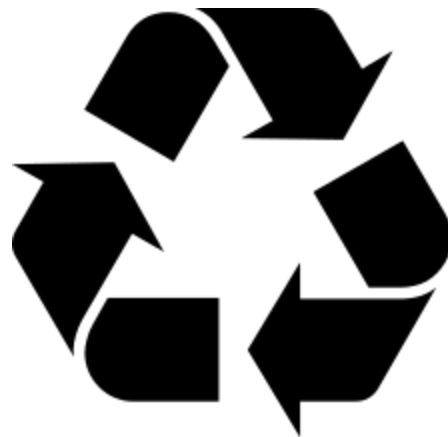


Recycle

Description: Students will explore how materials are sorted by properties. This type of sorting parallels the recycling industry. Students will be given a group of objects that are deemed “trash.” They must use a scientific process to sort the material into categories. Students will test material to see if it is translucent or opaque, whether the material sinks or floats in water, and if the material is magnetic. Students will end with piles of plastic, glass, magnetic metal, and non-magnetic metal.



Grades: 3-8

Estimated Time: Approximately 15-20 minutes

Recommended Group Size: 2 students (kit supports 4 groups)

Key Questions: What do translucent and opaque mean? What is the difference between characteristics of an object versus properties of a material? What other properties (or characteristics) could we use to sort these materials?

Content Expectations Addressed: Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.

Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.

Reflecting on knowledge is the application of scientific knowledge to new and different situations. Reflecting on knowledge requires careful analysis of evidence that guides decision-making and the application of science through history and within society.

Teacher Background:

Vocabulary:

Transparent – Light passes through the material and you can see clearly through it.

Translucent – Light passes through the material, but you cannot clearly see through it.

Opaque – Light does NOT pass through the material

Properties of an object - Distinguishing feature including chemical property, density, etc.
Properties are features that are shared by anything made of the same material.

Characteristics of an object – Can vary from one object to another; even if the two objects are made of the same material. Characteristics include size, color, shape, etc.

Materials: Four sets of sorting bins labeled: Magnetic, Non-Magnetic Metal, Plastic, Glass, 4 2-Quart plastic tubs, 4 2-Quart plastic tubs with holes drilled in the bottom, 1 ream of paper towel, 4 bags of “Trash” challenge materials, 4 magnetic wands, 4 flashlights.

“Trash” Challenge material bags (**PLEASE DRY ALL ITEMS BEFORE RETURNING TO BAGGIE**) each include:

Piece of milk carton, plastic lid(s), metal lid, green plastic piece, blue plastic piece, plastic cap to a marker, aluminum connector, copper end cap, clouded glass pellet, clear glass pellet, green glass pellet, clear glass marble, misshapen glass pellet, steel bearing, electrical punch.

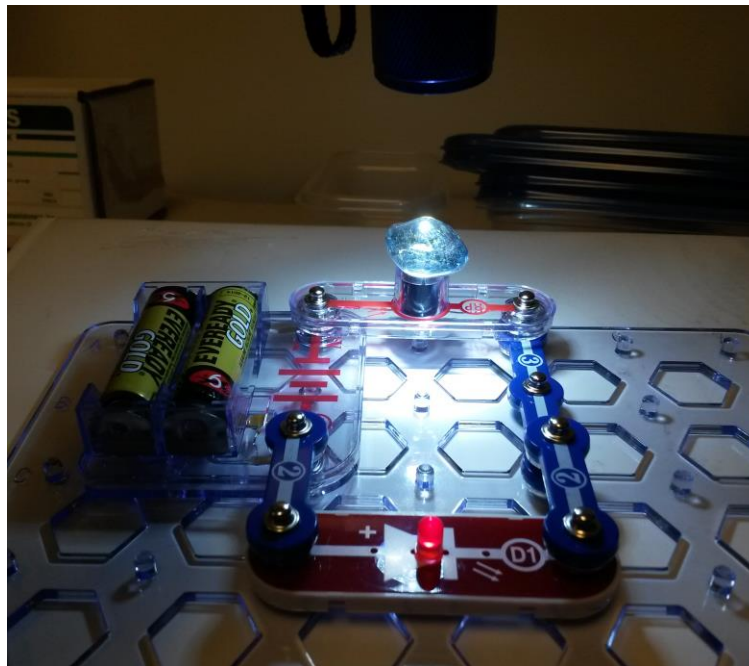
Set-Up:

A. Each station will need:

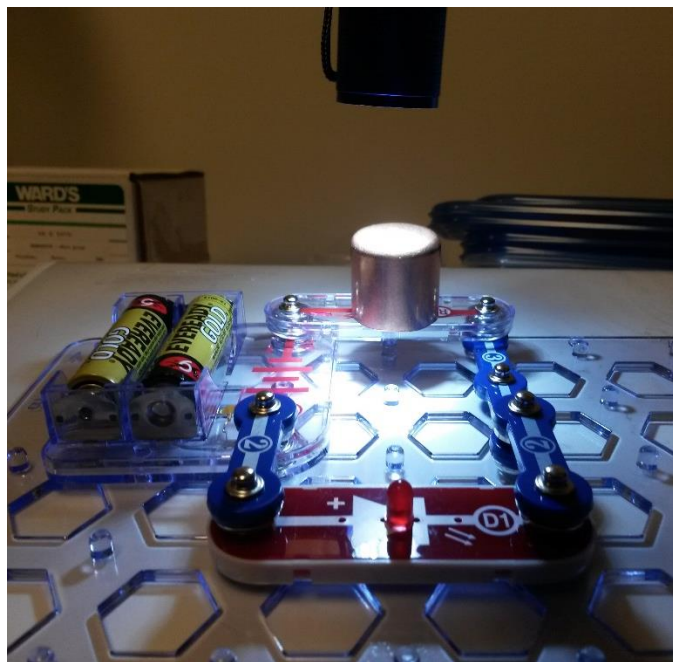
- One large bucket filled about 2/3 full of water
- One large bucket with holes in the bottom
- 4 small bins (labeled: Magnetic, Non-Magnetic Metal, Plastic, Glass)
- “Trash” (bag of various materials)
- 1 Magnet Wand (orange)
- 1 Flashlight
- 1 Photoresistor snap circuit
- PAPER TOWEL

Procedure:

1. Students must use a scientific procedure to sort their materials based on PROPERTIES. They cannot simply assume that something is glass or plastic based on sheer appearance or characteristic.
2. They can do these processes in almost any order:
 - Use magnet to pull out the magnetic metal
 - Place objects in water; plastic will float
 - Sort glass and metal based on translucent or opaque by placing over the photoresistor and shining a flashing through the material. If the red diode light is lit (as shown below), then the material is translucent (or transparent).



If the red diode does not light, it is opaque (as shown below).



3. As the students experiment with materials, ask the following questions:
 - Could you use size to sort the materials? (NO. Size is a characteristic, not a property of a material.)
 - Ask them what other properties they could use to sort the materials. Make sure they know the difference between a property or a characteristic and are only using properties to sort.
 - How did you sort the glass from the metal, since they both sink in water? (Give vocabulary words for their explanation. Introduce translucent and opaque language by giving their respective definitions. Then ask students to identify which items they consider opaque and which are translucent.)
4. Challenge: Give the student a paper clip. Ask them what bin it belongs in. (It is both plastic and magnetic metal). Ask a student how you could separate the two materials using a process that could be done on a large scale. (Simply pulling them apart separates them, but in a recycling center, you can't have someone sit and pull all the materials apart. Ideas they might consider: melting, breaking the whole thing into little pieces.)
5. PLEASE **DRY MATERIALS** promptly and thoroughly before putting them away.

Resources:

Keith Oliver – GVSU physics

Tim Evans – GVSU physics