each student.

Procedure

1. Give each student a copy of Structure of the Earth Student Activity Sheet, SD 4, page 1. Ask students to respond to question 1 individually. Emphasize to students that this is a time to make predictions and share prior knowledge. Allow about 5 minutes to draw their model and then share ideas.
   Questions 1 and 2 are designed to engage students with materials or concepts, ask questions, and share what they notice. Avoid teaching content at this time, even during discussions.
2. Next, have students answer question 2. Allow 3-5 minutes for them to record their answers, then lead a class discussion.
   If no one mentions the temperature of the interior of the earth, ask students to think about how hot or cold it is and why that might be.
3. Explain that they will explore some events that happen inside the earth that may give clues about its structure.
4. Give each pair of students one 11" x 17" Earth's Interior model.
5. Project Earth's Interior Diagram, SD 1. Explain that it shows the Earth as if a wedge were removed. The depth is marked in miles on one side and kilometers on the other. Familiarize students with the distances shown by comparing them to familiar distances such as a distance to a nearby town. Ask students to share anything else they notice about the model that might give them important information.
6. Give out the event strips from Earth's Interior Events, SD 3, transparent tape, and scissors. Also give students SD 4 pages 2 and 3. Ask pairs to cut the strip into 10 individual cards. Point out that each card is an event or condition occurring inside the Earth.
7. Challenge students to tape the cards to the model at the depth where they think that event or condition occurs. Remind students to use their earlier predictions, prior knowledge, and information in the model to make choices. Ask both members of the pair to write their own reasons for card placement on SD 4, #3.
   If a pair disagrees, tell them to choose a depth, but write their individual ideas in the chart. Students do not have to worry about being wrong, but need to think it through and write down their reasoning.
8. Circulate and look at students' reasons for placing cards. Use this as formative assessment of students' current understanding of the Earth's interior.
9. Tell students that in the next part of the lesson they will learn about the interior of the earth and will be able to update their models as they learn more.
10. To close the lesson, ask students to put a star beside the 3 cards they are most confident about. Have students share these selections and why they are confident in these choices.

Part 2 - What is Happening Below Our Feet?

Materials

Materials for the whole class

- Ability to project Earth's Interior Answer Key (SD 2)
- Access to Earth's layers reading

Materials for groups of 2 students

- Their completed Earth's Interior Diagram from Part 1
- Their Structure of the Earth Student Activity Sheet (SD 4) from part 1

Procedure

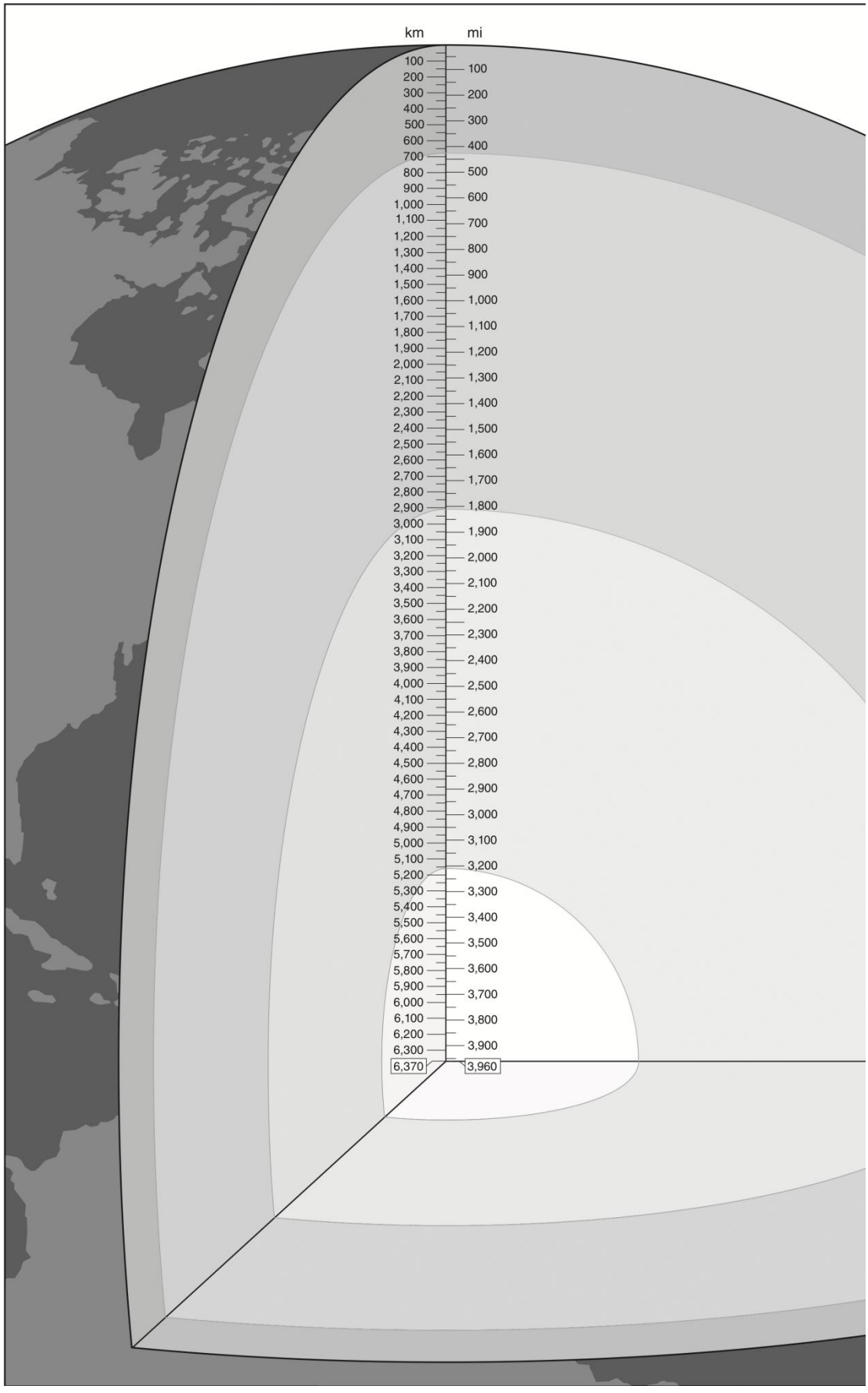
1. Have students take out their completed Earth's Interior Diagram and SD 4. Tell students that in this part, they will learn specific information about Earth's interior and record interesting facts they uncover.
2. Tell students that their task is to gather information about the layers of the Earth, depth of each layer, and other interesting facts. Record this information on the chart on SD 4, question 4.
   Possible resources for this are located at www.ciblearning.org. You can also assign text or other source material you have access to. Students can work individually or in partners or teams to gather needed information. If students need more support, consider using a guided note format to ensure that students get the necessary information.
3. As a class discuss, the information the students have gathered to ensure complete and accurate data has been collected.
4. Ask students to look at their Earth's Interior Diagram. Using their new information, students should rearrange their cards. When students have finished this portion, briefly discuss any changes they made and why.
5. Project Earth's Interior Answer Key, SD 2, to show the correct placement of the cards.

Content Connection

Ask students to label the layers on their model and write 2-3 important facts about each layer.

SD 1

Earth's Interior Diagram



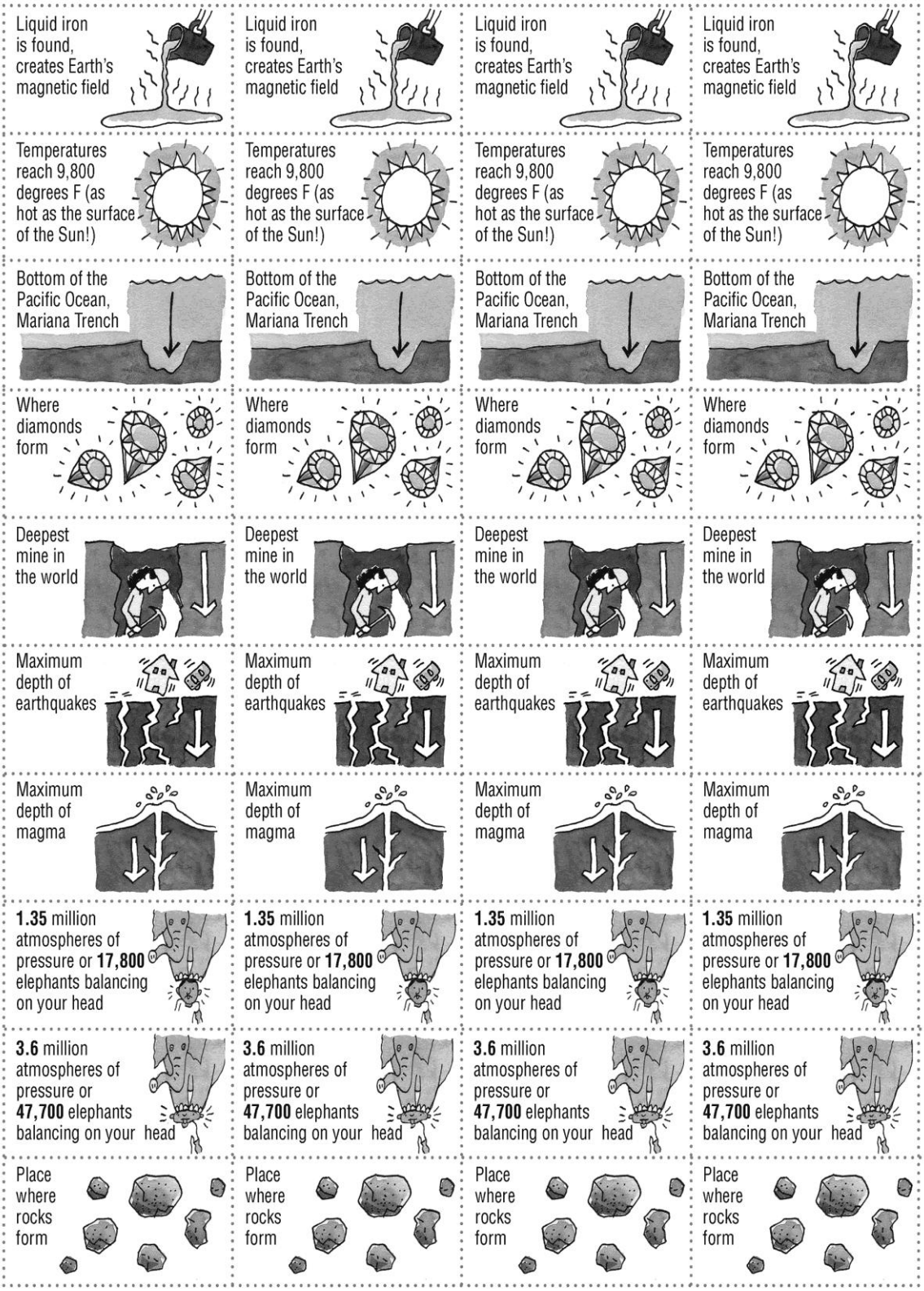
SD 2

Earth's Interior Answer Key

Depth from surface	Fact
1,800 - 3,200 mi	liquid iron is found, creates Earth's magnetic field
3,200 - 3960 mi	temperature 9,800˚ F, as hot as the surface of the sun
6.8 miles	bottom of the Pacific Ocean, Mariana Trench
93-155 miles	where diamonds form
2.5 miles	deepest mineral mine in the world
467 miles	maximum depth of earthquakes
1,800 miles	maximum depth of magma
1,800 miles	1.35 million atmospheres of pressure or 17,800 elephants balancing on your head
3,200 miles	3.6 million atmospheres of pressure or 47,700 elephants balancing on your head
0 - 120 mi	where rocks form

SD 3

Earth's Interior Event Cards



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Structure of the Earth Student Activity Sheet

Name:

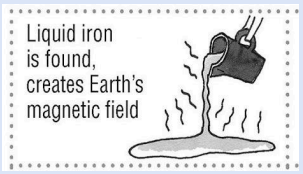
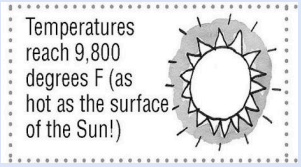
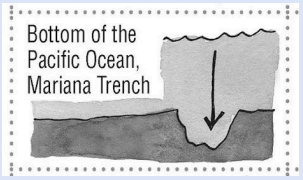
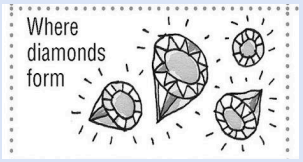
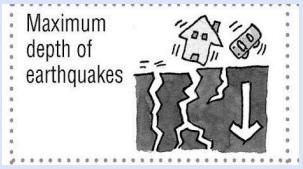
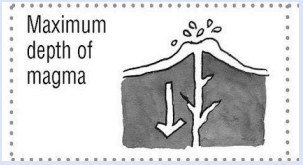
1. We know what the surface of the Earth looks like. What do you think below the surface and deep underground looks like? Consider these questions as you draw your model: What materials is it made of? What are the conditions? Is it all the same? Does it differ as you go deeper?

2. Now that you've shared your ideas on what the interior looks like, write down your ideas on what happens underground.

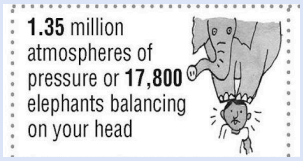
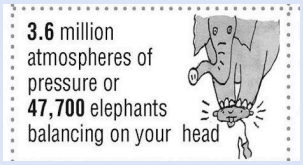
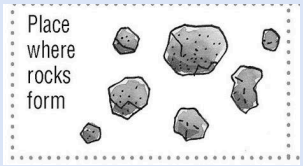
SD 4
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Structure of the Earth Student Activity Sheet

3. Write your reasons for placing the card where you did.

Earth Interior Event Card	Reason
	
	
	
	
	
	
	

Structure of the Earth Student Activity Sheet

Earth Interior Event Card	Reason
	
	
	

4. List the layers that make up the Earth, the depth where each layer is located, and interesting facts about each layer.

Layers of the Earth	Depth	Interesting Facts