Veteran Education Transfer Plan
Cover Sheet

Title of ETP	Exploring the Earth
Name of IISME Fellow	Deborah Bodony
Fellow's year-round email	bodony@stanford.edu
Sponsor Company	NASA Ames Research Center
Name of Mentor	Christina O'Guinn
National Board Certificate Area	Early Adolescence/Science

I, the IISME Fellow named above, affirm that the ETP I am submitting is my own work, that I acknowledged sources where appropriate, and that I avoided including any proprietary information of the Sponsor Company. By my submission I am assigning to IISME my entire copyright in the ETP. I understand IISME is simultaneously granting me a license to use the ETP for pedagogical purposes.

_____ _____

Signature Date

Category	*Curriculum* Subject: Math Science Technology _____ Level: Elem Middle High Other *Staff Development* *Describe*_____ *Other* *Describe*_____

This document can be downloaded from http://iisme.org under Summer Fellowships, Fellowship Forms.

Objectives	**California Science Standards:** • Students will learn that the Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core. (1b) **Early Adolescence/Science National Board Standards:** • Accomplished science teachers have a broad and current knowledge of science and science education, along with in-depth knowledge of one of the subfields of science, on which they draw to set appropriate learning goals with their students. (Standard II: Knowledge of Science) • Accomplished science teachers select and adapt instructional resources, including technology, laboratory, and community resources, and create their own resources to support active student explorations of science. (Standard III: Instructional Resources) • Accomplished science teachers stimulate interest in science and technology and elicit their students' sustained participation in learning activities. (Standard IV: Engagement) • Accomplished science teachers use a variety of instructional strategies to expand students' understanding of the major ideas of science. (Standard VIII: Fundamental Understandings)
Abstract (50 words or less)	"Exploring the Earth" is a unit focused on students learning about the interior of the Earth. A variety of instructional strategies including the use of technology, hands-on activities, teacher-directed learning, and student-directed learning are used throughout the unit in order to stimulate student thinking.
Describe how your ETP aligns with the National Board Standard stated in your proposal.	Through the lessons I wrote for my ETP, as well as for my fellowship, my knowledge of the Earth's interior was greatly expanded, and I learned current information about the scientific debates relating to the understanding of the interior of the Earth. (Standard II: Knowledge of Science) The focus of my ETP was to develop a unit on the interior of the Earth that used a variety of instructional strategies, especially those that would stimulate student thinking. As a result, my ETP aligns with Standard III: Instructional Resources, Standard IV: Engagement, and Standard VIII: Fundamental Understandings.
Describe the connection between your ETP and the Summer Fellowship.	For my summer fellowship, I wrote geology and biology lesson plans for NASA's Astroventure program. There are two direct connections between my ETP and my fellowship: both works are focused of on geology, and I used the same lesson planning format for my Astroventure lessons as for my ETP.

D7

Growth-Measurement Devices	Before beginning this unit, students will complete a pre-test about their knowledge of the interior of the Earth. This pre-test will also include questions about the students' experiences in science classes prior to the current one. After completing this unit, the students will take a post-test with questions focused on the scientific concepts that were taught in this unit as well as on the benefits of the instructional strategies used.
Resources Needed	See Materials and Equipment section in unit
Evaluation/Assessment Measures Used	Students are evaluated through a variety of methods in this unit. These methods include discussion, completion of worksheets for activities such as the scavenger hunt and asthenosphere model, homework, group project, and a short answer test.
Formatting specifications	PC __X__ or Mac____ **(Must be in Word or Text Format)** Software used _Microsoft Word___
Submitted Copy	Soft and hard copy due to peer coach by the end of the summer fellowship. Also, a copy of the cover sheet signed by a school site administrator submitted to IISME Oct.1, 2003 to receive $300 grant.

I, the **Mentor** named above [please select one of the following],

- ❑ have read the attached ETP, and my comments, if any, appear below.
- ❑ have read the attached ETP, and, as outlined in the IISME-Company Fellowship Agreement, have reviewed it on behalf of the Sponsor Company, and have determined that the ETP does not contain any Sponsor-proprietary information. My additional comments, if any, appear below.

Comments:

_____ _____

Signature Date

Administrator's comments:

_____ _____

Signature Date

D8

Unit on Exploring the Earth

Abstract:
"Exploring the Earth" is a unit focused on students learning about the interior of the Earth. A variety of instructional strategies including the use of technology, hands-on activities, teacher-directed learning, and student-directed learning are used throughout the unit in order to stimulate student thinking.

Standards:

California Science Standards:

- Students will learn that the Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core. (1b)

Early Adolescence/Science National Board Standards:

- Accomplished science teachers have a broad and current knowledge of science and science education, along with in-depth knowledge of one of the subfields of science, on which they draw to set appropriate learning goals with their students. (Standard II: Knowledge of Science)
- Accomplished science teachers select and adapt instructional resources, including technology, laboratory, and community resources, and create their own resources to support active student explorations of science. (Standard III: Instructional Resources)
- Accomplished science teachers stimulate interest in science and technology and elicit their students' sustained participation in learning activities. (Standard IV: Engagement)
- Accomplished science teachers use a variety of instructional strategies to expand students' understanding of the major ideas of science. (Standard VIII: Fundamental Understandings)

Deborah Bodony
IISME Fellow

NASA Ames Research Center
Summer 2003

Calendar for Exploring the Earth

Day 1 Administer Exploring the Earth Pre-Quiz Complete the Engage Section	Day 2 Complete Explore Part 1 Complete Explain Part 1	Day 3 Complete Explore Part 2	Day 4 Complete Explore Part 2	Day 5 "Crust Day" Complete Explain Part 2 Complete Explore Part 3 Complete Explain Part 3
Day 6 "Mantle Day" Complete Explore Part 4 Complete Explain Part 4	Day 7 "Core Day" Complete Explore Part 5 Complete Explain Part 5	Day 8 Begin Extend: Introduce Earth's Interior Project	Day 9 Continue with Extend: Construction of Earth's Interior Project	Day 10 Continue with Extend: Construction of Earth's Interior Project
Day 11 Complete Extend: Final construction of Earth's Interior Project	Day 12 Administer Exploring the Earth Post-Quiz Begin Evaluate: Students present projects	Day 13 Complete Evaluate: Students complete Layers of the Earth Test		

Materials and Equipment:

Day 1:

- A class set of Exploring the Earth Pre-Quiz
- A class set of Homework Schedule for Unit on Exploring the Earth
- Video showing volcanoes (ideas for videos: JASON Project Hawaii video or Dante's Peak)
- Pictures of geologic features in California (ideas of pictures you may wan to use: the coast line, Sierra Nevadas, desert areas, and include local areas such as coastlines near SF as you head into the bay.

Day 2:

- Apples (one apple for every 2 or 4 students)
- Knife to cut apples
- Napkins or paper towels (one for every student)

Day 3 and 4:

- Computers with internet
- A class set of The Earth's Layers Scavenger Hunt
- A class set of Earth's Interior Reading Strategy Activity

Day 5:

- Hard boiled eggs (one for each group)
- Black felt tip marker (one for each group)
- Knife to cut eggs
- A class set of A Layer a Day WS
- A class set of Broken Egg Activity

Day 6:

- A class set of Asthenosphere Model

Following materials needed for each group:

- 15 g cornstarch
- Triple beam balance
- 2 small beakers
- 10 mL cold water
- Graduated cylinder
- Eyedropper
- Spoon or stirring rod

Day 7:

- A class set of Earth's Magnetism Activity

Following materials needed for each group:

- Bar magnet
- Iron filings in paper cup
- Sheet of paper
- Computer with internet

Day 8 - 11

- A class set of Interior of the Earth Project directions

Day 12:

- A class set of Exploring the Earth Post-Quiz

Day 13:

- A class set of Interior of the Earth Test

Preparation:

- Gather materials.
- Cut apples into halves or quarters (on Day 2).
- Prepare hard boiled eggs (for Day 5).

Day 1: Engage

1. Show students a video clip of a volcano erupting.

   Note to Teacher: If you participated in the JASON Project Hawaii, these videos are great for showing students volcanoes. Dante's Peak is also a great movie to show parts of at the beginning of this lesson.

   - Question: Describe what you see happening in this video clip.
   - *Answer: (Accept all reasonable answers. One observation should be that material is coming out of the volcano.)*

   - Question: Where does the material come from that erupts out of a volcano?
   - *Answer: (Accept all reasonable answers.)*

   - Show students pictures of geologic features in California.

   - Question: What observations can you make about these geologic features in California?

     Note to Teacher: Idea of pictures to show are: the coast line, Sierra Nevadas, desert areas, and include local areas such as coastlines near SF as you head into the bay.
   - *Answer: (Allow students to share their ideas. Encourage students to be as specific as possible.)*

   - Question: How do you think these pictures may help us understand the interior of the Earth?
   - *Answer: (Allow students to share their ideas.)*

- Question: From looking at these pictures, what do you think the interior of the Earth might look like? Why do you think this?
- *Answer: (Allow students to share their ideas. Encourage students to explain why. This will help you understand what prior knowledge the students have.)*

- Question: What do you think the temperature of the interior of the Earth might be like? Why do you think this?
- *Answer: (Allow students to share their ideas.)*

- Question: What type of materials might make up the interior of the Earth? Why do you think this?
- *Answer: (Allow students to share their ideas.)*

2. Introduce the purpose of the unit and the Scientific Question.
   - Say: In this unit, we are going to learn about the interior of the Earth through a variety of different types of activities.

   - The Scientific Questions that we will be exploring are:
     -What are the layers of the interior of the Earth?
     -What are the properties each of the layers?

Homework due tomorrow: Think carefully about the scientific questions. Using only your brain (meaning do not ask a friend for the answer, do not look up the answer in an encyclopedia or on the internet), describe what you know about the interior of the Earth. If you have never studied the interior of the Earth or you do not remember the information, describe what you think the interior of the Earth is like. You will be graded on the thoroughness of your answer.

Day 2: Explore Part 1

1. Have some students share the answer they developed to the homework question.
   - Encourage students to explain why they answered the way they did.

2. Collect homework assignment. Keep this assignment until the end of the unit or make a copy of each student's answer. This will help you to see the growth they have made during the unit.

3. Lead students in the Earth as an Apple Activity.
    - Pass out a napkin or piece of paper towel to each student.
    - Pass out a half or quarter of an apple to each student.
    - Ask the students to observe the apple and then draw a detailed picture of the apple in their lab notebooks. Encourage the students to draw the different layers of an apple that you can see when you cut it.
    - Have the students discuss their drawings and observations about the apple pieces with a neighbor.

Day 2: Explain Part 1

1. Discuss the similarities between the interior of the Earth and an apple.
    - Say: The apple you have just drawn has similar features to the interior of the Earth.

    - Question: What features of the apple do you think might be similar to the Earth?
    - *Answer: (Accept all reasonable answers. Hopefully one or more students will respond that the Earth is made up of layers just as the apple is.)*

    - Say: The interior of the Earth is made up of layers just like the apple you drew is made up of layers.

    - Have students look at their drawings.

    - Question: If you eat all the flesh of the apple, what do you have left?
    - *Answer: With some help, students should respond "the core".*

    - Say: The innermost part of the apple is called the core. The innermost part of the Earth is also called the core.

    - Have students label the core on their drawing of the apple and write next to the word core – innermost part.

    - Say: Now look at the biggest part of the apple, the part you eat. This is considered to be the middle of the apple. In the Earth, the middle part of the Earth is called the mantle.

    - Have students label the mantle on their drawing. And have them write next to the word mantle – middle part.

- Question: If we were to make a pie with these apples, what would we place in the bottom and top of the pie pan with the apples in the middle?
- *Answer: Hopefully the students will say that you place a crust on the bottom and top.*

- Say: The top layer of the Earth is also called the crust. This is the layer of the Earth that we live on. The crust of the apple is the red skin that you bite into when you eat it.

- Have the students label the crust on their drawings. And have them write next to the word crust – top part.

- Question: What do you notice about the thickness of the skin of the apple compared to the middle or fleshy part of the apple?
- *Answer: The fleshy part of the apple is much thicker than the skin.*

- Say: The mantle of the Earth is also much thicker than the curst. We have used an apple to help us understand the location of the three main layers of the Earth. Now we want to learn more details about each of these layers.

2. Discuss scientists who study the Earth and how they learn about the interior of the Earth.
   - Question: What type of scientist studies the Earth, including the interior of the Earth?
   - *Answer: (Allow students to share their ideas about the answer to this question.)*

   - Say: Scientists who study the Earth are geologists. Geologists study many things about the Earth. One of these is the interior of the Earth. Geologists also study the Earth's surface. They study how things such as earthquakes, flooding, erosion, and glaciers change the Earth's surface.

   - Say: If you wanted to learn about the interior of your apple, you could use an apple to cut it in half. Or you could use an apple corer to take the core out of the apple to study it.

- Question: How do you think geologists learn about the interior of the Earth?
- *Answer: (Allow students to share their ideas.)*

- Question: Are there places on Earth where people can go beneath the surface of the Earth? Explain your answer.
- *Answer: (Allow students to share their ideas. Hopefully, some students will respond that if you go inside a cave you have gone beneath the surface of the Earth.)*

- Question: Who has ever visited a cave?
- *Answer: (Allow students to share their answers to this question.)*

- Say: If you have been inside a cave or seen a picture of the inside of a cave before, you have been/seen an area below the Earth's surface. But even the deepest cave does not come closer to reaching the center of the Earth.

- Say: Due to the extreme conditions in Earth's interior, geologists cannot dig a hole to the center of the Earth. In your reading for this unit, you will learn about how geologists study the interior of the Earth without observing it directly.

Homework due tomorrow: Read pages 16 – 19 in your book. (Prentice Hall Science Explorer Inside Earth)

Day 3 and Day 4: Explore Part 2

1. Review the main layers of the Earth with the students.
   - Say: Yesterday we studied an apple to learn about the three main layers of the Earth.

   - Question: What layer of the Earth do we live on?
   - *Answer: The layer of the Earth that we live on is the crust.*

   - Question: What is the layer below the crust called?
   - *Answer: The layer below the crust is called the mantle.*

   - Question: What is the innermost layer of the Earth called?
   - *Answer: The innermost layer of the Earth is called the core.*

- Say: Yesterday we learned the main layers of the Earth. Today we are going to learn some of the characteristics of each layer.

2. Explain that today half of the students will be completing an activity using the internet, while the other half of the students will be using their books to complete an activity. Then tomorrow, the two groups will switch so that each student has an opportunity to complete both activities.
   Note to Teacher: This lesson is written for a classroom that has 10 computers. If you have enough computers for each student to use one in your classroom or the school computer lab, then you can split up the students as the lesson is written or you can have the entire class complete the internet activity one day and the entire class complete the reading strategies activity the second day.

3. Assign half of the students a computer to use to complete the activity, The Earth's Layers Scavenger Hunt.

4. Have these students follow the directions on the Earth's Layers Scavenger Hunt worksheet to complete the activity. Encourage students to read each page of the website carefully.

5. Have the second half of the students complete the Earth's Interior Reading Strategy Activity. (The textbook that this activity is based on is Prentice Hall Science Explorer Inside Earth).

Homework due on Day 5: Finish any work that was not completed in class on "The Earth's Layers Scavenger Hunt" and the "Earth's Interior Reading Strategy Activity".

Day 5: Explain Part 2

1. Collect worksheets from the Earth's Layers Scavenger Hunt and Earth's Interior Reading Strategy activities.

2. Discuss what students learned from completing the Earth's Layers Scavenger Hunt activity and the Earth's Interior Reading Strategy Activity.
   - Question: What did you learn from completing the two activities?
   - *Answer: (Accept all reasonable answers. Students should explain specific information they learned from these two activities. This information may include that they learned that the core is divided into two layers. The outer core is a liquid, and the inner core is a solid.*

Students may explain that they live on the crust, that the core is the hottest, and that there are layers called the lithosphere and asthenosphere.)

3. Explain that over the next few days they will spend time learning about the properties of each layer of the Earth. Tell the students that we will call this "A Layer a Day".

Day 5: Explore Part 3 – "Crust Day"

1. Review with students what they know about the crust so far.
   - Say: Our focus for today will be on the crust.

   - Say: Remember in our activity, Earth as an Apple, the skin of the apple was like the crust of the Earth. The crust of the Earth can be described as forming Earth's outer skin.

   - Question: In your Earth's Layers Scavenger Hunt activity and the Earth's Layers Reading Strategy Activity, what did you learn are the important properties of the crust?
   - *Answer: (Allow students to share their answers. List student answers on the board so students can record this information in their notes. Listed below are the important properties that students should have knowledge of at this point in the lesson.)*
     Important Properties of the Crust:
     - *The layer that we live on.*
     - *Includes rocks, mountains, soils, and water.*
     - *Approximately 5-40 km thick (3 - 25 miles). (This measurement differs slightly depending on the source. The website states that the thickness is 8-32 km thick. Do not focus on this difference. The important idea that we want students to walk away with is an understanding that the crust is much thinner than the other layers.)*
     - *Thinnest under the oceans, and it is thickest under the continents (specifically under high mountains).*
     - *Broken into many pieces called plates.*

2. Have students record the important properties of the crust in their notes or on the "A Layer a Day" worksheet.

3. Lead students in the Broken Egg Activity.
    - Break students up into groups of 2-4 students and provide them with their materials.

    - Say: The Earth's crust is very thin and brittle, much like an egg shell.

    - Have students make cracks in the shell by rolling it in their hands or on the desk. Students should not peel off the shell.

    - Question: What do you notice about the shell now?
    - *Answer: (Accept all reasonable answers. Students may respond that the shell is broken, that the shell is made up of many pieces, and that some of the pieces overlap others.)*

    - Have students use a felt tip pen to outline the edges of the cracked pieces.

    - Show students a transparency of the Earth's plates. There is a picture of the Earth's plates attached with the student handout. The website below contains 4 additional sources for pictures of the Earth's plates: http://www.letus.northwestern.edu/projects/esp/phaseD/officialplates/officialplates.html

    - Have students complete the rest of the Broken Egg activity following the directions on the student handout.

Day 5: Explain Part 3

1. Collect the Broken Egg Student Handout.

2. Discuss conclusions from the activity.
    - Question: What similarities did you observe between the eggshell and the crust?
    - *Answer: (Accept all reasonable answers. Student responses may include that the eggshell was thin and brittle like the crust and that it was broken into pieces like the crust.)*

    - Question: Was the hard boiled egg a good model of the interior of the Earth? Why or why not?
    - *Answer: (Accept all reasonable answers. Students may respond that the egg was a fairly good model of the interior of the Earth. The egg*

had the same number of layers at the Earth, and the layers were similar in their thicknesses. For example, the shell representing the crust was the thinnest, while the white part representing the mantle was the thickest.

3. Explain "A Layer a Day" homework assignment that will be due on Day 8.

Homework due on Day 8: Using the knowledge you gain from our discussions and activities for "A Layer a Day", you will write a short answer of at least three paragraphs where you explain what you have learned about each of the main layers of the interior of the Earth (the crust, mantle, and the core). Your short answer will need to be written in your own words so copying information directly from your notes or your book will not be acceptable. To complete this homework assignment, read over your notes, think about the activities, and describe each layer in as much detail as you can.

Day 6: Explore Part 4 – "Mantle Day"

1. Review with students what they have already learned about the mantle.
   - Say: The layer we will focus on today is the mantle.

   - Question: In our activity, Earth as an Apple, what part of the apple did we say was like the mantle?
   - *Answer: The "meat" of the apple or the part you eat was like the mantle.*

   - Question: What did you learn about the mantle earlier in this unit?
   - *Answer: (Allow students to share their answers. List student answers on the board so that they can be used at the end of the lesson. Listed below are the important properties that students should have knowledge of at this point in the lesson.)*
     Important Properties of the Mantle:
     - *Located below the crust.*
     - *Largest layer of the Earth.*
     - *3000 km(approximately 1800 miles) thick*
     - *As you travel towards the center, the temperature and pressure increase.*

2. Have students record the important properties of the mantle in their notes or on the "A Layer a Day" worksheet.

3. Explain information about the lithosphere and asthenosphere.
    - Say: Scientists can describe the layers of the Earth in two different ways. They can describe the interior of the Earth based on what materials make up the layers, or they can describe the interior based on the movement of the layers. If scientists describe the interior based on the materials that make up the layers, then they describe the main layers that we have been focusing on.

    - Question: What are the main layers of the Earth that we have been studying?
    - *Answer: The main layers we have been studying are the crust, mantle, and core.*

    - Say: If they describe the interior based on the movement of the layers, then they describe the lithosphere, asthenosphere, mantle, outer core, and inner core.

    - Question: Do you remember the terms lithosphere and asthenosphere from the scavenger hunt?
    - *Answer: Students may remember reading about these two layers, but they often have difficulty understanding how they relate to the other layers of the Earth.*

    - Say: The lithosphere is a rigid layer formed by the crust and the uppermost part of the mantle. These two parts move together as plates on top of the Earth's surface. Remember we completed an activity yesterday where we looked at the plates of the Earth.

    - Say: Let's write this information on the board so that you can add it to your notes.
      Information about the lithosphere:
        - Layer formed by the crust and the uppermost part of the mantle
        - The crust and uppermost part of the mantle move together as plates.
        - Rigid layer

    - Say: The asthenosphere is located under the lithosphere. It is part of the upper mantle, and it is partially melted. Because the asthenosphere is partially melted, the asthenosphere can flow slowly.

- Question: We know that the lithosphere is located on top of the asthenosphere, and we just learned that the asthenosphere flows slowly. How do you think this movement affects the lithosphere?
- *Answer: (Allow students to share their ideas. Students may come to the conclusion that the lithosphere moves on top of the asthenosphere.)*
  Note to Teacher: A simple demonstration to help students understand that the lithosphere floats on top of the asthenosphere is to place a piece of cardboard or a thin sponge on top of thick liquid. If you cause slow movement in the liquid by tapping the container that the liquid is in, the cardboard or thin sponge will move at a slow rate.

- Say: Let's write this information on the board so that you can add it to your notes.
  Information about the asthenosphere:
  - Located under the lithosphere
  - Part of the upper mantle
  - Partially melted
  - Can flow slowly
  - Lithosphere/Plates float on the asthenosphere

4. Introduce students to the Asthenosphere Model activity.
   - Explain to students that in this activity they are going to make and observe a substance.
   - Encourage students to think about how this substance is similar to and different from the asthenosphere.
   - Pass out the Asthenosphere Model activity sheet.
   - Review the materials that students will use. Be sure to explain to students that this activity can be quite messy so they should be very careful while completing it.
   - Explain to students that they need to measure the amounts of water and cornstarch carefully in order to have a successful asthenosphere model.
   - Break students into groups of 2-4 students and have the students begin completing the activity.

5. Have students complete the Asthenosphere Model activity.
   - Explain clean up procedures for the activity once most students are close to completing the activity.

Day 6: Explain Part 4

1. Collect Asthenosphere Model activity sheets from students.

2. Discuss student conclusions from the activity.
   - Question: What similarities did you observe between the mixture of cornstarch and water and the Earth's asthenosphere?
   - *Answer: (Accept all reasonable answers. Student responses may include that they observed that the mixture is similar to the asthenosphere because it flows at a slow rate.)*

   - Question: What differences did you observe between the mixture of cornstarch and water and the Earth's asthenosphere?
   - *Answer: (Accept all reasonable answers. Students may respond that a major difference is the materials that make up the asthenosphere are not cornstarch and water. Students may also explain that the interior of the Earth is very hot, and we did not include heat in our model.)*

   - Question: Using your knowledge of the asthenosphere, describe a material that you feel best represents the properties of the asthenosphere. Explain why you chose this material.
   - *Answer: (Allow students to share their ideas. A material that is great to represent the properties of the asthenosphere is silly putty. If you have some available, bring it in to discuss with students the similarities and differences between the silly putty and the asthenosphere.)*

Homework due on Day 8: (See description at the end of Day 5.)

Day 7: Explore Part 5 – "Core Day"

1. Review with students what they have already learned about the core.
   - Say: The layer we will focus on today is the core.

   - Question: In our activity, Earth as an Apple, what part of the apple did we say was like the core?
   - *Answer: The core of the apple was like the core of the Earth.*

   - Question: What did you learn about the core earlier in this unit?
   - *Answer: (Allow students to share their answers. List student answers on the board so that they can be used at the end of the*

lesson. Listed below are the important properties that students should have knowledge of at this point in the lesson.)

Important Properties of the Core:

- *Located below the mantle.*
- *Has two parts: outer and inner core*
- *Outer core – 2,250 km (1400 miles) thick; inner core – 1,200 km (800 miles) thick*
- *Made up of nickel and iron*
- *Outer core – liquid state due to the temperature; inner core – solid state due to the extreme temperature and pressure*

2. Have students record the important properties of the core in their notes or on the "A Layer a Day" worksheet.

3. Explain how the Earth's magnetic field is created.
   - Question: What state of matter is the outer core?
   - *Answer: The outer core is in a liquid state.*

   - Question: What state of matter is the inner core?
   - *Answer: The inner core is in a solid state.*

   - Say: As the planet rotates between day and night, the liquid outer core rotates with it. The slow rotation of liquid metal in our core creates a current that causes Earth to act like a very large magnet. The Earth has north and south poles, just like any magnet does.

4. Introduce students to the Earth's Magnetism Activity.
   - Show students a bar magnet.

   - Question: What do you know about the object that I am holding in my hand?
   - *Answer: (Accept all reasonable answers. Most students have had experience with bar magnets before, and they will probably tell you that metal objects are attracted to it.)*

   - Pass out the Earth's Magnetism Activity worksheet.

   - Break students into groups.

   - Explain to the students that they should follow the directions on the worksheet to complete this activity.

- Be sure to review with students that they should not allow any iron filings to directly touch the bar magnet.

Day 7: Explain Part 5

1. Collect Earth's Magnetism Activity worksheets from students.

2. Discuss student conclusions from the activity.
   - Question: What did you learn from completing this activity?
   - *Answer: (Accept all reasonable answers. Student responses may include that the Earth has a magnetic field.)*

   - Question: Why is the magnetic field important to life on Earth?
   - *Answer: Students should find from their research that the Earth's magnetic field shields life on Earth from dangerous solar wind particles (particles that move away from the sun at high speeds). Students may also find out that the magnetic field protects us from cosmic rays, which are particles that are ejected when some stars explode.*

Homework due on Day 8: Using the knowledge you have gained from our discussions and activities for "A Layer a Day", write a short answer of at least three paragraphs where you explain what you have learned about each of the main layers of the interior of the Earth (the crust, mantle, and the core). Your short answer needs to be written in your own words so copying information directly from your notes or your book will not be acceptable. Read over your notes, think about the activities, and describe each layer in as much detail as you can.

Day 8: Extend

1. Collect Layer a Day Homework assignment.
   - If time is available, students could share their answers to this homework assignment.

2. Introduce Interior of the Earth Project.
   - Say: During the last few days, you have learned a lot about the interior of the Earth. We have completed many activities about the interior of the Earth to help you better understand it. We have discussed each layer, we have completed an activity for each layer, and you have completed a homework assignment all about the layers of

the Earth. Over the next couple of days, you will work with a group of students to create a three-dimensional model of the interior of the Earth.

- Pass out Interior of the Earth Project directions to students.

- Say: The goal of this project to work with a group of fellow classmates to create a three-dimensional model of the interior of the Earth that correctly represents each layer. I will be looking to see that your group develops a model that shows each layer to scale and that uses materials that demonstrate the properties of each layer.

- Question: What properties will you need to represent when you model the crust?
- *Answer: The crust is the layer we live on. It is brittle and very thin. The crust and uppermost part of the mantle are broken into pieces called plates.*

- Question: What properties will you need to represent when you model the mantle?
- *Answer: The mantle is under the crust, and it is the thickest layer.*

- Question: What properties will you need to represent when you model the core?
- *Answer: The core is located below the mantle. It is made up of two parts – the outer and inner core. Both parts of the core are made up of nickel and iron. The outer core is liquid, while the inner core is solid.*

- Question: What layers of the Earth have we not discussed?
- *Answer: We have not discussed the asthenosphere and the lithosphere.*

- Question: Where will you include these two layers on your model?
- *Answer: The lithosphere is the crust and the uppermost part of the mantle, while the asthenosphere is the upper part of the mantle.*

3. Break students into groups and have them read over the directions.

4. Have students begin brainstorming how they will model the interior of the Earth.

Homework due on Day 9: You will be working with a group of your classmates to make a three-dimensional model of the interior of the Earth.

1. Think about how you would model the interior of the Earth.
2. Draw the interior of the Earth as you would like to see it modeled.
3. Label your drawing with the layers you represented.
4. Decide what materials you could use to model each layer. List the materials you would like to use for each layer on the drawing.

Day 9 Extend

1. Check to see that each student has completed his/her homework.

2. Explain procedures for today.
   - Say: Today you should share the ideas that each person in your group developed last night for homework. Discuss the ideas and decide how to make the best model of the interior of the Earth.

   - Say: Once you have decided on the basic plan for your model, you will need to follow the directions to determine the measurements you will use for each layer in order to make them to scale. Then you will on make a drawing of how you want your model to look, and you will label each layer. Next to each layer, write the thickness and list the materials that you would like to use.

   - Say: Before the end of the class period today, I would like to see your plan. I will discuss the plan with your group, and make any suggestions for improvement. Once I approve the plan, you are ready to begin construction. Do not begin building your model before I have approved it.

   - Say: By the end of class today, decide what materials each student is responsible for bringing in.

3. Students have the rest of the period to develop their plans and have their plans approved.

Homework due tomorrow: As a group, you should have decided what materials you group needs to complete your model of the interior of the Earth. Bring these materials in to use in class tomorrow.

Day 10 Extend

1. Answer any questions students have about their projects.

2. Explain schedule for rest of the week.
   - Explain to students that they have all day today and tomorrow to construct their models.

   - Explain to students that their model is due on Day 11 and that they will present their models to the class on this day.

   - Explain to students that their test over the interior of the Earth is on day 13. Encourage them to begin studying early. To study, the students can review "A Layer a Day" notes, "A Layer a Day" homework assignment, and all activities that were completed in class.

Homework due tomorrow: Discuss with your group what each member can do at home to help complete the model on time and to the best of your ability.

Day 11 Extend

1. Discuss any questions students have about their projects.

2. Explain schedule for rest of the week.
   - Explain to students that their last day to finish constructing their model is tomorrow.

   - Explain to students that their model is due on Day 11 and that they will present their models to the class on this day.

   - Explain to students that their test over the interior of the Earth is on day 13. Encourage them to begin studying early. To study, the students can review "A Layer a Day" notes, "A Layer a Day" homework assignment, and all activities that were completed in class.

Homework due tomorrow: If necessary, work at home and/or during recess with your group to complete the model.

Day 12: Evaluate Part 1

1. Explain Exploring the Earth Post-Quiz.
   - Encourage students to do their very best.

   - Explain to students that this post-quiz is to help me see what growth they have made in their knowledge of the interior of the Earth.

2. Administer post-test.

3. Explain procedures for presenting the interior of the Earth models.
   - Say: Each group will present their model of the interior of the Earth to the class. The group presenting should explain why they chose to make their model the way they did, what materials they used for each layer, and why they felt the materials represented the properties of the layer.

   - Say: While each group is presenting, the rest of the class will be listening attentively. There will be time for questions at the end of each presentation.

4. Have each group present their model of the interior of the Earth.

Homework due tomorrow: Review "A Layer a Day" notes, "A Layer a Day" homework assignment, and all activities that were completed in class to prepare for our test on Day 13.

Day 13: Evaluate Part 2

1. Discuss with students the Interior of the Earth Test.
   - Encourage students to write notes on their scratch paper of information that they want to include in their essay.

   - Explain to students that they should be as detailed as possible in their essay.

2. Administer Interior of the Earth Test.

No Homework

References and Resources

Prentice Hall Science Explorer Inside Earth textbook

Broken Egg Activity adapted from Teacher Created Materials, Inc.

Astroventure
http://astroventure.arc.nasa.gov

Using Models to Understand Earth's Interior
http://www.ncela.gwu.edu/classroom/toolkit/lessons/smodels.html

Lesson on the Earth's Layers developed by the University of North Dakota
http://volcano.und.nodak.edu/vwdocs/vwlessons/lessons/Earths_layers/Earths_layers1.html

Map of Earth's major plates
http://www.EnchantedLearning.com/subjects/astronomy/planets/earth/Continents.shtml

Additional source for maps of Earth's plates
http://www.letus.northwestern.edu/projects/esp/phaseD/officialplates/officialplates.html

Acknowledgements

Christina O'Guinn
NASA Ames Educational Technology Team, Lead

Deborah Bazar
Astroventure Content Writer/Researcher

Exploring the Earth Pre-Quiz

Name_____ Class___ Date_____

Part 1: For each of the questions below, answer based on your experiences in your past science classes.

1. What is your favorite activity from past science classes? (e.g., planting seeds, using a microscope to look at slides, dissecting)

_____

2. What topic did you enjoy studying the most in past science classes? (e.g., airplanes, habitats, living things, chemistry, cells)

_____

3. Listed below are activities that are done in science classes. Please read through the entire list. Then place a "1" next to the activity you enjoy doing the most, and place a "2" next to the activity you enjoy doing second, and all the way down until you have a "16 " next to the activity you enjoy doing least.

_____ Watching teacher demonstrations
_____ Watching science movies such as Bill Nye
_____ Reading out loud from the textbook
_____ Reading silently from the textbook
_____ Working in groups to develop a skit/play
_____ Working in groups to make a model
_____ Taking notes as the teacher talks
_____ Taking notes as the teacher talks and writes the notes on the board
_____ Taking your own notes
_____ Using the computer to complete an internet science activity
_____ Using the computer to type up notes or an outline
_____ Completing an experiment that your teacher developed

_____ Completing an experiment that you and a group of fellow classmates developed from a question given to you by your teacher
_____ Completing an experiment that you and a group of fellow classmates developed all the way from coming up with your own question to experiment on

_____ Completing a worksheet on the information you just read about

_____ Completing a worksheet with a partner on the information you just read about

4. Many students enjoy completing activities and experiments. They are fun because often you get to work with a group of people, you are able to work at your own pace, and you can explore something you are interested in. Sometimes your teacher needs to have you learn new information in a more traditional setting. Read the entire list below. Then place a "1" next to the method that would help you would learn the most, and place a "2" next to the method that would help you would learn the most, and all the way down until you have a "9" next to the method that would help you would learn the most. If there are a combination of methods that would help you learn the information best, write these in the space below the list.

_____ Reading a section in the textbook individually

_____ Reading a section in the textbook out loud as a class

_____ Reading a section in the textbook out loud in small groups

_____ Taking notes from your book individually

_____ Taking notes from your book in pairs or small groups

_____ Discussing the reading as a class after having read it individually

_____ Completing a guided reading worksheet as you read a section in the textbook

_____ Listening to the teacher explain a topic and then taking notes

_____ Listening to the teacher explain a topic and taking notes from the board that the teacher has written

Part 2: Answer each of the questions below to the best of your ability. If you are not sure about an answer, take an educated guess.☺

1. What are the main layers of the Earth?

   _____

2. Which of the three main layers of the Earth do you live on?

   _____

3. What is the center of the Earth called?_____

4. The center of the Earth has two parts to it. What are these two parts called?_____

5. How would you describe the temperature of the interior of the Earth?

   _____

6. Which layer of the Earth is the hottest? _____

7. What are the three states of matter? _____

8. The center of the Earth is made up of two layers. Name these two layers, and then explain what state of matter each of these two layers is in.

   a. _____

   b. _____

9. What materials make up the layers in the center of the Earth?

_____

10. Scientists use the word "flow" to describe one of the layers of the interior of the Earth. Which layer "flows" and what causes it to "flow"?

_____
_____

11. What is the lithosphere? _____

12. What adjectives do scientists use to describe the lithosphere?

    _____

Homework Schedule for Unit on Exploring the Earth

Very important dates this unit:

- **Due Day 12: Earth's Interior Model**
- **On Day 13: Layers of the Earth Test**

Assignment for Day 1:

1. Think carefully about the scientific questions. The Scientific Questions that we will be exploring are:
   -What are the layers of the interior of the Earth?
   -What are the properties each of the layers?
2. Using only your brain (meaning do not ask a friend, parent, neighbor, etc. for the answer, do not look up the answer in an encyclopedia or on the internet), describe what you know about the interior of the Earth in a paragraph format. If you have never studied the interior of the Earth or you do not remember the information, describe what you think the interior of the Earth is like. You will be graded on the thoroughness of your answer.

Due Date: Day 2 at the beginning of the period

Assignment for Day 2:

Read pages 16 – 19 in your book (Prentice Hall Science Explorer Inside Earth).

Due Date: Day 3 at the beginning of the period

Assignment for Day 3 and Day 4:

Finish any work that was not completed in class for "The Earth's Layers Scavenger Hunt" and the "1-1 Reading Strategy Activity".

Due Date: Day 5 at the beginning of the period

Assignment for Day 5 – Day 7:

Using the knowledge you have gained from our discussions and activities for "A Layer a Day", write a short answer of at least three paragraphs where you explain what you have learned about each of the main layers of the interior of the Earth (the crust, mantle, and the core). Your short answer needs to be written in your own words so copying information directly from your notes or your book will not be acceptable. Read over your notes, think about the activities, and describe each layer in as much detail as you can.

Due Date: Day 8 at the beginning of the period

Assignment for Day 8:

You will be working with a group of your classmates to make a three-dimensional model of the interior of the Earth.

1. Think about how you would model the interior of the Earth.
2. Draw the interior of the Earth as you would like to see it modeled.
3. Label your drawing with the layers you represented.
4. Decide what materials you could use to model each layer. List the materials you would like to use for each layer on the drawing.

Due Date: Day 9 at the beginning of the period

Assignment for Days 8 and 9:

As a group, you should have decided what materials you group needs to complete your model of the interior of the Earth. Bring these materials in to use in class tomorrow.

Due Date: Days 9 and 10 at the beginning of the period

Assignment for Day 10:

Discuss with your group what each member can do at home to help complete the model on time and to the best of your ability.

Due Date: Day 11 at the beginning of the period

Assignment for Day 11 and 12:

1. Work at home and/or during recess with your group to complete the model.

Due Date: Day 12 at the beginning of the period

2. Review "A Layer a Day" notes, "A Layer a Day" homework assignment, and all activities that were completed in class to prepare for our test on Day 13.

Due Date: Day 13 at the beginning of the period


The Earth's Layers Scavenger Hunt

Name_____ Computer #_____

Directions: Please check each number off as you complete it.

1. Log on to the following website to complete a lesson on the Earth's layers: http://volcano.und.nodak.edu/vwdocs/vwlessons/lessons/Earths_layers/Earths_layers1.html

2. Read the introductory paragraph for this website, and then click the "Next" icon.

3. Read the next page, "The Four Layers". Answer the questions below.

Questions:

A. Look at the drawing of the interior of the Earth. How many layers are represented on this drawing?

_____

B. When we did our activity involving the apple, how many main layers did we show made up the Earth? _____
Using the information on this page of the website, explain how we are correct and the drawing on the website is correct.

_____
_____
_____

C. Which layer of the Earth do you live on? _____

D. Which part of the Earth is the hottest? _____

4. Click the "Next" icon and then look at the Earth's layers diagram on the next page. Answer the questions on the next page.

Questions:

A. What are the three states that matter can exist in? (This is a review from 5th grade.) _____

B. What state of matter is the outer core in? _____

C. What state of matter is the inner core in? _____

D. What do you think causes them to exist in different states?

_____
_____
_____

5. Click the "Next" icon and read the next page, "The Crust".

6. Answer the questions below.

Questions:

A. Where is the crust the thickest? _____

B. Where is the crust the thinnest? _____

C. Why do you think "A" and "B" are true? _____

_____

D. What are the pieces of the crust called? _____

E. How are the pieces of crust able to move?

_____
_____
_____

7. Click the "Next" icon and read the next page, "The Lithosphere".

8. Answer the questions on below.

Questions:

A. What are the two types of crust that are discussed in this reading?

_____

B. What is the lithosphere?

_____

C. What adjectives are used to describe the lithosphere?

_____

D. Choose one or both of the adjectives that you listed in "C". What do you think this word means? If you aren't sure, use the dictionary to look it up in the dictionary. _____

_____

E. Name an object in the classroom that you think could also be described by the word you defined in "D".

_____

9. Click the "Next" icon and read the next page, "The Mantle".

10. Answer the questions below.

Questions:

A. The mantle is the largest layer of the Earth. How many miles thick is the mantle? _____

B. Imagine that you and your family are going to drive this far in the car. You start from the Bay Area, and drive towards the East coast. Use a map to help you decide what part of the United States you would end up in.

_____

C. One characteristic of the mantle is that it flows. The reading describes that it flows like asphalt. Another analogy is to think of silly putty. The mantle is often described as flowing like silly putty. How would you describe silly putty when it moves?

_____

D. Why does the mantle flow? _____

_____

11. Click the "Next" icon and read the next page, "Convection Currents".

12. There are no questions to answer for this page. We will learn about convection currents in our next unit.

13. Click the "Next" icon and read the next page, "Outer Core".

14. Answer the questions below.

Questions:

A. What metals make up the outer core? _____

B. What state are these metals in? _____

15. Click the "Next" icon and read the next page, "Inner Core".

16. Answer the questions below.

Questions:

A. What state of matter is the inner core? _____

B. What materials make up the inner core? _____

C. What causes the metals in the inner core to exist in this state of matter? _____
_____

D. What temperature may the inner core reach? _____

E. How does the pressure in the inner core compare to the pressure here at sea level? _____

17. Congratulations! You have completed the Earth's Layers lesson. Please return to your seat and use your new knowledge of the Earth to complete the final questions on the next page.

Final Questions: Please use complete sentences when answer the following questions. Use the back of this paper if you need extra room when answering any of the questions below.

1. Draw and label a picture of the four layers of the interior of the Earth.

2. Use your new knowledge of the Earth's interior to write a short answer in which you name and describe the properties of each of the main layers of the Earth. Your short answer will be graded based on the following guidelines: main layers named, each layer is described in detail, use of information gained from scavenger hunt is used in answer, and correct grammar is used in writing the answer.

3. The year is 2040. You are a world-renowned geologist for the Department of the Interior of the Earth in Washington D.C. Through the use of amazing new robot, samples have been taken from the each of the main layers of the interior of the Earth. Three samples arrive at your office. You open the box to find that the samples are not labeled. At first, you let out a scream. "How could they do this? All of the work we have done to prepare for this, and they forgot to label the samples." You calm down, and realize that you can solve this problem. How will you determine which sample belongs to which layer? What are the properties for each layer?

Earth's Interior Reading Strategy Activity

Name_____ Partner's Name_____

1. Open your books to page 16. This is the beginning of 1-1, Earth's Interior.

2. **Survey:** Slowly skim through pages 16 through 24. Be sure to do the following:
   - Read the introduction (this is page 16).
   - Read the headings in turquoise and purple.
   - Notice the words that are in bold-faced type.
   - Look at the pictures and read the explanations about each picture.

3. **Question:** On the back of this paper, rewrite each turquoise heading (starting on page 20) as a question. For example, the first turquoise heading is "The Crust". A good question would be, "What is the crust?". Continue this process until you are at the end of the section on page 24.

4. **Read:** Read pages 20 through 24 with your partner. Read one paragraph out loud and then have your partner read the next paragraph out loud. After each paragraph, discuss what you read with your partner. Decide what important information you should write down. Then write this information in your own words under the correct question on the back. For example, if you have just read information on the crust, then you could record notes on the crust under the question, "What is the crust?". (Important note: Pages 22 and 23 contain a lot of great information. Be sure to read each paragraph on these two pages as well!)

5. **Recite:** Once you have read all of the information, look over your notes with your partner. Look at each question and discuss the notes you wrote down (don't read them word for word, but summarize the main points). Did you answer all of the questions that you had written down? Do you need help understanding any of the information or terms? This is a great time to clarify any parts of the reading with your teacher.

6. **Review:** Summarize the main points that you learned from the reading into a concept map/web. The center of your map should be "The Earth". Then branch out from the center with each of the main layers. Lastly, make a branch for each main point that you learned.

A Layer a Day:
A Study of the Interior of the Earth

The Crust

The Mantle

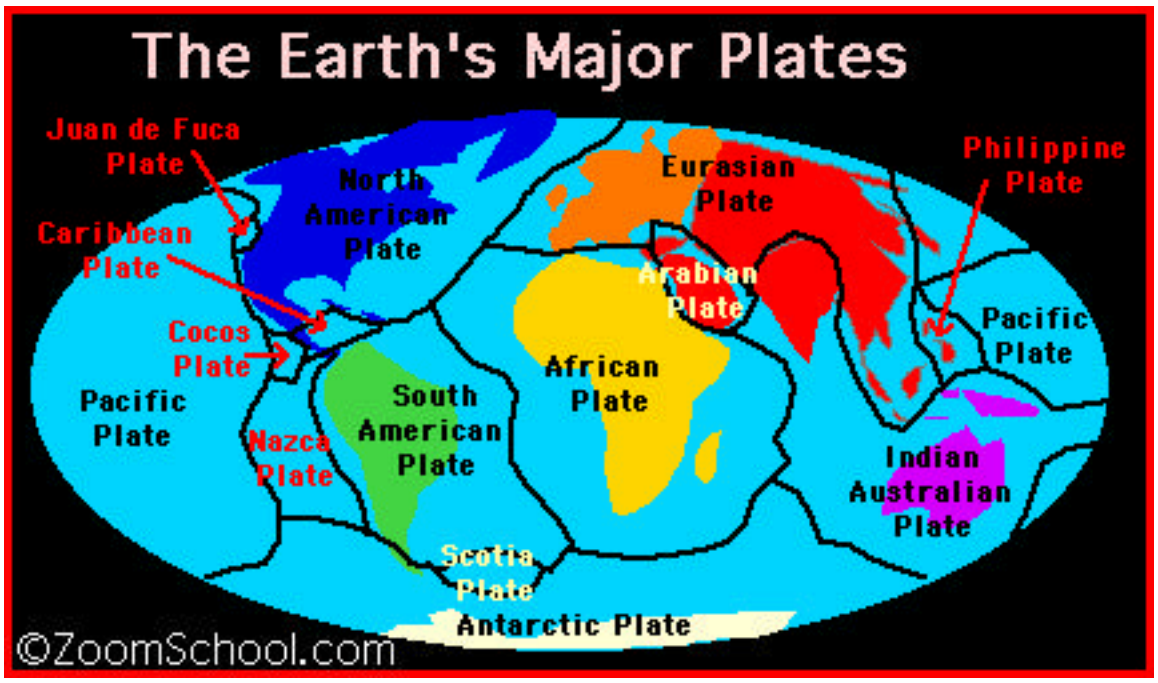
The Lithosphere

The Asthenosphere

The Core

Broken Egg Student Handout

Name_____ Class____ Date_____



Follow the directions below. Be sure to read each one carefully.

1. Look carefully at the shell of your egg. Now look at the picture above of the Earth's plates. Take special note of the black lines on the map. These lines represent the plates of the Earth.

2. Compare the cracks in your eggshell of to the picture above of the Earth's plates. What similarities do you see? (Please use complete sentences to answer.)

3. What differences do you see between the cracks in your eggshell and the picture of the Earth's plates? (Please use complete sentences to answer.)

4. Your teacher has sections of clear drinking straws available for you to use. How do you think this can be used to learn about the inside of the egg without opening the egg? Write your answer below and then discuss your answer with your teacher. After you discuss your answer, your teacher will give you a section of a straw to use.

5. Do you think that scientists could use a similar method to learn about the interior of the Earth, replacing a straw with a piece of equipment? Do you think there are any limitations to this method?

6. Get a plastic knife and cut the egg in half. Do not remove the shell.

7. Place a black dot about the size of a pea into the center of the yolk.

8. Draw one half of your egg below. Be sure to show label layer of the egg – the shell, the white part, the yolk, and the black dot.

9. Your egg can be used as a model for the interior of the Earth. Next to the labels for each layer of the egg, write the layer of the Earth that it could represent.

10. In a paragraph, describe the new information that you learned about the crust today. Be sure to include information from our discussion in class as well as this activity.

Asthenosphere Model

Name_____ Class____ Date_____

Materials (per group):
15 g cornstarch
Triple beam balance
2 small beakers
10 mL cold water
Graduated cylinder
Eyedropper
Spoon or stirring rod

Directions: Please read and complete each of the steps below. Place a check next to each item after completing it.

____ 1. Measure 15 g of cornstarch using a triple beam balance.

____ 2. Put the 15 g of cornstarch in one of the beakers.

____ 3. Measure 10 mL of cold water using a graduated cylinder.

____ 4. Pour the 10 mL of cold water into the second beaker.

____ 5. Stir the mixture using a spoon or stirring rod.

____ 6. Continue to add water, one dropperful at a time.

____ 7. Stir the mixture after each addition. Stop adding the water when the mixture becomes difficult to stir.

____ 8. Try to pour the mixture into your hand. Record your observations.

____ 9. Try to roll the mixture into a ball and press it. Record your observations.

Observations: Record your observations for each item. Be sure to answer whether the substance was a solid, liquid, or gas at that point in the experiment.

Cornstarch prior to beginning experiment:

Solid, liquid, or gas?

Cornstarch after water was added:

Solid, liquid, or gas?

When you tried to pour the mixture into your hand:

Solid, liquid, or gas?

When you tried to roll the mixture into a ball and press it:

Solid, liquid, or gas?

Results and Conclusion: Please use complete sentences when answering the following questions.

1. How is the mixture of cornstarch and water similar to the Earth's asthenosphere?

2. How is the mixture of cornstarch and water different from the Earth's asthenosphere?

3. Using your knowledge of the asthenosphere, describe a material that you feel represents the properties of the asthenosphere. Explain why you chose this material.

Earth's Magnetism Activity

Name_____ Class____ Date_____

Materials:
Bar magnet
Iron filings in paper cup
Sheet of paper
Computer with internet

Directions: Please check off each item as you complete it.

____ 1. Place the sheet of paper over the magnet.

____ 2. Sprinkle the iron filings over the sheet of paper. DO NOT PUT THE IRON FILINGS DIRECTLY ON THE MAGNET!

____ 3. Make a drawing below of your observations.

Drawing of your Observations:

Observation Question: Please use complete sentences.
1. What is the shape of a bar magnet's magnetic field?

(Please turn your paper over to answer the Results and Conclusion questions.)

Results and Conclusion: Please use complete sentences when answering the questions below.

1. How does this activity relate to our study of the Earth's interior?

2. What suggestions do you have for making this activity better represent the magnetic field created by the interior of the Earth?

3. Using the computers located in the classroom, research to find out why the magnetic field is important to life on Earth. After completing your research, write a short paragraph that explains why the magnetic field is important to life on Earth.

   Source for information:

Interior of the Earth Project

Name_____ Group members_____

Goal: To work with a group of fellow classmates to create a three-dimensional model of the interior of the Earth that correctly represents each layer.

1st Day of Project:

Brainstorm ideas for your model. Write these ideas in the space below.

2nd Day of Project:

a. Share and discuss the ideas that each person in your group developed for homework and decide how to make the best model of the interior of the Earth. Write your idea for the best model in the space below.

b. Now that you have decided on the plan for your model, you need to determine the measurements you will use for each layer in order to make

them to scale. Follow the directions below to do this. (The following directions are adapted from a worksheet in the teaching resources for Prentice Hall Science Explorer Inside Earth.)

1. The distance from the surface of the Earth to the center is _____ km. (Look at pages 22 and 23 in your book for help.)

2. How large do you want your model to be, from the outside to the center?
   _____ cm

3. Divide your answer to Question 1 by the answer to Question 2 to calculate the scale you will use when building your model.

   1 cm = _____ km

4. Write the layers of Earth that you will include in your model and write how thick each one is. Then use the space below the chart to figure the thickness of each layer to the scale you will be using.

Layer	Thickness	Thickness to Scale
	km	cm
	km	cm
	km	cm
	km	cm
	km	cm
	km	cm

c. Make a drawing below of how you want your model to look. Label each layer. Next to each layer, write the thickness in cm and list the materials that you would like to use.

d. Bring your plan to your teacher for approval. _____
Approval by teacher

You are now ready to begin constructing your model. It is important to decide what materials each student in your group is responsible for bringing in tomorrow.

3rd Day of Project:
You have all class period to construct your model. At the end of the period, record what you and your group accomplished today.

4th Day of Project:
You have all class period to construct your model. At the end of the period, record what you and your group accomplished today.

Exploring the Earth Post-Quiz

Name_____ Class___ Date_____

Part 1: For each of the questions below, answer based on your experiences in your past science classes.

1. What was your favorite activity during this unit?

_____

2. Listed below are activities that we completed in class during our unit, Exploring the Earth. Please read through the entire list. Then place a "1" next to the activity you enjoy doing the most, and place a "2" next to the activity you enjoy doing second, and all the way down until you have a "10" next to the activity you enjoy doing least.

   _____ Watching a short video of a volcano erupting
   _____ Earth as an Apple Activity
   _____ Earth's Layers Scavenger Hunt (using the computer)
   _____ Earth's Interior Reading Strategy Activity
   _____ Lithosphere and Asthenosphere Activity
   _____ Simulating Plasticity Activity (corn starch and water)
   _____ Earth's Magnetism Activity
   _____ Taking notes from the board on the properties of each layer
   _____ Working with a group to make a model of the Earth
   _____ Presenting your model of the Earth to the class

3. During this unit on the layers of the Earth, we completed a variety of activities. Some of the activities may not have been as exciting as others, but all types of activities are needed to learn the material. Listed below are more traditional methods of learning that were used in this lesson.. Read the entire list below. Then place a "1" next to the method that helped you learn the most, and place a "2" next to the method that helped you learn the second most, and all the way down until you have a "8" next to the method that would help you would learn the most. If there are a combination of methods that helped you learn the information best, write these in the space below the list.

   _____ Reading a section in the textbook individually
   _____ Reading a section in the textbook as you complete a reading strategy activity

_____ Completing activities like, Earth as an Apple, to help me see the similarities and differences between an apple and Earth

_____ Taking notes from the board that the teacher has written based on answers provided by students in the class

_____ Listening to the teacher explain a topic and taking notes from the board that the teacher has written

_____ Completing a scavenger hunt for an online tutorial

_____ Writing a short answer on the layers of the Earth using your notes and other resources

_____ Working with a group to develop and make a model of the Earth

Part 2: Answer each of the questions below to the best of your ability. If you are not sure about an answer, take an educated guess.☺

1. What are the main layers of the Earth?

   _____

2. Which of the three main layers of the Earth do you live on?

   _____

3. What is the center of the Earth called?_____

4. The center of the Earth has two parts to it. What are these two parts called?_____

5. How would you describe the temperature of the interior of the Earth?

   _____

6. Which layer of the Earth is the hottest? _____

7. What are the three states of matter? _____

8. The center of the Earth is made up of two layers. Name these two layers, and then explain what state of matter each of these two layers is in.

   a. _____

   b. _____

9. What materials make up the layers in the center of the Earth?

_____

10. Scientists use the word "flow" to describe one of the layers of the interior of the Earth. Which layer "flows" and what causes it to "flow"?

_____
_____

11. What is the lithosphere? _____

12. What adjectives do scientists use to describe the lithosphere?

    _____

Interior of the Earth Test

Name_____ Class____ Date_____

Directions: In the space below, write an essay about the interior of the Earth. Be detailed! Use information that you have gained from completing your project, discussions in class, taking notes, and completing activities. Feel free to include pictures or diagrams to strengthen your essay. The focus of the essay is on content, although correct grammar, paragraph and sentence structure, and spelling are expected. You will be marked off if any of these detract from understanding the information in your essay. Good luck!☺