Liquid Assets!

Lesson Overview

In this lesson, students will learn how to extract the iron from money and in the process learn the characteristics of magnetism.

Suggested Grade Levels: K-8

Standards for Lesson

Content Standard A: Science as Inquiry
Content Standard B: Physical Science
VA SOL:
K.3 a; 2.2 a, b; 4.3 e; PS.11 b

Time Needed

1 day

Materials for Lesson

- A U.S. $1 bill
- Kitchen blender
- Water
- A zipper-lock bag
- Super Strong Neodymium Magnet

Content Background

Information for teacher:

U.S. dollar bills are printed with a special ink that contains iron and other magnetic metals to prevent counterfeiting. As a result, dollars can be used to demonstrate magnetic characteristics.

Engage

Tell students that today they are going to discover just how valuable the dollar really is because it has special properties. Place a dollar bill at each team of four students and tell them to record in their science notebooks 5 properties of a dollar. RALLY ROBIN: Students share their observations with their partner.

Explore

Fold the dollar bill in half and hold the open bill so that the fold is toward you. Hold the neodymium magnet near the bottom of the bill and lift. Tell students to record observations and ask them to make an inference to explain why the bottom of the bill moves. *(The iron in the bill is attracted to the magnet.)*

Explain

Neodymium magnets (Nd-Fe-B) are composed of neodymium, iron, boron and a few transition metals making them some of the strongest magnets in the world. The magnetic field created by the neodymium magnets is so strong; it will line up to match the magnetic north and south of the earth. It makes a great compass!

Larger neodymium magnets are so strong that they may even be dangerous if not handled properly. A pair of these magnets will leap into a deadly embrace from over 6 inches apart and may knock chips off themselves from the force of the impact. You'll be amazed at the super strength of the magnets, but we must warn you to be careful. Any type of magnetic media will be history in the presence of one of these large neodymium magnets.

Elaborate

1. Take a dollar bill (your own or borrowed).
2. Fill the blender half full with water (between 3 and 4 cups).
3. Allow students to thoroughly examine the bill to verify that it's real.
4. Drop the dollar bill into the blender and put on the lid.
5. Turn on the blender and make dollar soup. Grind it, blend it, liquify it until it is torn into thousands of little pieces.
6. After the money has been grinding away for at least a minute, stop the blender and pour the contents into a quart size zipper-lock bag. Seal the bag.
7. Place the Super Strong Neodymium Magnet in the palm of your hand and place the bag of money soup on top of the magnet.

8. Place your last remaining hand on top of the bag and rock the mixture back and forth in an effort to draw all of the iron to the magnet.
9. Flip your hands over and look closely at the iron that is attracted to the magnet. You can slowly pull the magnet away from the bag to reveal the iron!

Evaluate

Ask student to consider the following questions to better understand the real-world application:

1. What evidence is there that the ink in a dollar bill is made of iron, instead of some other metal? *The ink is strongly attracted to a magnetic field. Iron is one of only a few metals that is attracted to a magnet.*
2. Is the iron in currency present as ions or elemental iron? *Elemental iron. The ions are not that strongly attracted to a magnetic field.*
3. What are the advantages to having magnetic materials in currency? *The bill may be read by vending machines more easily. It may also help prevent counterfeiting.*

Have students discuss answers with teammates and to record answers in their science notebooks.

Observation Sheet

What do you see with your eyes?

What do you smell with your nose?

What do you hear with your ears?