



## SfS Away from the Classroom!

### C04: Separation of Substances (Recommended for Grades 3-8)

Please use the following resources to learn strategies for separating different substances.

Watch this Video: [Reading Rainbow video on Recycling](#)

#### Answer these questions:

- The recyclables arrived all mixed up on the same truck. How was the cardboard separated out?
- How are the different metals sorted?
- How are the plastic, wrapping wires, and ink removed from the cardboard?
- How are the paper labels removed from the plastic?

**Activities:** Follow these directions to try three different separation challenges!

You will need:

<u>for Challenge 1</u>	<u>for Challenge 2</u>	<u>for Challenge 3</u>
<ul style="list-style-type: none"><li>• Rocks/pebbles</li><li>• Gravel</li><li>• Sand</li><li>• bowl for mixing</li></ul>	<ul style="list-style-type: none"><li>• Aluminum foil, cut into 2" squares</li><li>• Newspaper, cut into 2" squares</li></ul>	<ul style="list-style-type: none"><li>• Salt</li><li>• Sand</li><li>• bowl for mixing</li></ul>
<p>Ask your parents' permission to use materials you find around your house as tools for doing the separations. If you have a scale, measure the mass of materials before and after separating -- how much can you recover?</p>		

#### Challenge 1: Rocks, Gravel, and Sand

1. Combine a handful of rocks/pebbles, a handful of gravel, and a handful of sand in the bowl. Mix well!
2. Now try to separate everything out by size. What tools can you use to make it easier?
3. Compare the results of separating by hand and separating using different tools. What are the advantages of each method?

#### Challenge 2: Foil and Newspaper

1. Shuffle your foil and newsprint squares together so that they are well mixed.
2. For this challenge, you may *not* separate them by hand. Pretend that you are in charge of a recycling plant and need to separate huge amounts of paper and foil.
3. Try to come up with two different strategies, and compare them: Which recovers more of the materials? Which uses less energy? Which generates less waste?



### Challenge 3: Salt and Sand

1. Combine a couple spoonfuls of salt with a couple spoonfuls of sand in a small bowl. Mix well!
2. Notice how similar in size the grains of sand and salt are. You will need a different strategy than you used in the other challenges.
3. Keep in mind that some strategies take more time than others.

### A 6-8th grade challenge:

1. Measure the mass of each material before you mix them.
2. Measure the mass of each material after you separate them.
3. Use this formula for your score, or the Recovered Fraction, for each material:  
$$\text{Mass after Separation} \div \text{Starting Mass} = \text{Recovered Fraction}$$

(Hint: A score of “1” is perfect!)

### Make observations & use Claims, Evidence, and Reasoning!

1. **Claim:** The different properties of materials may be used to separate them.
  - **Evidence:**
  
  - **Reasoning:**
2. **Claim:** There are advantages and disadvantages to different separation techniques.
  - **Evidence:**
  
  - **Reasoning:**