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Earth Science Curriculum Map

The experiments in this module fall under eleven topics that relate to three aspects of earth and space science:

- 1. The Planet Earth**
- 2. Earth's Crust and Resources**
- 3. Heat in the Environment**

The activities in this module have two intentions: to teach concepts related to earth and space science, and to provide students the opportunity to apply necessary skills needed for mastery of science and technology curriculum objectives.

Throughout the experiments, the scientific method is used. The scientific method is an investigative process which follows five steps to guide students to discover if evidence supports a hypothesis.

In each section you will find teacher notes designed to provide you guidance with the learning intention, the success criteria, materials needed, a lesson outline, as well as provide some insight on what results to expect when the experiments are conducted. Suggestions for differentiation are also included so that all students can be successful in the learning environment.

LESSON TOPICS

Introduction

Lesson 1 - Inside the Earth

Teacher Notes

Student Activities

Lesson 2 - The Tectonic Plates

Teacher Notes

Student Activities

Lesson 3 - Mountain Formation

Teacher Notes

Student Activities

Lesson 4 - Earthquakes

Teacher Notes

Student Activities

Lesson 5 - Volcanoes

Teacher Notes

Student Activities

Lesson 6 - Rock Types

Teacher Notes

Student Activities

Lesson 7 - Exploring Minerals

Teacher Notes

Student Activities

Lesson 8 - Fossils

Teacher Notes

Student Activities

Lesson 9 - Erosion

Teacher Notes

Student Activities

Lesson 10 - Temperature Change

Teacher Notes

Student Activities

Lesson 11 - Heat Transfer

Teacher Notes

Student Activities

INSIDE THE EARTH

LEARNING INTENTION:

Students will learn about the characteristics of each layer of the Earth's composition.

SUCCESS CRITERIA:

- identify and describe the layers that make up the inside of the Earth
- create a list of questions about the composition of the Earth
- research to answer questions about the inside of the Earth
- create a 3-D model of the Earth, depicting its layers

MATERIALS NEEDED:

- a copy of "A Look Inside the Earth" Worksheet 1 and 2 for each student
- a copy of "Earthly Wonders!" Worksheet 3 and 4 for each student
- a copy of "Creating a Model of the Earth" Worksheet 5 for each student
- access to the internet
- large Styrofoam balls (one for each student)
- paint (green, blue, brown, orange, yellow, red)
- paint brushes, newspaper, exacto knives, a couple of boxes of toothpicks
- clipboards, pencils

PROCEDURE:

***This lesson can be done as one long lesson, or be divided into two or three shorter lessons.**

1. Give students Worksheets 1 and 2. Read through the information with students then discuss it to ensure their understanding of the content.
2. Divide students into pairs. Give them Worksheets 3 and 4. They will engage in a think-pair-share activity to brainstorm,

discuss, and create questions about the Earth's composition. With access to the internet, students will research the answers to the questions that they choose from Worksheet 3. An option is to have the pairs of students re-group to share their findings, as they may not have chosen the same questions to research.

3. Give students Worksheet 5 and the materials to create a three-dimensional model of the Earth and its composite layers. Read through the materials needed and what to do sections to ensure their understanding of the task before they begin. This project may span over a couple of days, as the paint on the exterior will need time to dry before students cut into the interior of the model to paint it.

*To enhance the learning about the Earth's crust, show the students Bill Nye the Science Guy episode called "Earth's Crust". Episodes can be accessed at www.youtube.com

DIFFERENTIATION:

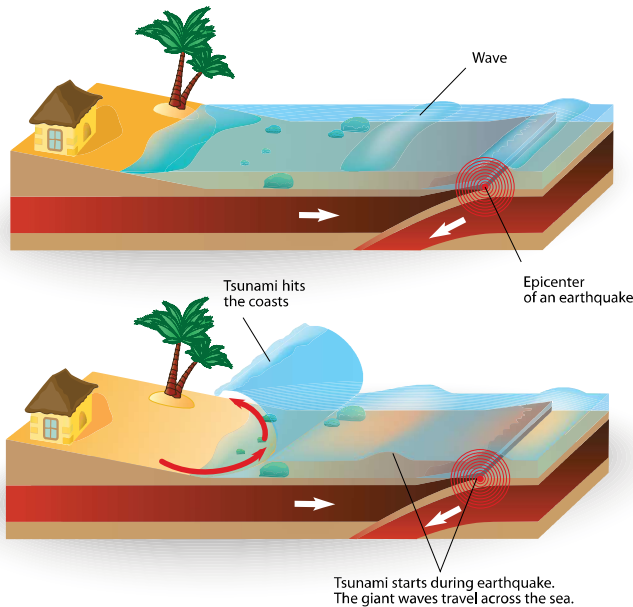
Slower learners may benefit by working as one small group with teacher support to complete Worksheet 3 together on chart paper. An additional accommodation would be to have these learners choose only two questions to research the answer for on Worksheet 4.

For enrichment, faster learners could access the internet to research the composition of the Earth's moon. Students can draw a diagram that illustrates their research, with detailed descriptions of the moon's interior layers.



A Look Inside the Earth

TSUNAMI



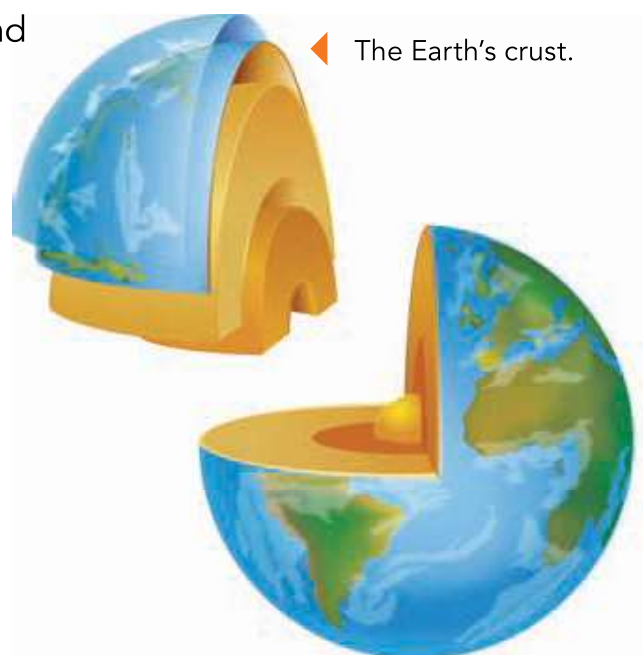
- ▲ This Tsunami wave is caused by an earthquake. Geologists study these earthquake waves to uncover what is happening inside of the Earth.

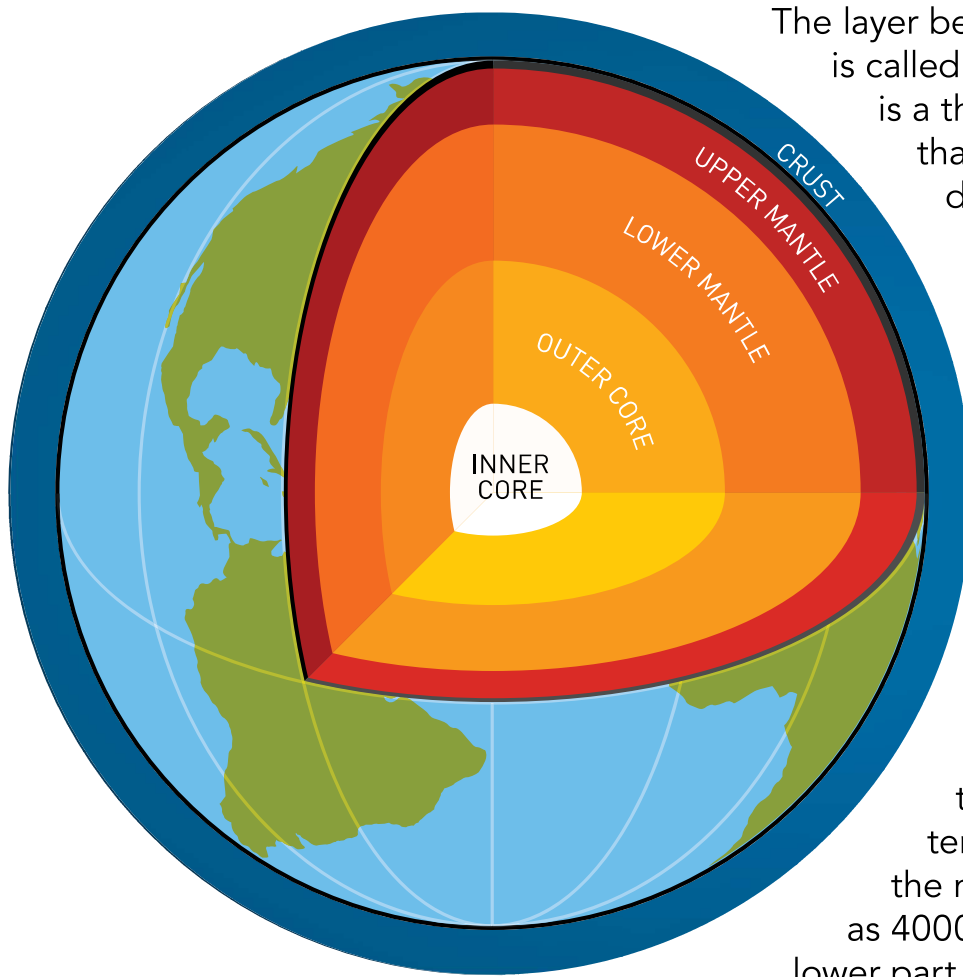
The study of the earth beneath us is known as the science of geology. Geologists are scientists who study the origins and development of the Earth, as well as its size, shape, and composition. They study the processes which have changed the Earth's surface over millions of years, and the forces that continue to change the Earth's surface today.

Most of the information that geologists have about the **inside** of the Earth has been gained from studying geologic events that occur on the Earth's crust, especially earthquakes. Investigating earthquake waves is one of the ways geologists have of learning about the inside of the Earth.

Cutting through the Earth, we would pass through layers. The first layer is called **the crust**. The crust is a thin, hard outer layer which covers the entire surface of the Earth. All the landforms of the Earth, such as mountains, hills, valleys, and plains, are part of the crust. The crust is the part of the Earth that supports all life, and is where we get the resources we need to survive on our planet.

The Earth's crust makes up less than one percent of the Earth's volume, and varies in thickness from about 5 km to about 50 km at its greatest depth.





The layer beneath the Earth's crust is called **the mantle**. The mantle is a thick layer of the Earth that is about 2900 km deep, and it accounts for eighty-three percent of the Earth's volume.

The upper part of the mantle is known as the 'lithosphere'. It is solid like the crust. The lower part of the mantle is known as the 'asthenosphere'. This part of the mantle has much higher temperatures. The temperature in this part of the mantle could be as high as 4000 °C. The rock in this lower part of the mantle is melted or 'molten', and it flows slowly.

The Earth's core consists of two regions, **the outer core** and **the inner core**. The core is even hotter than the mantle, and it makes up about sixteen percent of the Earth's volume.

The outer core is about 2200 km thick. Because of the high heat, this part of the core is like liquid and flows very slowly. The outer core forms the magnetic field of the Earth.

The inner core, which is the centre of the Earth, is a solid mass made up of iron and nickel. This part of the core is about 2500 km in diameter.

Earthly Wonders!

Think Pair Share

With a partner, do some thinking and sharing of ideas about the Earth's composition. What do you wonder about? Write some questions that you would like to have answers to about the inside of the Earth.

1.

2.

3.

4.

5.

6.

Choose **four** of your questions, and use your researching skills to find the answers to your wonders!

Answer to question # _____:

Answer to question # _____:

Answer to question # _____:

Answer to question # _____:



Creating a Model of the Earth

You have learned about the layers that compose the Earth, and now it is time to create a three-dimensional model of the Earth!

Materials needed:

- newspaper
- a large Styrofoam ball
- 4 strong toothpicks
- 6 small paint brushes
- a pencil
- an exacto knife (or sharp-edged tool)
- paint (green, blue, brown, yellow, red, and orange)

What to do:

1. Use the pencil to draw the continents of the Earth on the Styrofoam ball.
2. Paint the continents of the Earth green.
3. Paint the remaining surface of the Earth blue, to represent water.
4. Stick the toothpicks into one side of the Styrofoam ball. Then set it down on the toothpicks to dry.
5. Once the outside of the Earth model has dried, use the exacto knife to cut one quarter of it out. This will expose the inside of the Earth model.
6. Use the pencil to draw the layers that make up the inside of the Earth.
7. Paint the crust brown. Paint the mantle orange.
8. Paint the outer core yellow. Paint the inner core red.
9. Set it down on the toothpicks to dry.
10. Label the layers, and place your model of the Earth on display!