Rocks of the Earth

Students will be introduced to the layers of the Earth and learn the specific characteristics of each layer by constructing a kinesthetic model of the Earth.

Grade Level : 1st

Phenomena:
By observing rocks, we can learn more about the layers of the Earth.

Objectives:
- Students will observe rocks and look at them from different perspectives.
- Students will describe the layers of Earth.
- Students will participate in a kinesthetic model that shows the specific characteristics of the layers of the Earth.

Materials:
- Rock and mineral samples
- A visual aid showing the layers of the earth
- One piece of paper per student
- Earth beach ball

Appendixes:
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Time Considerations:
Preparations: 20-30 minutes
Lesson Time: 60-70 minutes
Introduction: 5 minutes
Activity 1: 15 minutes
Activity 2: 10 minutes
Activity 3: 10 minutes
Activity 4: 5-10 minutes
Activity 5: 5 minutes
Activity 6: 5-10 minutes
Conclusion: 5 minutes

Related Activities:
Sorting Rocks, Rockin' Rocks, Discovering Minerals, Boulders to Bits

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Next Generation Science Standards

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Scientific Engineering Practices (SEP):
Constructing Explanations and Designing Solutions.

Disciplinary Core Ideas:
The History of Planet Earth.

Crosscutting Concepts:
Stability and Change

Excellence in Environmental Education Guidelines

Strand 1—Questioning, Analysis, and Interpretation Skills
(A, B, C, G) Learners are able to develop question, design investigations, collect information, and draw conclusions in order to learn about the environment.

Strand 2.1—The Earth as a Physical System
(A) Learners are able to identify changes and differences in the physical environment.

Background

There are three families of rocks: (1) igneous,
(2) sedimentary
(3) metamorphic

Igneous Rocks

Igneous rocks are those that form from molten magma. Magma is melted rock which can rise through the Earth's crust. Magma found on the surface of the Earth is called lava. Magma that cools very slowly at great depths in the crust as giant magma chambers can eventually solidify to form "Intrusive Igneous Rocks" such as granite (granite is composed of an interlocking network of minerals rich in quartz and feldspars). These very large intrusions tend to form the cores of major mountains, and can be later exposed by erosion. Classic examples occur as the Sierra Nevada Mountains of California, The Rocky Mountains and the Appalachian Mountains. When magma is released by volcanoes as lava it cools to become extrusive igneous rocks.

Sedimentary Rocks

When mountains are weathered, broken down and eroded away, sediment is produced. The sediment (such as sand and mud) is carried to inland basins and to the

oceans where it is deposited. The sediment accumulates, is then buried by succeeding layers of sediment and is eventually compacted and cemented together to form a sedimentary rock. Examples include conglomerates (very coarse, boulder-like or pebbly deposits), sandstones (composed of sand sized grains of quartz), and mud rocks called shale.

Metamorphic Rocks
The last family of rocks are called Metamorphic rocks. They undergo a metamorphism, which is a change of form. After great burial and due to the pressure of the rocks above (overburden), as well as heat within the crust, rocks will be forced to re-crystallize and transform into a new metamorphic rock to conform with its new surroundings. However, at greater depths, the rocks all melt completely to form new magma, and the process starts all over again. This illustrates a small part of the rock cycle.

Layers of the Earth
The Earth is made up of different layers. These layers can be defined by their properties. The Earth has an outer silicate solid crust, a highly viscous mantle, a liquid outer core, and solid inner core. The core is believed to be composed of 80% iron, along with nickel and one or more light elements, whereas other dense elements, such as lead and uranium, either are too rare to be significant or tend to bind to lighter elements and therefore remain in the crust.

The Earth's mantle extends to a depth of 2,890 km, making it the thickest layer of the Earth. The mantle is composed of silicate rocks that are rich in iron and magnesium relative to the overlying crust. Convection of the mantle is expressed at the surface through the motions of tectonic plates.

The crust ranges from 5-70 km in depth and is the outermost layer. The thin parts are the oceanic crust, which underlie the ocean basins and are composed of dense iron magnesium silicate rocks. The thicker crust is the continental crust, which is less dense and composed of sodium potassium aluminum silicate rocks.

Preparation

Check the weather forecast prior to the lesson to ensure students dress appropriately for their outdoor rock hunt.

Gather the following materials: paper (one piece per student), Earth ball, and Earth cross section poster.

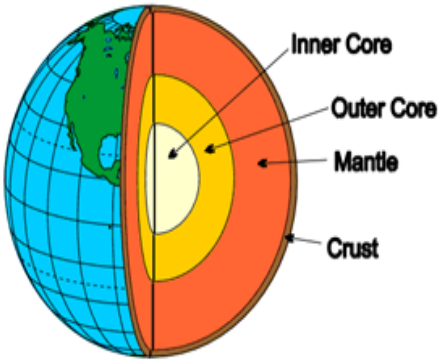

Figure 1

Doing the Activity

Introduction
Ask students if they know the name of the planet that we live on (*earth*). Ask students what you can find on the earth (*plants, animals, people, houses, water, etc.*).

Move students outside for the following activity. Give students a leading question to think about as they walk outside; "*As we walk outside I want everyone to think about what else you may see on Earth.*"

Activity 1: Points of View
Once outside, ask students to name the different objects they see on Earth.

Tell the students to imagine themselves as birds, flying over the Earth. Ask the students what they may see on Earth if they were birds in the sky.

Next, tell students to imagine that they are astronauts on a space ship in outer space. Ask the students what the Earth would look like from outer space.

(Instructors note: Use the Earth Beach Ball to help students

visualize Earth from this perspective).

Turn the students' focus towards the ground. Tell the students to imagine they were an ant crawling over the ground. What would Earth look like to an ant?

Next, ask the students if they were to go into the Earth what would it look like beneath our feet?

Explain to students that they are going to imagine that they are taking a trip to the center of Earth. Have students brainstorm and predict what they may find.

Activity 2: Layers of the Earth
Arrange students in a circle. Pretend to lift an imaginary door that leads to Earth's interior.

As the class begins to "walk" to the middle of Earth, describe to students what they would see and feel.

The Crust: layers and layers of very old rocks all around. Explain that **we all live on top** of the crust layer.

The Mantle: Very, very hot! It's ***slow moving*** melted rock.

The Core: Super hot and spinning. ***It's solid to the core***.

Activity 3: Layers in Motion
Explain to students that nobody can actually visit the center of Earth, because of its extreme heat. So, instead we are going to build Earth by acting out the layers.

- *Core:* 4 Students standing back to back and chanting: "Solid to the core!"
- *Mantle:* 6-8 students circling the core holding hands and waving their arms chanting: "Slow Moving!"
- *Crust:* 8-10 students standing evenly spaced around the mantle taking on a shape of the crust such as a mountain, valley, hill, cliff, etc… The crust should chant "crust, crust, crust!"

As each layer is added rehearse each chant. Finally, put the layers in motion all together.

Activity 4: Rock Hunt
Tell students they are going to take a closer look at Earth's thinnest layer (the Crust) by looking at ROCKS!

Have students spread out and find a "special" piece of crust (rock) of their own.

Gather students and lead them back inside to examine their rocks closer.

Activity 5: Rock Examination
Tell students to examine their rocks and describe how they look.

Create a word bank on the board with words students generate to describe their rocks.

Bring around a bucket of water (or damp cloth) and quickly wash their rocks; ask if any new characteristics can be seen.

Activity 6: Different Perspectives:
Pass out a piece of paper to each student and tell them to draw their rock. They can draw their rock from any perspective they would like and should use crayons or colored pencils to color in the rock. Also ask them to write two to three descriptive words about their rock.

After the students have finished drawing their rocks, have them flip the paper over and ask them to draw the rock as if from an ant's view.

Conclusion

In order to review with the students the layers of the Earth ask them questions; At what layer is life found? Which layer is solid and spinning.
Next, look at the word bank that the students helped create.

Pick out words from the bank and ask the students to hold up their rocks if that word describes their rock. Ex. Ask for smooth rocks, students should hold up their rock if it is smooth.

Assessment

Asses students' knowledge from the words they use to describe their rocks.
Asses students from both drawings they make of the rocks.
Asses students by their contributions to the class discussion.

Extensions

Ask the students to find another rock that looks different from the two they found during the rock hunt. Tell them to come back to show the class their rock and use descriptive words to explain why their new rock is different than their other samples. They can also draw their rock from a new perspective.

Find a book to read to the students that illustrates the rock cycle.

Show students samples of different rocks or minerals. Have students describe these samples by using descriptive words.

Vocabulary

Core: The center of the Earth; below the mantle. Consists of iron and nickel. It is made up of a liquid outer core and solid inner core.

Crust: The outermost solid shell of a rocky planet or moon, which is chemically distinct from the underlying mantle; composed of a great variety of igneous, metamorphic, and sedimentary rocks. The crust is underlain by the mantle.

Igneous Rock: Formed by crystallization of molten (or melted) material; either magma (within the earth) or lava (on the surface of the earth).

Magma: Melted rock found beneath the earth's surface. Magma flows as lava out of volcanoes and becomes igneous rock when it cools.

Mantle: The layer of Earth between the crust and the core; consists mainly of magnesium-iron silicate minerals. It has an upper, partial molten part and a lower, solid part. The upper part is the source of magma and volcanic lava.

Metamorphic Rock: A rock formed from preexisting solid rocks by mineralogical, structural, and chemical changes, in response to extreme anges in temperature, pressure, and shearing stress.

Sedimentary Rock: Rock formed by layers of sediment in the ground being pressed together.

Sources

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Images:
Figure1—http://www.english-online.at/science/solar-system/inner-planets-of-the-solar-system.htm