

Metal in Money



Submitted by Drew Beahm

Introduction

- U.S. dollar bills are printed with special inks that contain traces of iron and other magnetic material in an effort to prevent counterfeiting. So, the only logical question that follows is, "Can you get the iron out of a dollar bill?"

Objective

- Showing that there is metal in money

Standards

Activity:	
Mathematics	In process of change
Science	In process of change
Social Studies	In process of change

Unit Suggestions

- One of my favorite things about this activity is watching the kids' reactions to me blending a dollar bill. It immediately grabs their attention and they are connected right away. So, I tend to make a big scene when blending.

Time Allotment

- 30 min

Materials

- \$1 bill
- Kitchen blender
- Water
- Quart size zipper-lock bag

- Super strong Neodymium Magnet

Set Up

I like to make a big deal out of blending the dollar to grab the kids' attention. Many times I will take out a dollar during the previous subject lesson and just let it sit while the kids are working. Then I take a magnet and start lifting one end of the dollar pretending like I don't know what is going on (I find that students will pay attention more if they think they are learning with me).

Directions

Step 1

- After I lift the dollar bill with the neodymium magnet, I ask the class how this is possible. After getting a few interesting answers I imply that there has to be metal in the dollar some how.

Step 2

- Ask the class how to find out if there is metal in the Dollar bill.

Step 3

- After many interesting solutions from students on how to extract the metal, I go get a blender and fill it half way with water. I tell the kids I'm going to make "Dollar Bill Soup." They LOVE this part!

Step 4

- Blend the dollar for about a minute (until it is a blend of thousands of small pieces).

Step 5

- After blending is done, pour contents into a gallon zip lock bag.

Step 6

- Place the neodymium magnet in the palm of your hand and place the bag of money soup on top of the magnet. Place your other hand on top of the bag and rock the slurry back and forth in an effort to draw all of the iron to the magnet. Flip the bag 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!

How does it work?

- Neodymium magnets (Nd-Fe-B) are composed of neodymium, iron, boron and a few transition metals. These magnets are very strong for their small size. Some of the iron in the dollar bills is elemental. The inks are magnetic which makes it easy to read the bills with some machines.

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.

What are the advantages to having magnetic materials in currency? The bill may be read by machines more easily. It may also help prevent counterfeiting.

Additional Ideas/Resources

I often have kids ask me if it is illegal to destroy money. Below is the law.

Section 333. Mutilation of national bank obligations

Whoever mutilates, cuts, defaces, disfigures, or perforates, or unites or cements together, or does any other thing to any bank bill, draft, note, or other evidence of debt issued by any national banking association, or Federal Reserve bank, or the Federal Reserve System, with intent to render such bank bill, draft, note, or other evidence of debt unfit to be reissued, shall be fined under this title or imprisoned not more than six months, or both.

Officials say that **the law only prohibits you from destroying or defacing money if you still intend to use it as money**. If you're destroying it for some other reason, it's legal. That's how magicians who make special coins get away with it or the companies that make the souvenir coin-flattening machines. This law is actually printed on the side of some of the coin-flattening machines. Destroying a one dollar bill for the sake of extracting the magnetic ink doubtfully means that you are not going to try to return the liquefied bill into circulation.