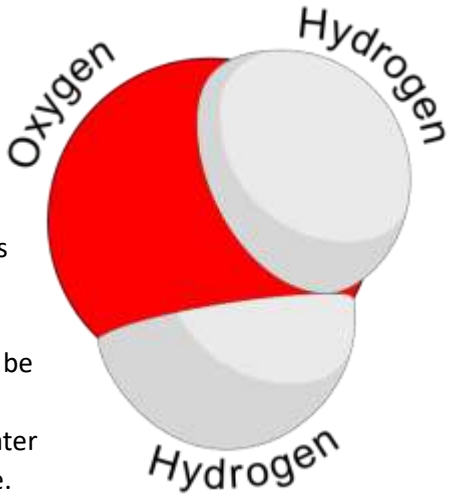
May Dose of Discovery: Week 3

Bathroom Science: The Magic of Water

Learning Points:

- Children will be able to have fun and experiment with how water interacts with itself and the world.
- Children will be able to experience the properties of water (polarization; cohesion and surface tension; and adhesion) through simple activities in their bathroom.
- Children will also be able to see how we can use the power and properties of water to move from place to place.
- These activities can be done all in one afternoon or broken up in the week or weekend, as desired.

Background Information:



Water is one of the basic elements of life. Living things need it every day to survive. It seems that water is everywhere and in all facets of life. We drink, bathe, and play in it. Scientifically speaking, water is a cool molecule to study.

Water is a ***polar molecule***. Even though water is a neutral molecule in that it has an equal number of protons and electrons, there is an uneven electron distribution within each water molecule that makes it polar. The oxygen atom in a water molecule attracts electrons more strongly than hydrogen does. This means that electrons tend to be at the oxygen end of the molecule. This makes the oxygen end of the molecule slightly negative. Thus, the hydrogen end of the molecule is slightly positive. This polarity of water gives it some special properties that you can easily demonstrate right in your own home.

Cohesion simply means that water molecules like to stick to each other. This is caused by the slightly negative charge of the oxygen atom of one water molecule being attracted to the slightly positive charge of the hydrogen atoms of another water molecule. ***Surface tension*** is a good example of cohesion at work. Have you ever seen a water skipper "skate" across the water of a pond? This insect literally walks on water because it takes advantage of the surface tension of water. Water molecules hold together tight enough to let these insects stay on top of the water.

Water molecules are attracted to each other and they are also attracted to other charged molecules. This is ***adhesion***. You can see this when it rains and water drops form on windows. These drops should be pulled to earth by gravity, but the force of the adhesion of water to that surface is stronger. All these properties come together to make water interact with the world in some weird and unexpected ways.

-Toni Anderson, *THH*

Information Adapted from *Properties of Water Experiments*: https://thehappyhousewife.com/homeschool/properties-of-water-experiments/

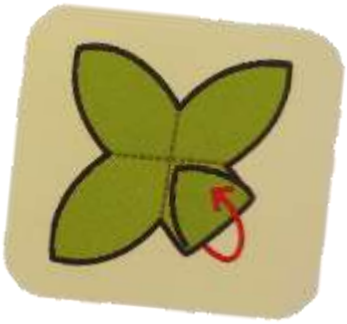
Materials:

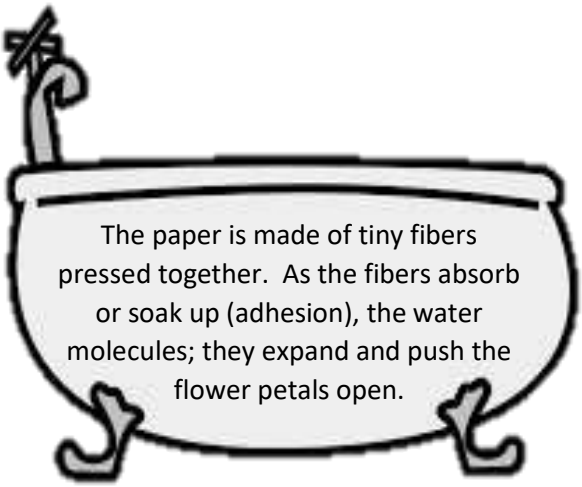
- Water and Adhesion
  - Bathtub; water; paper; scissors; paper towels; 2 glasses; food coloring; 5 toothpicks.
- Water and Cohesion
  - Bathtub; water; cardstock; marker; scissors; 2 pennies; butter or margarine
- Water Properties at Work
  - Bathtub; water; paper cup; plastic box; glue; thumbtack; pencil; bendy straw; tape; pitcher
  - Bathtub; water; 1" sponge; balloon; 4-5" piece of clear plastic tubing; rubber bands; scissors

Activities:

Water and Adhesion: Paper Flowers

Step 1: Fold a square of paper in half, then fold it in half again. Draw a petal shape on the square and cut it out. Open the flower shape. Fold in each petal towards the center, like in the picture. Fill up the bathtub with cold water and place the flower on the water. Watch the petals slowly open the longer it is in the water…





Why do you think this happens?

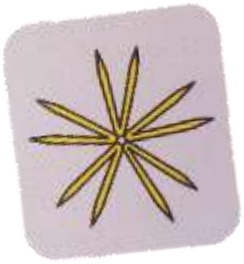
Step 2: Try some different shapes or numbers of petals for your paper flowers and see if it makes a difference.

Step 3: Repeat Step 1 using a paper towel to make your flower.

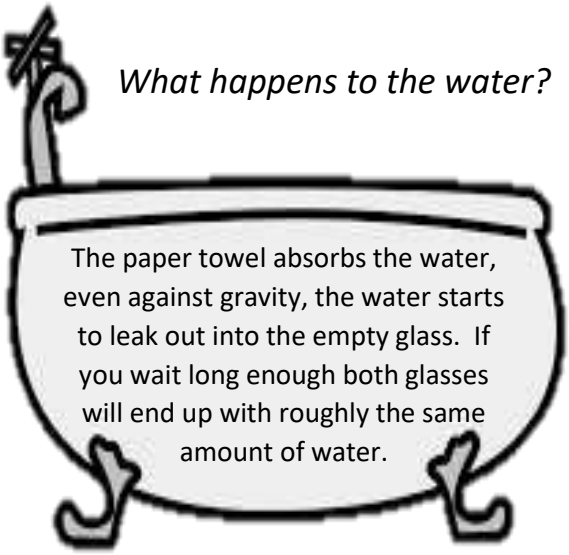
How does this flower react to the water?

A paper towel is made of very thin layers of paper. It absorbs water so fast that the flower sinks before it has a chance to open! Experiment with other materials like cardstock or wrapping paper.

Step 4: Now roll up a paper towel and put one end in an empty glass. Half-fill another glass with water and tint it with a couple of drops of food dye. Place the other end of the paper towel in the glass of water and leave it for a few hours.



What happens to the water?

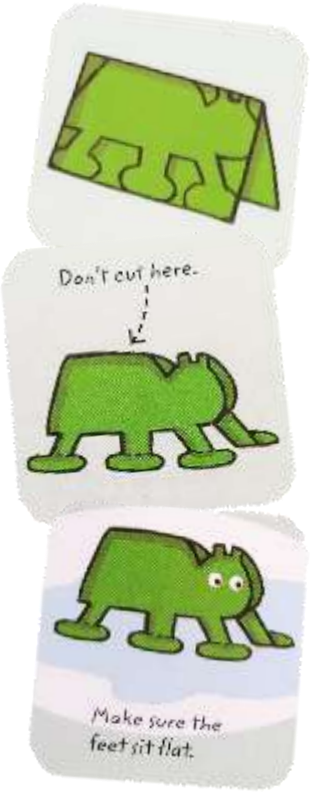


Step 5: Now bend 5 wooden toothpicks into 'v' shapes without breaking them. Arrange them like in the picture above on a small plate and add a few drops of water to the middle. Watch what happens as the toothpicks absorb the water.

Toothpicks are made of wood fibers. As each toothpick absorbs water, it expands and pushes its "arms" apart until they rest against their neighbor. This makes a neat, 5-point star shape

Adapted from activities from *365 Science Activities* by Usborne Activities pg. 8-9: *Paper, Wood, and Water!*

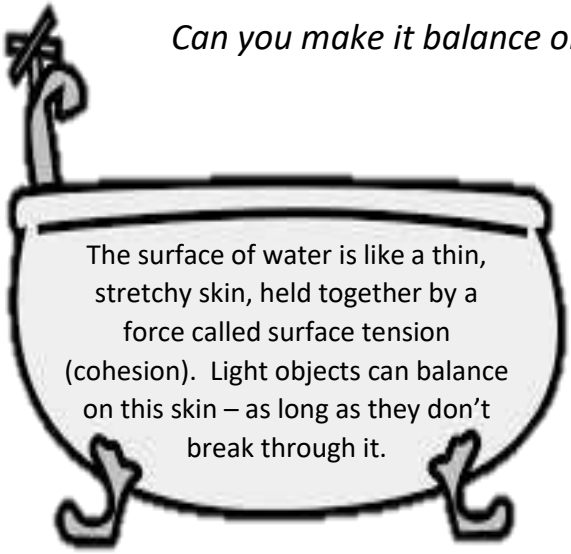
Water and Cohesion: Walking on Water!



Step 1: Fold a piece of cardstock in half. Then draw a bug shape with three legs and feet, like in this picture. Make sure the top of the bug touches the fold in the cardstock. Cut neatly around the shape, being careful not to cut along the fold. Then fold out the bug's feet so the shape stands up.

Step 2: Fill the bathtub with cold water and gently place the bug on top of the water, so all its feet touch the surface at once.

Can you make it balance on the water?



Step 3: Repeat Steps 1 – 2 to make another bug, but this time with bigger feet.

Is it easier to make it stand on the water?

It should be easier to balance the big-footed bug on the water because bigger-feet spread the bug's weight more evenly over the water's surface.

Step 4: Experiment with a few more factors to see how they affect your bug: Try taping a coin onto each side of the bug's back.

Can you still make the bug stand on the water?

The bug with the coins is too heavy so it breaks the water's skin and sinks.

Step 5: Make another bug and smear butter or margarine under its feet. Place it on the water.

Does it work better?

Grease repels water, which makes it easier for the bug to stay on the surface. Many real water bugs have oily feet, too!

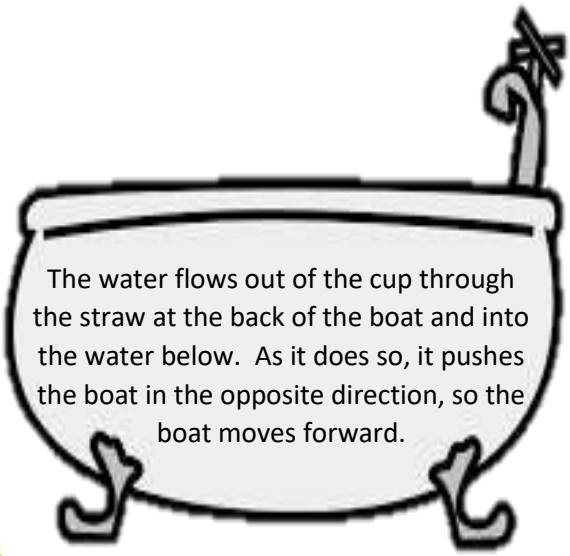
Adapted from activities from *365 Science Activities* by Usborne Activities pg. 22-23: *Walking on Water!*

Water Properties at Work: Boats

- **Water Power!**

Step 1: Glue a paper cup to the middle of a thin plastic food box. Push a pencil through the box and into the cup. Take out the pencil and push a long, bendy straw through the holes and tape it in place.

Step 2: Fill a bathtub with cold water and place the boat gently on the water. Pour water into the cup and observe what happens.



- **Air Power!**

Step 1: Gather the materials for your last bathtub experiment. Use the scissors to cut a pointed end to the sponge to make the bow of your boat. Blow up your balloon and let the air out to make the balloon nice and stretchy. Slip the end of your balloon over the top of the plastic tubing. Wrap a rubber band around the balloon to secure it to the tubing.

Step 2: Now in the stern of the boat, use the scissors to make a small slit by folding the sponge in half and cutting a small hole. Feed the plastic tubing through the slit so that it sits halfway through. Fill up the bathtub and blow the balloon up by placing your mouth over the lower part of the plastic tube - the bit sticking below the boat's 'hull'. Place a finger over the end of the tube to stop the air coming out straight away.

Step 3: Put your boat into the water and remove your finger, the rush of air from the deflating balloon should propel your boat. Experiment with other rubber bands to see if you can get the boat to travel faster and farther. You'll have to squeeze the water out of the sponge each time you launch your boat.

Adapted from activities from *365 Science Activities* by Usborne Activities pg. 114: *Water Power!* and Kidspot Things to Do Activity: https://www.kidspot.com.au/things-to-do/activity-articles/make-a-balloonpowered-bath-boat/newsstory/6a50cac5a46f22ab31fab247082504a0