

Earth Science Unit A

Grade level: 3rd

Unit A Earth's Surface

Time Frame: Sept.

Unit Essential Questions:

- What are earth materials?
- What evidence shows us that earth's surface has changed over time?

Big ideas:

- The surface of the earth can be changed by erosion, glaciers, volcanoes, landslides, earthquakes, and weathering
- The surface of the earth can be grouped as rocks, clay, gravel, sand, soil, and minerals.

Essential Concepts/Skills/

GLCE's: Earth Materials Change and Resources

- recognize and describe different types of earth materials (mineral, rock, clay, boulder, gravel, sand, soil, water, and air) (E.SE.03.13).
- identify and describe natural causes of change in the earth's surface (e.g., erosion, glaciers, volcanoes, landslides, and earthquakes) (E.SE.03.22).
- recognize that rocks are made up of minerals (E.SE.03.14).
- develop research strategies and skills for gathering information about earth material and for problem solving the various natural causes of change in the earth's surface (S.IA.03.14).

NGSS: Weather and Climate ***Note the Oakland Units do not address these standards at this time. Resources have been added for teachers to teach these to students.*

- 3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]
- 3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.
- 3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]
- ESS2.D: Weather and Climate- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)
Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)
- ESS3.B: Natural Hazards- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.

PRE-PLANNING CONSIDERATIONS

Misconceptions that need to be addressed:

Students may hold many misconceptions about erosion, including:

- **Rocks do not change**
- **Weathering and erosion are essentially the same thing. The two words can be used interchangeably.**
- **Erosion happens quickly**
- **Erosion is always bad.**

Students tend to view the earth as static, stable, and unchanging. They often have difficulty believing that rocks can change or be worn down through the process of weathering. Students also tend to confuse weathering (the physical or chemical breakdown of rock) with erosion (the process of transporting sediments).

Even once students understand the concepts of weathering and erosion, they tend to have difficulty conceptualizing the long time frames needed for these processes to occur. Many science lessons focus on the negative aspects of erosion (soil loss, ecosystem destruction, sediment buildup in water sources) and lead students to believe that erosion is always bad. However, teachers should stress that erosion does have positive aspects as well. Delta areas, like the Mississippi and the Nile, were created by the deposition of eroded sediments carried downriver. Without erosion, these rich, fertile farming areas would not exist.

Misconceptions about Volcanoes

- **Volcanoes are randomly located across the earth's surface.**
- **Volcanoes are found only on land.**
- **Volcanoes are found only in hot climates.**
- **All volcanoes erupt violently.**
- **Volcanoes only erupt straight up through the top vent.**
- **If a volcano doesn't erupt for a hundred years, it's extinct.**
- **If a volcano does not produce lava, it is not dangerous.**

Elementary students may believe that volcanoes are randomly scattered across the earth, when the majority are located along tectonic plate boundaries. "Ring of Fire" is the name given to an area along the border of the Pacific Plate with a high concentration of volcanoes. The Pacific Northwest, Alaska's Aleutian Islands, and Japan are all located in the Ring of Fire. Volcanoes are found on land and under the ocean's surface, as well as in areas with cold climates (like Antarctica).

Students may also believe that all volcanic eruptions are violent, but many are not. The levels of silica and dissolved gases in the magma determine whether a volcano

erupts explosively or effusively. Magma and gas may escape through cracks and weak areas on the sides of the volcano in addition to the top vent. Baking soda and vinegar models, a staple of elementary school science, do not accurately model an eruption and could lead to the formation of misconceptions.

Students may also not understand that volcanoes can be inactive for long periods without being considered extinct. When volcanoes no longer have a lava supply, they are extinct, but it can be quite difficult for scientists to know if and when this is the case. For example, scientists are fairly certain that volcanoes of the Hawaiian Islands chain are extinct. Mount Vesuvius in Italy was believed to be extinct before erupting violently.

The lifespan of a volcano can be measured in millions of years, so a volcano that has not erupted in thousands of years would most likely be classified as dormant, rather than extinct. Yellowstone Caldera in Yellowstone National Park hasn't erupted violently for approximately 640,000 years, but has had minor activity much more recently. Scientists thus do not consider Yellowstone Caldera to be extinct, but dormant.

Finally, students may believe that volcanoes are only dangerous due to lava flows. In reality, pyroclastic flows, ash clouds, and mudflows can be extremely hazardous. Deadly mudflows (lahars) have occurred recently in Colombia and the Philippines, and the eruption of Mount St. Helens produced an ash cloud and landslides of ice, mud, and rock.

Misconceptions about Earthquakes

- Earthquakes happen randomly across the earth's surface.
- The ground opens up during an earthquake.

As with volcanoes, students may believe that earthquakes happen in random locations across the earth. Most of the world's seismic activity is associated with tectonic plate boundaries and fault lines.

While shallow crevasses may form during an earthquake due to landslides or ground failures, the ground does not "open up" along a fault line. If a fault opened up, there would be no friction and no earthquake!

Taken from the website

<http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/common-misconceptions-about-weathering-erosion-volcanoes-and-earthquakes>

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- earth materials
- mineral
- rock
- clay
- boulder
- glacier
- sand
- soil

- erosion
- weathering
- volcano
- eruption
- earthquake
- landslides

Supplies to gather or things that need to be done:

- | | |
|---|--|
| Bucket | Photos of commercial uses of earth material |
| Clay | Photo of Pompeii |
| Coffee Filters | Plastic grocery bags |
| Crayons or colored pencils | Plastic spoons |
| Cups | Poster or picture of the Grand Canyon |
| Disposable paint roller pan | Radiant Heater |
| Elevation map of Michigan | Rocks |
| Elevation map of the United States | Rulers |
| Garbage bags | Safety goggles |
| Hand lens | Sand |
| Ice cubes | Sandstone |
| Limestone | Scissors |
| Loamy soil | Shoebox |
| Newspapers | Soil Samples |
| Paper | Straws |
| Paper cups | Toothpicks |
| Paper plates | Topsoil |
| Paper towels | Volcanic pumice (lava rock) |
| Pebbles | Water |

Additional Resources

ENGAGE (Choose 1 or 2)

Websites

Smithsonian Collecting: Rocks and Minerals (website with neat information about collecting rocks and minerals. <http://www.smithsonianeducation.org/idealabs/collecting/main.html>)

How a Fossil Forms: web book with audio

http://www.harcourtschool.com/activity/science_up_close/306/deploy/interface.html

New Jersey - Tour at Sterling Hill Mine Museum (interesting clip of minerals in a mine)

http://www.mineraltown.com/videos/sterling_hill_museum.htm

Mining Map of the United States <http://www.msha.gov/KIDS/MINING.HTM#.U8MqAPIdUin>

Mineralogy for Kids (great place to learn about rocks) <http://www.mineralogy4kids.org/>

Interactive Rock Cycle and Rock Collecting <http://www.learner.org/interactives/rockcycle/>

The Rock Cycle <http://www.cotf.edu/ete/modules/msese/earthsysflr/rock.html>

A map of the United States which classifies landforms of the continental U.S..

https://www.teachervision.com/tv/printables/concepts/es_transparencies_6.pdf

Earthquake Facts for Kids

<http://earthquake.usgs.gov/learn/kids/>

Colin CO2 A narrated, interactive story which can help younger children understand climate change and how they can help.

EXPLORE:

**See Oakland County Lessons for Explore Activities

Alternative Lessons:

[Beyond Penguins and Polar Bears Link](#)

Hands-On Science and Literacy Activities about Erosion, Volcanoes, and Earthquakes

EXPLAIN:

Promethean flip charts to go with the unit -

Rock and Earth

<http://www.prometheanplanet.com/en/Resources/Item/30373/rock-and-earth#.U8MiTvldUik>

Weathering and Erosion

<http://www.prometheanplanet.com/en/Resources/Item/42634/weathering-and-erosion#.U8MtVldUik>

Landforms - Forces that shape the land.

<http://www.prometheanplanet.com/en/Resources/Item/213016/landforms-forces-that-shape-the-land-this-flipchart-reviews-various-landforms-weathering-erosion#.U8MuCvIdUik>

NIE - GZ Rumbling Grumbling Volcanoes

<http://www.prometheanplanet.com/en/Resources/Item/254616/nie-gz-grumbling-rumbling-volcanoes#.U8MvuPIdUik>

ELABORATE:

Engineering Project: [Shakes and Quakes: Activities in Earthquake Engineering](#)

Objective: To stimulate young minds and allow them to better understand the way in which civil engineering structures respond to severe earthquakes, students investigated the seismic behavior of masonry structures

****Note:** Legos are necessary for this project. It also calls for a shake table. This can be constructed using 2 sturdy pieces of cardboard or wood as a platform. Place 6 bouncy balls between the two pieces and secure the platforms with large rubber bands. Twist in the platforms in opposite directions to create a shaking simulation.

There is also a formula students are to use to figure out rent value. This formula deals with square roots. The formula can be adjusted by the teacher to meet the classroom needs. Teachers can adjust this project however necessary to make it meaningful for their own students.

WEATHER AND CLIMATE

Weather Maps: *Note The 3rd Grade NGSS are related to Weather and Climate

Objective: Students will do the following: 1. Understand basic information about weather. 2. Learn about different kinds of weather maps. 3. Create and present National weather maps showing different conditions.

[Discovery Education: Weather Maps Lesson/Activity](#)

EVALUATE:

1. Write a news report describing a real or fictional natural disaster. Include the damage, the relief efforts, and the impact on the area (E.SE.03.22, S.IA.03.14).
2. Research and analyze given samples of earth materials, select one earth material in which to describe in detail (E.SE.03.13, S.IA.03.14).
3. Given a small selection of rocks, classify each based upon their mineral make up and describe in writing the process used for classification (E.SE.03.14).