



BIG IDEA

Soap helps break up molecules of dirt, and washing our hands helps us stay clean, healthy and germ-free!

MATERIALS

- Dish soap
- Bowl
- Food Coloring
- Milk
- Cotton Swabs

INSTRUCTIONS

1. Fill your bowl with about 1 cup of milk, making sure it entirely covers the bottom of the bowl.
2. Add some food coloring to the center. It's best to add food coloring one drop at a time. You can use a variety of colors or only your favorite, but you want about 20 drops total!
3. Take a cotton swab and dip it in! Does anything happen? Make some observations.
4. Flip your cotton swab over and dip the clean end into your soap. Make sure to get the cotton covered in soap.
5. Take the soapy end of the cotton swab and dip it into the center of the milk. Does anything happen now? The food coloring should spread out really fast! Why does this happen?

THE SCIENCE

Soap is made of two parts that make it perfect for cleaning: a **hydrophobic** part and a **hydrophilic** part. Something that is hydrophobic will repel water, and something that is hydrophilic will combine with water. Milk has both *fats*, which mix with the hydrophobic parts of the soap, and *water*, which mixes with the hydrophilic parts of soap. When the soap is dipped into the milk, the hydrophobic parts seek out the fats very quickly to combine with them. In the process, most of the food coloring gets knocked out of the way!

Why is soap so good at cleaning? Since soap has both hydrophilic and hydrophobic pieces, it can mix with lots of things. The hydrophilic pieces mix with water while the hydrophobic pieces mix with oils and grease.

How does soap keep us healthy from germs? Most germs and bacteria are surrounded by a layer of fats that is hydrophobic. When you wash your hands with soap and water, the hydrophobic parts of the soap mix with the protective layer of fats on the germ and break it apart!

Finally, why do we call the pieces hydrophobic and hydrophilic? HYDRO means water, PHOBIA means fear and PHILIA means love. These might sound familiar! Ever heard of arachnophobia? It's the fear of arachnids like spiders. What about Philadelphia? It's the city of brotherly love!