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Lesson plans

Summer 2002 RET Program (9 pages total)

Lesson Plan #1

Objectives:

This lesson will cover grade level 6 and cover granular settling and distribution with dry materials. Through predictions and drawings and experimenting, the students will realize that granular material has a state all it's own.

Standards:

The student understands that all matter has observable, measurable properties.

SC.A.1.3.6 The student knows that equal volumes of different substances may have different masses.

SC.A.1.3.1 The student identifies various ways in which substances differ (e.g. mass, volume, shape, density, texture, and reaction to temperature and light).

Materials:

One clear glass jar with lid

Sand

Various size pebbles

Teaching Procedures:

Divide the students into five groups of four. Each table will be given an empty glass jar with lid, sand, and various pebble sizes. Have the students put equal parts of sand and pebbles into the jars (beginning with the pebbles) and secure the lids. Now ask the groups, given the materials in

the jars, which do they think is the denser of the two and make their predictions as to their deposition? Visually the students will probably answer, the rocks. Now instruct each student to gently shake the contents in their jars (the results will be more visible if the jar is shaken in a horizontal position). Ask each group to illustrate the contents next to their predictions. Tell the students that what we've illustrated is that density depends on the type of substance and not necessarily the substance.

Brazil Nut Theory

Anyone who has opened a can of mixed nuts knows that the larger nuts tend to be at the top. Ever wonder why this happens? This phenomenon even has a name, the Brazil Nut Effect.

Some research has found that with large amplitudes of shaking, the larger particles get tossed upward and the smaller particles quickly fall into the empty space behind or below.

This study is a perplexing part of granular physics and the science behind it.

Lesson Plan Number 2

Objectives:
This lesson is designed for grade level 6 and covers granular settling and deposition with dry materials that have had water added (making density an important factor). The students will gain an understanding of how water changes the rate at which the different materials will sink.

Standards:
The student understands that all matter has observable, measurable properties.
SC.A.1.3.2 The student understands the difference between weight and mass.
SC.A.1.3.6 The student knows that equal volumes of different substances may have different masses.
SC.D.1.3.1 The student knows that mechanical and chemical activities shape and reshape the Earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in layers.

Materials:
Clear glass jars with lids
Various size pebbles
Sand
Water

Teaching Procedures:

Divide the students into five groups of four. Each table will be given an empty jar with lid, sand, 3 cups of water, and various sized pebbles. Students will layer the materials in the same order as experiment one (pebbles, sand, water). Students will, at this point, predict what

will happen to the materials when shaken (same way as experiment one). Predictions can be guided to answer the questions: In what order will they settle? What effect will the water have on the materials?

After students have shaken the jar, they will describe the state of the jar and its contents. Ask students: Why did the materials settle differently this time? What effect did the water have on the material?

Teacher instruction will focus on how materials of different density sink at different rates in water (as opposed to falling at nearly the same rate in open air). The density of water (1 g/ml)causes the sand, while smaller, to sink more slowly than the pebbles. The order (pebbles, sand, water) is opposite of the first experiment because in air, the density of the materials is secondary to their sizes and shapes.

Lesson Plan Number 3

Objectives:

This lesson will cover grade level 6 and address the aspects of density in relationship to the Earth's layers. It is designed to illustrate through discussion and a hands-on activity that in any mixture of liquids, denser materials sink and less dense materials rise, much as how the Earth's molten materials separate.

Standards:

The student understands that all matter has observable, measurable properties.

SC.A.1.2.1 The student determines that the properties of materials (e.g. density and volume) can be compared and measured.

SC.A.1.3.6 The students know that equal volumes of different substances may have different masses.

Materials:

One clear glass jar with lid

Water

Vegetable oil

Corn syrup

Teaching Procedures:

Begin class with a review of the early Earth's atmosphere. The early atmosphere contained carbon dioxide, carbon monoxide, sulfur dioxide, water vapor, hydrogen, and nitrogen. Explain that the water vapor in the atmosphere eventually condensed into clouds which produced rain. The early Earth was alive with volcanic activity which made it very hot. As the rain cooled the earth, the liquid filled the low areas of the Earth's crust and formed the oceans. What we're going to experiment with and hopefully discover is how these liquids with different densities may have separated in the early Earth.

Experiment Procedures:

In the interest of materials, divide the class into five groups of four. Each table will be given a jar with water, vegetable oil, and corn syrup. Instruct the students to add their liquids one at a time. Without disturbing the mixture, have each group draw a diagram of the jar of liquids. Now have each group gently shake their jars with the lids on, in order to mix the liquids. Have them wait five minutes and again diagram their jars. Having done this, have them wait an additional 5 minutes and again diagram the settling of the liquids.