EARTH SYSTEMS
the layered look
part 1: the earth’s layers

FRAMEWORKS

SCIENCE
ESS 8.6.1 Identify and diagram the layers of the earth: crust, mantle, outer and inner core.
NS 1.7.1 Interpret evidence based on observations.
ESS 8.8.19 Investigate and analyze the composition of a variety of soils.

LANGUAGE ARTS
W 5.6.10 Write across the curriculum.
W 5.7.10 Write across the curriculum.
W 5.8.10 Write across the curriculum.

MATH
M 12.7.1 Understand, select and use the appropriate units and tools to measure length, weight, mass and volume to the required degree of accuracy for real world problems.
M 12.6.1 Identify and select appropriate units and tools from both systems to measure.
M 13.6.2 Determine which unit of measure or measurement tool matches the context for a problem situation.
M 12.8.2 Describe and apply equivalent measures using a variety of units within the same system of measurement.

OBJECTIVES

The students will learn:

OBJECTIVE #1 To identify the names of the four major layers of the earth.
OBJECTIVE #2 To identify the properties of each major layer.
OBJECTIVE #3 To diagram the earth’s major layers.
OBJECTIVE #4 To appropriately use verbal speaking skills in class discussion with the teacher and Garden Program Specialist.
Garden soil is part of the earth’s outermost layer, the crust.

**Overview**

The earth consists of four main layers: the crust, mantle, outer core and inner core. Each has unique characteristics.

**Garden Activities**

▲ Plant, harvest and work in the garden following the Garden Guide.

▲ Examining components of the continental crust

▲ Recipes and Taste tests as time permits (refer to Delta Garden Study Recipe Book)
**TIPS FOR THE CLASSROOM**

*Pre-lesson preparation:*

1. Determine how the “Layers of the Earth” visual will be used and prepare appropriately.

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**LESSON OUTLINE**

<table>
<thead>
<tr>
<th>activities</th>
<th>estimated duration</th>
<th>actual duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>in the classroom</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶️ Offer the icebreaker</td>
<td>5 minutes</td>
<td></td>
</tr>
<tr>
<td>▶️ Explain and diagram the layers of the earth, using the visual</td>
<td>15 minutes</td>
<td></td>
</tr>
<tr>
<td><strong>in the garden</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶️ Dig pit and examine soil in the continental crust. Identify and list the components found.</td>
<td>15 minutes</td>
<td></td>
</tr>
<tr>
<td>▶️ Implement recipes and taste tests as time permits (refer to the Delta Garden Recipe book).</td>
<td>5 minutes</td>
<td></td>
</tr>
<tr>
<td><strong>back in the classroom</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▶️ Hand out Student Workbooks, review and assign “Take it Home Activity” as homework</td>
<td>5 minutes</td>
<td></td>
</tr>
</tbody>
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**TIPS FOR THE GARDEN**

*Pre-lesson preparation:*

1. Prepare materials and student instructions for digging the pit.
2. Prepare to discuss student observations of the continental crust and its components.

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**classroom materials needed**

- Student Workbooks
- Keep the “Layers of the Earth” visual handy during class

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**garden materials needed**

- Tools for digging pit: shovel, measuring tape, and large tarp
## LESSON PLAN

### I. Start in the classroom

#### A. Icebreaker

Ask students: “How much of the Earth’s surface is used to grow food?”

**Answer:** “About 11%.”

Ask students: “Is Earth the largest planet?”

**Answer:** “Earth is the fifth largest planet.”

#### B. Present Main Topic

▲ Using the visual, explain the layers of the earth.

▲ Explain and define the characteristics of each layer.

**MEETS OBJECTIVE #1**

**MEETS OBJECTIVE #2**

### II. Take class to the garden

▲ Instruct students to dig up a soil pit (or several pits) and examine the components of the continental crust. Explain that the soil is part of the earth’s uppermost layer, the crust. Compare it with the students’ knowledge about the other three layers.

▲ Instruct students to pick and taste available vegetables. Explain that the crust is the layer on which life exists.

**MEETS OBJECTIVES #1, 2, 4**

### III. Take class back to classroom

▲ Hand out the Student Workbook as reference material and class assignment. Review take it home activities and encourage students to do them.
SUPPORTING INFORMATION FOR TEACHERS

BACKGROUND

The earth has several distinct layers, each with its own properties.

The outermost layer is the crust. It is the thinnest, but here is where life exists. It is covered with rocks, soil and water.

During class, there will be a soil pit dug. Of course, the depth of a hole this size doesn’t even come close to the bottom of the crust, which ranges from about 6 miles under oceans to typically 22 miles under continents. The deepest anyone has drilled into the earth is about 7.5 miles. Nevertheless, a soil pit yields valuable information about the kinds of layers that exist and may even give clues about the history of the school grounds. Gardeners will be able to determine how well suited a particularly area is for growing vegetables or other ornamental or edible plants.

Materials needed
- shovels
- a large tarp
- measuring tape

Procedure

1. In the garden, dig a hole in the garden at a location previously determined. An area not developed for gardening yet and void of large shrubs and trees is best. The pit should measure about 2 feet x 2 feet x 2 feet. Have a student measure the pit.

2. Dump the soil onto a sheet of plywood or tarp; you will use that to refill the hole when you are finished.

3. When the students examine the pit, inspect and discuss the soil layers.

   During the examination, consider the following questions:
   - What observations can be made about the continental crust?
   - Explore and list the components present in the continental crust.

4. Be sure to backfill the hole before you leave.

SOURCES

- UFA Geophysical Institute

- The ABCs of Ecology, An Educator’s Guide to Learning Outside
  Publication by Ecology Education, Inc., 2006

- Southern California Integrated GPS Network (SCIGN)
  http://scign.jpl.nasa.gov/learn/plate1.htm

- Moorland School, Clitheroe, Lancashire, BB7 2AJ, England
  http://www.moorlandschool.co.uk/earth/earths_structure.htm

- Enchanted Learning.com
  http://www.enchantedlearning.com/subjects/astronomy/planets/earth/Inside.shtml

- Earth Structure, Materials, Systems, and Cycles
  http://www.tulane.edu/~sanelson/geol204/struct&materials.htm
the layers of the earth

(see detail, right)

oceanic crust
continental crust
mantle
outer core
inner core

crust
mantle
outer core
inner core
What's the difference between dirt and soil? Dirt is under your fingernails, soil is under your feet! There is indeed lots of soil under your feet (and no dirt under your nails, we hope, unless you've been gardening!), as well as rock containing iron, oxygen and other materials. The earth consists of four main layers: crust, mantle, outer core and inner core. These layers are divided in accordance with their chemical characteristics.

**Crust**: This is earth’s outermost shell. Covered with soil, rock and water, this layer supports life. The crust is considered solid. It is very thin, averaging about 12.5 miles in thickness. The crust can be divided into two parts, the continental crust and the oceanic crust. The continental crust under the seven continents is about 22 miles thick. The oceanic crust under the oceans is about 6 miles thick. The crust is also brittle and can break, as it does during earthquakes. Most earthquakes occur within the crust.

**Mantle**: This layer is beneath the crust and it extends about halfway to the earth’s center. That makes it the thickest layer. It consists of solid rock that despite its solid state behaves like a very sticky, very thick (viscous) liquid—it flows! Not much, only a couple of inches per year, but this is still considered to “flow” compared to the crust. This movement is caused by the very intense heat from the earth’s center.

**Outer Core**: This layer is beneath the mantle. It is made of liquid iron and nickel. When it flows, it creates a magnetic field; this is, the source of the earth’s magnetic field.

**Inner Core**: This is the earth’s center, and immensely hot. Temperatures are thought to range from 9,000 to 11,000 degrees Fahrenheit.
Despite the heat, the inner core is made of solid iron and nickel. It doesn’t melt because the inner core is under enormous pressure. How do we know so much about the earth’s interior? Nobody has ever journeyed to the center of the earth, even though writers and movie makers have produced adventurous tales about such trips. Instead, scientists have studied seismic waves from earthquakes to get clues about the types of materials inside the earth.

Seismic waves are shock waves that travel through solid rock. These waves are generated by earthquakes or underground explosions. Scientists observe seismic waves using a seismograph, an instrument which detects and records earthquakes.
ESS 8.6.1 Identify and diagram the layers of the earth: crust, mantle, outer and inner core.

1. Which layer contains mostly liquid rock (iron)?

2. What is earth’s thickest layer? Thinnest?

3. Which layer is solid due to tremendous pressure?

4. Label the layers of the earth.

1. _____________
2. _____________
3. _____________
4. _____________

Take it Home
Remember that the crust is made of soil, rock and water. Do some yard work this afternoon that involves working with the soil, such as digging or planting, or moving rocks.
1. **Which layer contains mostly liquid rock (iron)?**
   - The outer core.

2. **What is earth’s thickest layer? Thinnest?**
   - Thickest: mantle
   - Thinnest: crust

3. **Which layer is solid due to tremendous pressure?**
   - The inner core.

4. **Label the layers of the earth.**

   ![Diagram of Earth layers]

   1. crust
   2. mantle
   3. outer core
   4. inner core
EARTH SYSTEMS

the layered look, part 1

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1. **Which layer contains mostly liquid rock (iron)?**

2. **What is earth’s thickest layer? Thinnest?**

3. **Compare and contrast the layers of the earth.**

4. **Label the layers of the earth.**

   1. ____________
   2. __________________
   3. __________________
   4. __________________

**Take it Home**

Remember that the crust is made of soil, rock, and water. Do some yard work this afternoon that involves working with the soil, such as digging or planting, or moving rocks.
1. Which layer contains mostly liquid rock (iron)?
   The outer core.

2. What is earth’s thickest layer? Thinnest?
   Thickest: mantle
   Thinnest: crust

3. Compare and contrast the layers of the earth.
   This will vary by student, but should include a description and comparison of all the layers of the earth.

4. Label the layers of the earth.

   ![Diagram of Earth's layers]

   1. crust
   2. mantle
   3. outer core
   4. inner core