Inquiry Project Grade 4 Curriculum

Investigating Earth Materials: Which Properties Change and Which Stay the Same?

1. UNDER FOOT	2. HEAVY FOR SIZE	3. LIQUID MATERIALS	4. MINERAL MATERIALS	5. TRANSFORMATIONS
1.1 What are some different kinds of earth materials? Students begin by imagining what they would find under their feet at various locations on Earth's surface. They then explore a small collection of common earth materials. As they sort the materials in different ways, they come to appreciate the variety of things that make up the surface of our planet.	**2.1 Same volume, same weight?** Students compare the weights of equal volumes of two liquids and two granular solids using a digital scale. They see evidence that equal volumes of different materials can have different *weights,* and that some materials are "heavy for their size."	**3.1 How can we compare the volumes of liquids?** Students arrange different-shape containers of water in order by the amount of space the water takes up. Use a "fair test" to compare the "volumes" of water. Discuss the meaning of "taking up space" and contrast it with measurements such as length or height, or weight.	**4.1 What causes the water level to rise?** Students gather evidence to decide if weight or volume is the determining factor in the displacement of water.	**5.1 What happens to shells when we crush them?** Students are introduced to the idea of conservation of matter through a classroom activity that mimics the long-term effects of weathering.
1.2 What can we learn about rocks by observing them carefully? Students focus on a set of four rocks. They use magnifiers to explore the rocks closely and they record their observations about one of the rocks in their notebook. After sharing their observations, students develop some general statements that apply to all the rocks.	**2.2 What makes a good weight line?** Students study a set of weight lines. Through their analysis of these lines they discover the essential characteristics of a good weight line. Careful work with weight and volume measure lines lays a foundation for later understanding of information displayed in conventional graphs.	**3.2 How can we measure the volume of a liquid?** Students get a hands-on introduction to cubic centimeters, a common unit of volume used by scientists. They then make and calibrate their own measuring cups and use them to measure some water volumes.	**4.2 How can we measure the volumes of rocks?** Students discover that when a rock is submerged in water, it displaces a "rock's worth" of volume. They find a way to measure that volume in cubic centimeters. They learn that the volume of solid objects can be found by measuring the amount of water they displace.	**5.2 What happens to weight and volume when we reshape a ball of clay?** Students manipulate plasticene—a stand-in for clay, a malleable earth material. They record the weight and volume of the plasticene, form it into a new shape, and then measure weight and volume again.
1.3 What can we learn about minerals by observing them carefully? Students begin by investigating eight minerals, considering some of their properties and sharing their observations. They then return to the four rocks they studied in the last investigation to see if they can identify any minerals in them.	**2.3 What can a good weight line show us about our earth materials?** Students are challenged to construct a weight line that will help them see – *really see* – how much heavier some earth materials are than others.	**3.3 How do oil and water compare?** Students compare some properties of oil and water by sight, then they measure volumes of oil and water at three different weights. They find a relationship between the weights and volumes and consider whether the relationship holds true for all weights of these materials.	**4.3 What happens when we add earth materials to water?** Students continue their investigation of volume and water displacement by adding solid, liquid, and granular materials to water and recording the volumes that result. They discover that when a granular material is added to a liquid, the combined volume is equal to the sum of the separate volumes minus the volume of the air between the grains in the sample.	**5.3 What's under my feet?** Students imagine a place on Earth's surface and documenting the earth materials found there.
1.4 What is soil made of? Students observe two soil samples, one sandy and one more organic, then compare their properties in a Venn diagram. They try to identify components of the soils, and consider the "empty" spaces between grains. They ponder where soil comes from and learn about weathering.	**2.4 Same weight, same volume?** Students review the weight data for the materials they have studied so far – sand, water, mineral, and organic soil. Then they predict how the *volumes* of these materials will compare if the *weights* are held constant.			