# Science in Your Kitchen!

## 17 Household Experiments for Kids

Kristen J. Navara

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Cover and interior design by KJ Navara.

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# -----Welcome!-----

Hi Everyone! My name is Kristen Navara. I'm a mom of 2 (Emmy, 7 and Addie, 4) and a science professor at the University of Georgia. Quite frankly, science can be fascinating if it is taught in an effective way. I have waited on the edge of my seat for my girls to get big enough to get excited about doing little science experiments at home, and when that day finally arrived, I realized that it was difficult to find a good source of experiments that are not only exciting for kids, but also don't require parents to run out to the store to buy a whole bunch of stuff that they normally wouldn't buy. So, I set out on a search to find easy, fun experiments to share with my kids and yours. My criteria when I began putting these experiments together were (1) all of the necessary materials already had to be present in my house, and (2) my two kids had to say "wow!" when I showed them the experiment. Each of the experiments in this book garnered a lot of excitement from my girls, and many of them require only one or two ingredients. I did not generate these experiments. These are classic science experiments that I've tweaked to make them even better, and provided the ones we deemed the coolest all in one place for you. Kids learn science most effectively when they can get their hands into it and really experience the concepts, and doing experiments with your kids is a great way to spend some quality time. So jump on in, have fun, and enjoy watching your kids learn that anyone can be a scientist!

Sincerely,

Kristen J. Navara
Associate Professor, Mom, and Blogger

Musings of a Mom Scientist

# Give white flowers vibrant colors

What you'll need:

- White flowers (roses, carnations, etc)
- A vase or cup with water
- Food coloring

How to make them:

1. Cut the stems on an angle to maximize the absorption surfaces on the stems.
2. Put a 4-5 drops of food coloring in a cup or vase with water and mix well. Make sure the color is really concentrated to get a good effect on the flowers.
3. Place the ends of the flower stems in the water and leave them overnight.

   You will begin to see color in the flower petals by the next day, and after a few days, the petals will have lots of color.

You can also make flowers take on multiple colors by splitting the stems and placing different parts of the stems into cups containing water of different colors. This can be difficult to do without damaging the stems, but with a careful hand and a good knife, it can be done. This is how florists make the rainbow roses that you can buy for someone!

# A “crawling” water rainbow

Kids love colorful things, and this experiment is sure to give you kids both some color and a wow factor. Watch water “crawl” from one jar or cup to another, creating a beautiful rainbow of colors!

What you’ll need:

- 7 clear cups
- Water
- Food coloring

How to make it happen:

1. Set the cups next to one another, forming a line.
2. Fill the first, third, fifth, and seventh cups almost to the top with water, and put just a bit of water in the remaining cups. This water will help make the mixing of the other colors look more dramatic.
3. To the first cup, add 5 drops of red food coloring.
4. Leave the second cup empty.
5. To the third cup, add 5 drops of yellow food coloring.
6. Leave the fourth cup empty.
7. To the fifth cup, add 5 drops of green food coloring.
8. Leave the sixth cup empty.
9. Finally, to the seventh cup, add 5 drops of blue food coloring.
10. Next, fold paper towels, first in half, and then in quarters, and put the end of the first one into the first jar, and the other end into the second jar. The first end of the next one goes in the second jar, and the other end in the third jar. And so-on until the last end of the last paper towel is in the last jar. Make sure that the paper towels aren’t too long, or the experiment will take longer to work.
11. Wait and watch what happens! The water will “crawl” up the paper towels, ultimately filling the three empty jars/cups with brand new hybrid colors. A couple of tricks can make the experiment speed up. Make sure to use really absorbant paper towels. We tried Sparkle paper towels and those did not work well, while Brawny paper towels made the experiment go really fast. If you want it to work even faster, you can heat up the water in the microwave first (hot not boiling) before you add it to the cups. I didn’t heat it and it still started depositing water in the empty cups within 30min.

BEFORE:

AFTER 30 MINUTES::

**Why this works:**

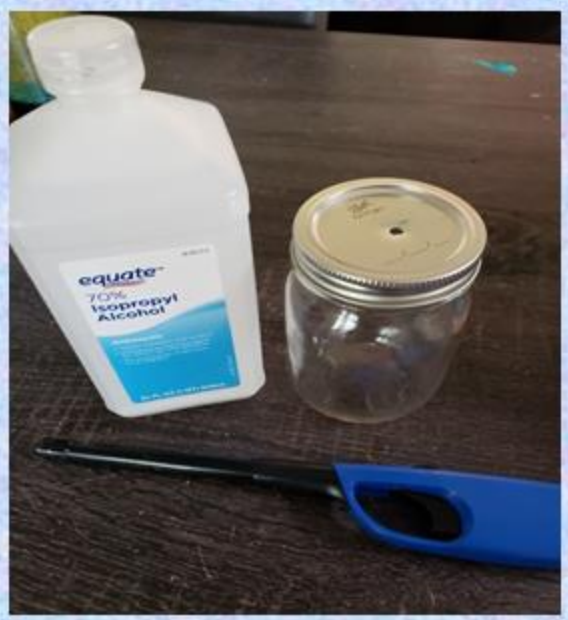
Like the first experiment, this one also demonstrates the concept of capillary action, which is the same concept as when plants can pull water up their stems. In this case, the capillary action is happening with paper towels. Paper towels, and the plants that they are made of, contain a type of sugar called *cellulose*. Chemical groups on the cellulose actually attract water, so the water wants to stick to the cellulose more than it wants to stick together itself. When this happens, it allows the water to "climb" against gravity! In this case, the water travels up the paper towel and then falls down into the cup next door.

# A mini-explosion in a jar

My kids absolutely loved this one. Who wouldn't like the shock of seeing a fiery shock wave in a jar? I'll warn you that this one does come with some danger. Anytime you combine fire and alcohol, there is a risk of spreading fire. In addition, since there is a pressure buildup in the jar, there is a slight risk that the jar could shatter. Some do this experiment in a plastic bottle instead. Since the plastic bottle is less stable and a mason jar is so thick, I chose the jar. We did this experiment more than 20 times with no issue, but should you choose to do it, I suggest taking the proper precautions (perhaps eye protection, stand back, etc) when doing it. That said, the results will thrill your child!

What you'll need:

- A mason jar
- Rubbing alcohol
- A long lighter




How to make it happen:

1. First, make a hole in the lid of the mason jar. I use a screwdriver and hammer, and just tap the screwdriver through the lid.
2. Pour about an eighth of a cup of alcohol into the jar. You don't need much. You just need enough that there's a small pool at the bottom.
3. Put your finger over the hole in the top of
4. the jar and tilt the jar around, spreading the alcohol over the entire inside of the jar. This will spread a thin layer of alcohol all over the inside of the jar. Make sure to include the inside of the lid.
5. Dry your finger and any alcohol that has spilled around you. This is important! You'll be lighting a flame and alcohol can catch fire!

6. Using a long lighter, touch the flame to the hole in the top of the jar. This should ignite the alcohol inside, sending a shock-wave down the inside of the jar. *Keep hands and faces away from the jar when doing this.* This will burn off the alcohol in the jar, leaving water behind, but sometimes you can get a second shock wave from the same alcohol if you repeat steps 3-5. This second shock wave often moves more slowly, so it's easier to see.

**Why this works:**

Fire needs two things to burn. It needs something combustible (burnable), and it needs oxygen. The chemical structure of alcohol makes it extremely flammable, which means it catches fire easily. This is because the structure of alcohol makes it very easy for the alcohol to transition from a liquid to a gas (also called vapor). Scientists say that a substance like this has a low *vapor pressure* (or in other words, a low pressure *against* turning into a vapor). When you burn alcohol, you are actually burning the vapor form, rather than the liquid. When exposed to a flame, that vapor very easily ignites into a fire. When you touch the flame to the hole in the jar, the vapor at the top ignites and a chain reaction occurs where all of the alcohol residue lining the inside of the jar catches fire. When the oxygen in the jar is used up, the flame can no longer maintain itself and it goes out. If you blow into the top of the jar, you add more oxygen and the reaction can occur again, until all of the alcohol has burned up.

# Tornado in a Jar

Down where we live in the South, we are well acquainted with tornadoes. Kids, in particular, are both scared and also intrigued by this strong weather force. Now you can make your own in a jar (and it's much safer than the real one)!

<u>What you'll need:</u>

- Jar with a lid
- Water
- Vinegar
- Dishwashing fluid
- Glitter (optional)

How to make it:

1. Fill the jar almost all the way with water. Leave a bit of space at the top because this will help allow the water to swirl.
2. Add a few drops of dishwashing fluid. You don't need much.
3. Add 1 tsp of white vinegar. Close the jar and swirl!

**Why it works:**

When you swirl the water in the jar, you generate something called *centripetal force*, which is a pressure that pushes the water towards the center of the bottle. The dish soap and vinegar that you added help you to see the vortex because they generate some bubbles that also gather towards the center. The glitter is meant to simulate the debris that you would normally see in a tornado. In a real tornado, a collision of air currents forms a rotation. As the air rotates, the centripetal force pushes the air into a vortex, similar to what you saw in the jar. In a real tornado, there is an area of low pressure on the inside of the tornado, and when that breaks down, the tornado disperses and disappears.

# Make your own lava lamp

Lava lamps are beautiful and relaxing. There's just something about those globs of color floating up and down. Now you can make one in your own kitchen using ingredients you probably already have!

What you'll need:

- ❖ A bottle or jar (an empty 1L soda bottle would work well)
- ❖ Vegetable oil
- ❖ Water
- ❖ Food coloring
- ❖ Alka Seltzer tablets
- ❖ A light (optional)

How to make it:

1. Fill the bottle about ¼ of the way with water. Here I used a clear bottle that I found at Walmart for 97 cents, but an empty clear soda bottle would work just as well.
2. Add 2-3 drops of food color to the water. I recommend using just one color, or you may end up with brown, as my daughter did in the bottle in the back of that picture up there.
3. Fill the rest of the bottle with vegetable oil, leaving a little space at the top.
4. Place a light on top. This is optional because it looks really cool even without the light. The light just adds a little something extra.
5. Finally, drop an Alka Seltzer tablet into the bottle and let it bubble! We've tried using more than one and it doesn't really add anything extra, so I recommend using just one.

**Why it works:**

Oil is hydrophobic, which means “water-fearing”. As a result, it doesn’t mix well with water. Liquids are made up of molecules, and the chemical properties of those molecules determine what types of other liquids you liquid likes to hang out with and which ones it doesn’t. Some molecules have electric charges that are unbalanced, and we call these molecules *polar.* Polar molecules like to hang out with other polar molecules, while *nonpolar* molecules also stay to themselves. Water is polar and oil is nonpolar. For that reason, when you pour the oil and water together, the layers will immediately separate.

Because oil is less dense than water, it floats on top. When you added the Alka Seltzer tablet, it began to dissolve, creating gas bubbles. As the gas bubbles rose to the top of the bottle, they carried some of the water with them. Because the water and the oil don’t like one another, the bubbles of water don’t ever mix in with the oil. They simply stay in little beadlets. Once the gas escapes the top of the bottle, the color water droplets are left behind, and because they are more dense than the oil, they drop back to the bottom.

# Make swirling colors in milk

What you'll need:

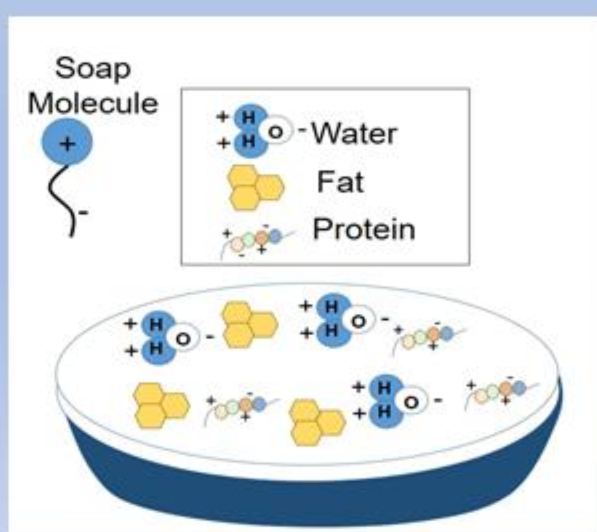
- A pan or bowl of milk
- A Q-tip
- Food coloring
- Dish soap

How to do it:

1. Pour the milk into a bowl or a pan.
2. Add one drop of each of four different food colors at different spots around the perimeter of the plate, making sure they don't overlap. They will start to spread slightly.
3. Pour a drop of dish soap onto a q-tip.
4. Touch the q-tip containing the dish soap into the center of the milk and hold it there. You'll see that almost immediately, the colors start to swirl and mix. The longer you hold it there, the more it will mix. The soap is disrupting the surface tension of the water, dispersing the surface of the milk and, as a result, the colors.

## Why does this work?

Milk is made up of many things. It contains water of course, which makes it liquid, but it also contains fats and proteins floating in the water. Fats (like the oil in the lava lamp experiment) are non-polar molecules, which means that they don't really have a net negative or positive charge on different parts of the molecule. Proteins, on the other hand, have parts that are positive and parts that are negative, and water (as we discussed above) is a polar molecule with a very positive side containing two hydrogen atoms and a very negative side containing an oxygen atom. Soap is great because it has two sides to it – an uncharged side and a negative side. The negative side is attracted to the positive part of the water molecule and the positive parts of the proteins, while the uncharged part attracts the fat molecules. Think about it this way: the fat molecules are surrounded by things they don't like, and when they see something they do (the uncharged part of the soap molecule), they flock to it. This is why soaps work so well to clean oils and grease off of dishes!
So when you add the soap molecules to the dish of milk, the soap molecules twist and spin all around the bowl trying to connect with the water, fat, and protein, and the food coloring allows you to see all of these molecules in action!



# Make a “rubber” egg

Kids have expectations about the way things are “supposed” to be, and it’s always fun to defy those. Eggs are supposed to be hard, except in this case, they’re not! Don’t try bouncing these “rubber” eggs, though, or you’ll end up with a mess!

What you need:

- An egg
- A glass or jar
- White vinegar


How to do it:

1. Fill the glass or jar with white vinegar. I’ve tried this with red wine vinegar too and it works just as well.
1. Place the egg in the cup or jar. The egg will usually sink, but if it doesn’t, place a spoon on top to keep it down. Otherwise, you’ll have a hard part left on the shell.
1. Leave overnight. The next morning, you’ll have a squishy “rubber” egg!

**Why it works:**

Eggshells are made of calcium carbonate, and vinegar is a potent acid. The vinegar breaks down the calcium carbonate and leaves behind the inner shell membrane of the egg. If you leave the egg in the vinegar for 2 days or more, the vinegar completely breaks down that outer shell, and the egg itself becomes opaque. You can see the yolk in the middle surrounded by the egg white or albumen.

# Measure pH using Cabbage Water

Anything that changes color is exciting to kids. Who knew that something we eat at the dinner table could make a great color-changing trick?

What you'll need:

- A head of red cabbage
- A pot to boil it in
- Household products that are acidic and basic.

How to do it:

1. Roughly chop the head of red cabbage and boil about 2-4 cups of it in a pot of water for about 10-20 minutes. The water should turn a dark or light purple, depending on the acidity of your water.
2. Cool the cabbage water for a half an hour or so.
3. Pour a small amount of cabbage water into three to five individual cups.
4. You can now test the pH of household products, making sure to use only clear products, or white ones dissolved well in water. Some of the products that I like to test include:

   White vinegar
   2 tsp baking soda dissolved in 1/8 cup of water
   Lemon juice (either freshly squeezed or from the container)
   Soapy water
   Egg whites
   Antacid tablets
   Shampoo
   Ammonia cleaner
   Laundry Bleach

   **Make sure to supervise children if using the stronger bleaches and cleaners for this experiment! In addition, don't mix strong acids and bases together or you could get an explosive reaction! You can dispose of these materials down the drain with the water running.*

Other things you can do:

- Dip strips of coffee filters into the juice and let dry to make pH strips!
- Test the pH of tap versus collected rainwater

Here's what it looked like when we tried this:


### Why this works:

Cabbage water has a pigment called anthocyanin that is responsible for the cabbage's red/purple color. This pigment can be used as a pH indicator, which means that it changes color when exposed to acids and bases. This is because the acids and bases physically change the chemical structure of the pigment molecule in ways that change how light reflects off of them. We see the wavelengths of light that are reflected back at us. Water usually has a neutral pH, though this can vary slightly. The lemon juice and the vinegar are acidic, and turn the cabbage water pink or red, while the egg white and the baking soda are very basic, and turn the color of the pigment to purple or blue/green.

# Make glue into the perfect slime

Slime is a major kid craze these days, yet few kids actually know what is happening when they make slime. Knowing what's going on in the slime-making process can help them to make fool-proof slime.

What you'll need:

- 1 cup Clear PVA glue (we've used Elmer's or CrazyArt)
- Water
- Food coloring (optional)
- Tide Free and Clear

How to make it:

1. Add 1 cup of PVA glue to a mixing bowl. If you don't have this much glue, you can cut the entire recipe in half.
2. Add 1/3 cup of water. This will dilute the glue a bit so the activator doesn't make too many crosslinks. It prevents the slime from coming out too hard.
3. Add a few drops of food coloring if you'd like and mix with a spoon.
4. Add ¼ cup of Tide Free and Clear and mix first with a spoon and then with your hands. I like to wear gloves for this step because you are handling straight detergent. It's important to mix with your hands because your hands add heat to the process, which helps the crosslinks to form in the glue, making slime.
5. After you've mixed for a while, add the remaining ¼ cup of Tide Free and Clear. It may seem like it's not coming together, but be patient and keep mixing. The biggest mistake people make is giving up too soon and adding too much activator. If it is still sticky after a while, add *very* small amounts of Tide until the consistency is right.

This should result in fluffly, stretchy, bubblicious slime! If you store it overnight, it may seem sticky the next morning. Avoid the urge to add activator! If you play with it for a bit, the stickiness will work itself out.

## Why this works:

The key to making slime is a polymer called Polyvinyl acetate (PVA) which is found in the Elmer's white and clear glues (called PVA glues) that actually advertise their use for slime-making on the bottle. Superglue and some of the other tacky glues don't have this polymer. It's PVA that helps to make the line of school glues washable. Inside glue, there are many sticky strands of PVA that are kept from sticking together by water that is mixed in with the strands. The water lets the strands slip by one another, which is why glue is liquid. The glue dries when water evaporates from it, and the strands are then able to stick together, and to the table or chair or project that you're using it for. If you add water, the strands separate, and you can wash them off.

In wet glue, strands of polyvinyl acetate (PVA) are kept apart by water. If you leave glue out, the strands begin to separate from the water. As the glue dries, the water evaporates out, and the strands stick together and to everything else too.

<u>How does PVA help to make slime?</u>

It turns out that if you link the PVA strands together without allowing them to completely stick, you can add some structure to the glue while also keeping enough of the water in it to keep it somewhat fluid. We can link the strands using a variety of substances that have been labeled "slime activators". What most, if not all, activators have in common is that they contain boron, which is a mineral that is found in both food and the environment. Boron is often taken as a supplement to improve bone strength, improve strength, and enhance cognitive function. If you check the labels of many household products, like starches, laundry detergents, and even your saline solution, you'll see variants of boron on the label.

When slime-making first became a thing, most slime was made using Borax, which is a detergent booster and a multi-purpose household cleaner that contains sodium tetraborate. When borax is mixed with water, you get boron ions. These boron ions then link with the strands of PVA and hold them together. This is why a basic recipe for slime includes glue, water, and Borax.

# Make a non-Newtonian fluid (also called an Oobleck)


Is it a solid or a liquid? Your kids won't be able to decide!

What you'll need:


- Corn Starch
- Water
- Food coloring (optional)

How to make it:

1. Pour a cup of corn starch into a bowl. If you don't have that much, go ahead and use less.
2. To about a half a cup of water, add a few drops of food coloring.
3. Slowly add the water to the corn starch, mixing with your hands as you go. Don't add it all at once. The amount of water that you'll need greatly depends on the humidity in the air, so the amount you need today may not be the amount you need tomorrow. As a rule of thumb, add enough water that the mixture flows, and if you pick it up to make a ball, it melts between your fingers.
4. Now you can play with it! If you drop something on the mixture's surface, it won't splash. If you hit the top with your hands or knuckles, it will feel like a solid. But when you pick it up, it will flow like a liquid.

## Why does it do this?

If you ever look this experiment online to find out why corn starch behaves as it does in water, you'll likely find that every website tells you that it's because you're forming a non-Newtonian fluid. Let's start with the "Newtonian" part. Sir Isaac Newton was a famous physicist that generated many of the theories that make up much of our basic understanding of how the world works. Newton stated that a substance that is a liquid should flow continuously, and applying force to the liquid should not affect that. But Oobleck is not a liquid…or a solid. Then which is it? Well, it can be both! When you mix cornstarch and water, the cornstarch doesn't dissolve. It stays suspended in the water. If you pour the Oobleck, the granules of corn starch can slide easily past one another, which allows the substance to flow like a liquid. On the other hand, if you apply a quick force to the substance, the corn starch granules in the mixture smush together, making the substance solid. But not all mixtures would do this. Researchers have debated for decades why cornstarch, in particular, causes this effect. A scientist at Cornell University ran some complex experiments on Oobleck and determined that in addition to the condensing of the granules in response to force, it is also friction between those granules that "locks" them together. Friction is that resistance you feel when you rub two objects together. If you push your hands together and rub, you can feel that they don't slide past one another very easily. That is friction, and that is what is causing your corn starch goup to act like a solid when you apply force to it.

# Bend water with a balloon

When water falls, it falls in a straight line, right? Maybe not! This experiment will really get your child thinking about what water is made of. By generating a little bit of static electricity, they can make water bend!

What you'll need:

- A balloon
- Access to a faucet

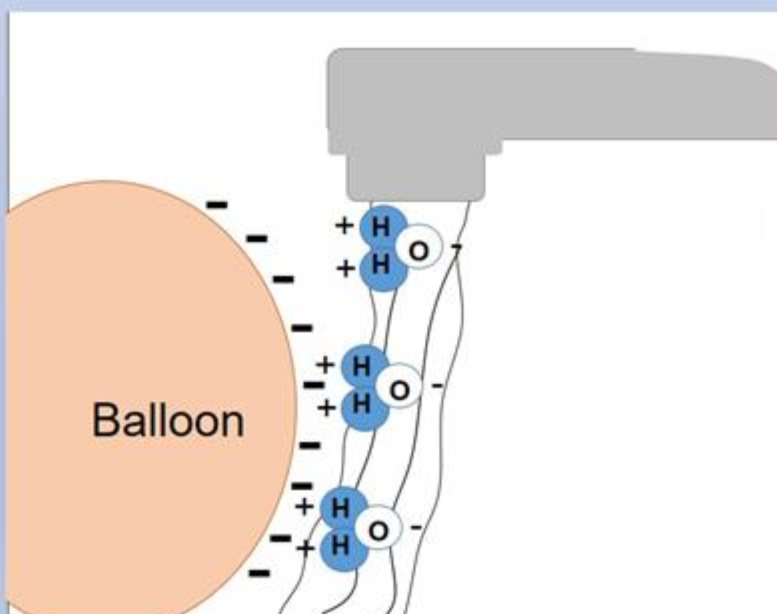
How to do it:

1. Blow up the balloon and tie it.
2. Turn on the faucet so the water is at a steady flow.
3. Rub the balloon vigorously on your head for at least 1 minute. When the hair on your head starts to stand up, it is ready.

4. Hold the spot on the balloon that was rubbed on your head right near the water flow. You'll see that the water flow begins to bend slightly towards the balloon!

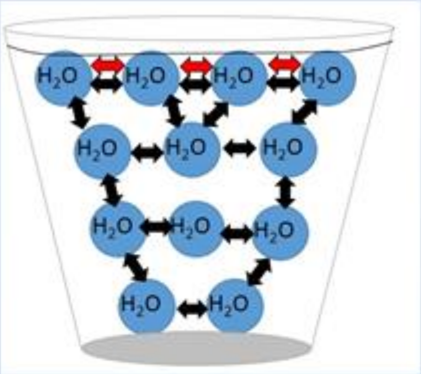
**Why this works:**

This experiment demonstrates the concepts of static electricity and "charge". When you rubbed the balloon on your hair, some of the negative charge (or electrons) transferred to the balloon. This left your hair positively charged, and those positively charged strands then repelled each other, which is why they spread out. Water is made up of two hydrogen atoms, which are positively charged, and one oxygen atom, which is negatively charged. When you hold the balloon close to the water, the positively charged hydrogens are attracted to the negative charge that you just passed to the balloon, and the water bends.



**The surface tension series!**

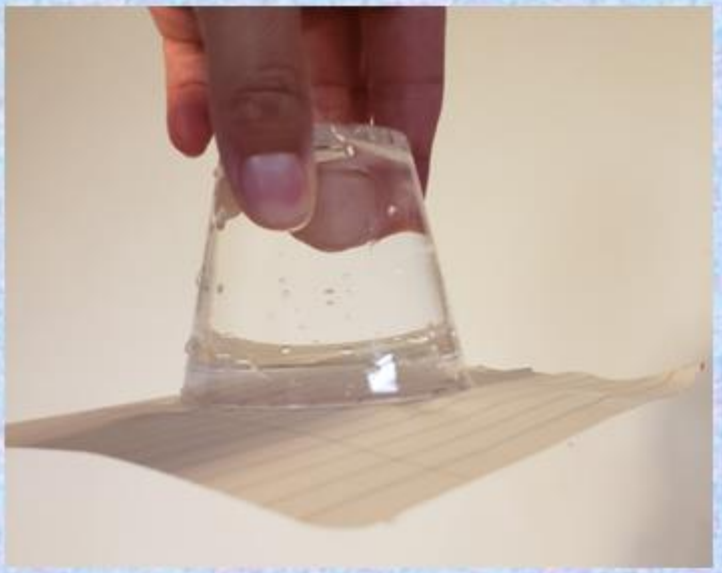
The next four experiments will demonstrate that water has what's called surface tension. Surface tension happens because water molecules are attracted to one another. In a glass of water, the molecules at the surface don't have molecules above them, so they stick together extra tight to form what seems like a sheet.




When you look at a water droplet, surface tension keeps that droplet from spreading out, holding it instead like a ball wrapped in very thin film. You can use surface tension to make a paper clip look like it's floating or turn a glass of water upside-down without spilling it!

Soap is an excellent disruptor of surface tension. The soap wedges itself between those water molecules on the top layer of water, allowing the water molecules to spread out. Soap can make the "floating" paper clip fall, it can power a foil motorboat through water, or make pepper in a bowl of water shoot away from your fingers like magic!

# Water that defies gravity



What you'll need:

- Cup or glass
- A piece of stiff paper

How to do it:

1. Fill the glass or cup with water all the way to the very tippy top.
2. Cut a piece of stiff paper (more heavy duty than standard notebook paper) into a square.
3. Lay the paper on top of the glass and push down to seal. Some of the water may spill over during this step. That's ok.
   Pick up the glass/cup from the bottom and flip quickly upside-down. The water should magically stay in the glass.

When turning the cup back over, it's a good idea to be near a sink, because if you don't tilt it back fast enough, some of the water could leak out. The key is to flip the cup quickly.

This experiment demonstrates the power of surface tension. That sheet of water on top of the surface is strong enough to hold the paper on like glue, sealing the water inside!

# Make a soap-powered boat

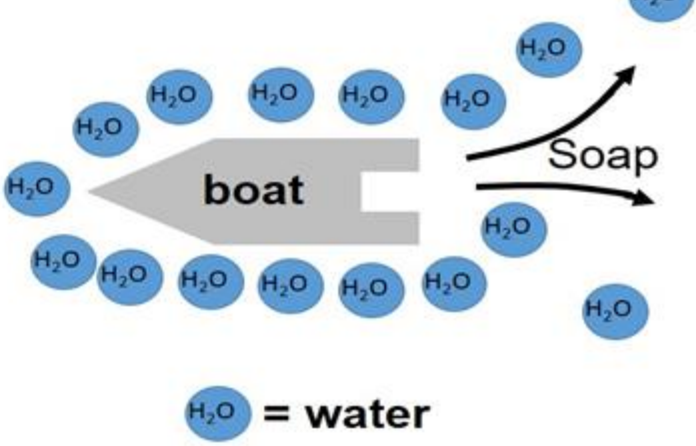
What you'll need:

- A pyrex dish full of water
- A piece of plastic or aluminum foil
- A Q-tip
- Dish or Laundry Soap

How to do it:

1. Cut the aluminum foil to make a flat boat shape, and add a notch in the back.
2. Fill a pyrex dish half full with water, and gently drop the boat on top of the water. It should float.
3. Pour a good glob of dish or laundry soap onto a Q-tip and let the soap drip into the notch of the boat. The boat should be magically propelled across the dish.

Once you have done the experiment, you'll notice that the boat will likely start to sink. That's because the boat was at least partially held up by the surface tension of the water, and adding the detergent to the water disrupted the surface tension, causing the water molecules to spread out.



# Make a paper clip float

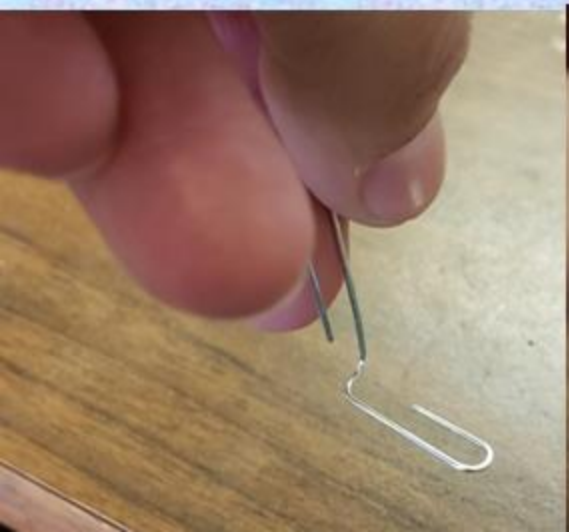
What you'll need:

- Two paper clips
- A cup of water
- A q-tip
- Dish soap

How to do it:

1. First, bend the first paper clip to make a "seat".
2. Next, lay the second paper clip on the "seat" of the first, and very slowly lower the second paper clip onto the surface of the water. As you lower the first paperclip, the second should begin to float. Make sure that both paper clips start out very dry or you may have trouble getting the second paper clip to float.
3. Gently remove the first paper clip. The second paper clip appears to float by itself on top of the water. You can dip your finger into the cup and the paper clip will not fall.
4. Next, pour a drop of dish soap onto the Q-tip and just gently touch the q-tip to the surface of the water far from the paperclip. The floating paperclip will then immediately drop.

The paper clip isn't really floating. It's too heavy for that. Instead, the surface tension of the water forms a sheet that holds the paper clip up. As soon as soap gets in between the water molecules, the sheet breaks and the paperclip sinks.



# Make pepper scatter like magic!

This one is a great trick for a magic show, because it's pretty dramatic. With just a single touch of your finger, you can make pepper shoot away like it's running scared!

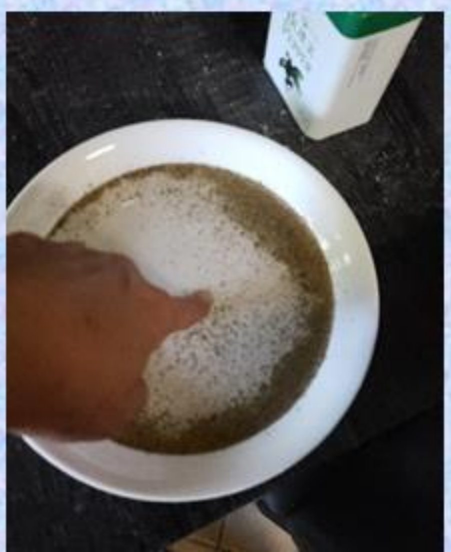
<u>What you'll need</u>:

- ❖ A bowl of water
- ❖ Ground pepper
- ❖ A Q-tip
- ❖ Dish soap

<u>How to do it</u>:

1. Fill the bowl with water.
2. Sprinkle some ground pepper on the top of the water.
3. Put a drop of dish soap on your finger and touch it to the water surface in the middle of the bowl. The pepper will shoot away from your finger like magic!

This is yet another demonstration of surface tension. Unlike the paper clip, the pepper is indeed light enough to be floating. That's why it never really sinks, even after you touch the water surface with dish soap. But what the soap does is make the water molecules quickly disperse, which makes the pepper look like it's shooting towards the outside of the bowl.

# Make a bubble in a bubble

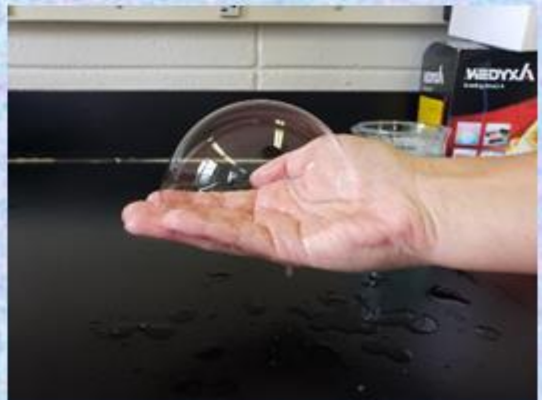
What you need:

- Bubble solution (storebought
- or home-made)
- A straw

How to do it:

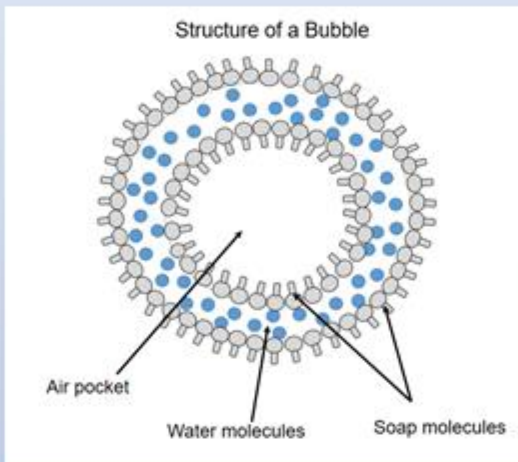
1. First, wet the table with either water or bubble solution.
2. Dip a straw into the bubble solution and gently blow a medium-sized bubble onto the table. You'll notice that, because the table is wet, the bubble doesn't pop! Don't blow too large of a bubble or it will be too fragile to hold additional bubbles.
3. Dip the straw into the bubble solution again, making sure that most of the length of the straw is wet with the bubble solution.
4. You can now magically pass the straw through the first bubble without popping it! Gently blow another bubble inside of the first bubble. You'll notice that the first bubble increases in size as you blow the second bubble.
5. Repeat the same steps, blowing a third bubble inside the second bubble. You can see how many bubbles you can blow before the outer bubble pops.

*Another fun trick to do with bubbles is to hold a bubble in your hand! Simply wet your hand and, using the straw, blow a bubble into your hand. You'll find that the bubble doesn't pop!



## Why does this work?

Remember the idea of surface tension that I told you about before? You have a layer of water molecules that form a sheet on the surface of water. When you mix water and soap and then blow some air into it, the water actually wraps around a pocket of air, and the soap holds the water in place by making a layer on either side of it.




All of these layers together are merely millionths of an inch thick! The soap not only allows the water to spread around the air to make the bubble, but it also protects it so it takes longer for the water to evaporate and dry. Most bubble solutions also have a polymer in them, like glycerin, which further protects the bubbles from drying.

**Take home message: Drying = bubble death.**

When you catch a bubble, it will usually immediately pop because a part of the bubble surface has dried, letting the air out of the inner pocket. If you touch the bubble with something wet (like your hand or the wet straw), it doesn't dry out, and so it doesn't pop!

# *Thank-you!*

I hope you've enjoyed these experiments as much as my kids and I did. As you can see from these activities, it doesn't take much to generate an excitement for science in kids. Sometimes a little food coloring, oil, and water can accomplish more than even a week in a classroom could. As a scientist, a mom, and a blogger, I am devoted to using scientific evidence to explore the whys and hows in parenting and in life. Please visit my blog at www.musingsofamomscientist.com for evidence-based answers to your parenting questions, as well as my newest downloadable activities for kids.