Bruce Museum at Home

STEAM Activities for Children

Lesson # 16: On the Bubble

Week of July 13, 2020

This STEAM at Home activity is another wet and wild experiment, but this week we are going to clean up our act, with soap bubbles! All the materials needed for these experiments are easy to find. Most of the items may be in your house already or are readily available at a grocery or drugstore. Please plan accordingly before beginning any of these projects with your learner, and consider wearing clothing that could get wet, stained, and soapy.

Learners will use their science journals to predict, record, and explore their experiments. If your learner hasn't made a science journal, instructions can be found here. If learners have a notebook or other paper they prefer to use, that's fine.

In order of appearance, this lesson contains: a materials list for On the Bubble, instructions for the experiment, ways to add on to the activity, a brief art activity, and NGSS Performance Expectations. Additionally, a list of chemistry vocabulary words is available as a separate document, and can be found here.

The experiment is fun and messy. Soap can be irritating to skin and eyes so be careful and keep a little fresh water on hand to rinse with.

Materials for On the Bubble: 1 cup liquid dish soap, 6 cups room temperature water, ¼ cup corn syrup or 1 tbsp glycerin, pipe cleaners, straight plastic drinking straws, container for bubble liquid (with lid if possible), plastic cups, a kitchen funnel, a sieve, flat surface to pour a little bubble liquid on.

Materials for art project: bubble liquid, bubble wands, butcher paper or sheets of white paper, tempera paint, small containers for mixing bubble liquid and paint.

Water is an incredible substance. For the past few weeks we've experimented with a variety of the physical properties of water, and this week we will be experimenting with **surface tension**, **evaporation,** and adding **surfactants** to liquids. This week, learners will be making a solution of water and soap, along with either glycerin or corn syrup (surfactants which make liquid water less attracted to itself, and

more likely to mix with other substances), to make bubble liquid, and experimenting with the properties of bubbles. Learners will likely have played with bubbles before, but the bubbles we are making today are not just for fun, they are for science!

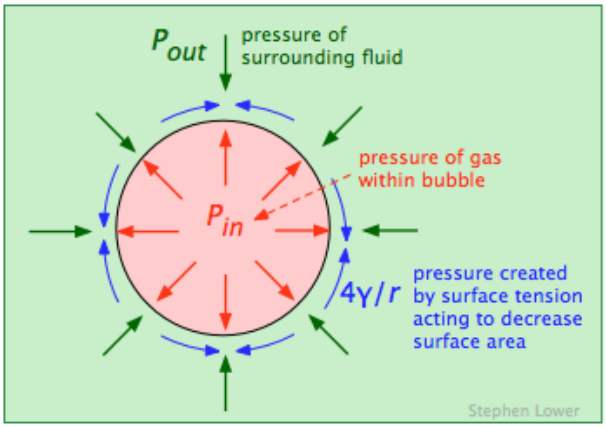
Ask your learner to use their science journal to write down questions they may have about bubbles, experiences they have had with bubbles (or bubble-like things, such as balloons, paper bags filled with air, even a ping-pong ball) and questions they may have about bubbles. Ask learners to think about washing dishes, taking a bath, washing their hair, cleaning clothing and other everyday examples of soap bubbles.

Questions to help focus your learner:

- How are soap bubbles made?
- How long do soap bubbles last?
- What are some of the things you've noticed about soap bubbles?
    - Shape?
    - Size?
    - Color?
    - Texture?
- Why do learners think soap and water make bubbles?
    - Can soap make bubbles without water?

Basic Soap Bubble Facts

- A soap bubble is simply air wrapped in a thin layer of soapy water, often called a film of soapy water.
- Water has many interesting properties; one of them is **surface tension.** This is the property of attraction in the molecules or atoms that make up the surface of a substance.
    - As we've learned, water molecules are mildly attracted to one another which is why ice has its interesting physical properties.
- The surface of a bubble is actually composed of three layers: soap, water, and then soap again.
    - We will be adding a little glycerin, or corn syrup, to our mixture as this will strengthen our soapy film and create longer-lasting bubbles to experiment with.
- All bubbles will default to a round shape, if left to their own devices.
    - The soapy skin of the bubble will shrink to the smallest (and thickest) shape possible to contain the air inside the bubble.



        - Spheres have the smallest surface area for the amount of volume that they can contain.
- Bubbles will pop if their soapy water skin evaporates or if they land on something sharp or are poked.
    - Anything that disturbs the balance of the soapy skin of the bubble will pop the bubble.
    - In time gravity pulls the soap and water down toward the bottom of the bubble; you may be able to see this happening.
        - When the top of the bubble gets thin enough, the bubble will pop due to the pressures on it, from both without and within.
- You may have noticed that there are shimmering rainbows on the surfaces of soap bubbles.
    - These rainbows are created by the reflection of light between the two layers of soap in the film.
        - As the watery layer in the middle evaporates, and the soapy layers get closer and closer together, the colors change.
    - Soap bubbles will also reflect the colors, shapes, and things around them.

Don't Blow It!

Now that you and your learner have refreshed your soap bubble knowledge, it's time to work up a batch of bubble mix and get blowing. If you have the time, create your bubble mixture the night before you plan on using it. This should provide you with a bubble liquid that will yield larger and longer-lasting bubbles then if you use you mix right away.

Make the bubble mixture: In a large container mix 6 cups of room temperature water with 1 cup of dish soap (like Dawn or Joy) and add either ¼ cup of corn syrup (light) OR 1 tbsp of liquid glycerin.

- Why are we adding glycerin or corn syrup to the bubble mixture?
    - Bubbles often pop due to dehydration.
        - The layer of water between the two soap layers dries up, and the bubble pops.
        - Corn syrup and glycerin are **hygroscopic**; this means that they actively absorb moisture from the air around them.
        - By adding one, or both, of these materials to the bubble solution the evaporative effect is slowed down, prolonging the life of the bubble.

Make bubble wands: There are many different ways to make a bubble wand. If you have store-bought wands feel free to use them, but making your own bubble wands is fun and easy!

- **Pipe Cleaner Wands:** Pipe cleaners are easily shaped into all kinds of different wands, round, square, star shaped, etc.
    - Learners can experiment with making different shapes and seeing if their bubble shapes correspond.
- **Household Object Wands:** Any household item with a hole in it can be used as a bubble wand. Sieves, a plastic cup with the bottom cut out, paper towel or toilet paper rolls, the handle of a pair of scissors, cookie cutters, etc.
- **Plastic Bendy Straw Wands**: These instructables are easy to follow and have pictures.
- **Multi-Straw Bendy Wands**: Glue a bunch of straws together into one giant straw!

Time to Blow!

- Make your bubble mixture. (It is recommended to do this at least an hour or two, if not the night before, to let the water, soap, and glycerin/corn syrup fully incorporate.)
- Put together your bubble wands.
- Go outside.
    - This is important because bubbles are messy!
- Blow bubbles!
    - Learners should use their science journals to record their results, and how they achieved them.

Challenges for learners:

- Make tiny bubbles.
- Make huge bubbles.
- Make long bubbles.
- Catch a bubble on your hand.
- Land bubbles on the ground.
- Stick your finger into a bubble without popping it.
- Can you make a square bubble?
    - Bubbles can be made square if there are other bubbles pushing on them from the sides. You can do this using a flat, non-porous surface with bubble liquid on it.

Questions to extend the learning experience:

- Learners can make their own bubble mixture, experimenting with different percentages of soap, water, and other mix-ins.
    - What happens if instead of glycerin/corn syrup we add rubbing alcohol?
    - What happens if you add both glycerin & corn syrup?
    - What if you add an extra ½ cup of soap, or an extra 2 cups of water?

- Experiment with different speeds of air to make bubbles, or bring out a battery-powered fan to create bubbles. How does the air flow affect the amount or shape of bubbles?

- The colors a bubble reflects have to do with its shape. Can learners achieve specific colors by manipulating their bubbles?
- Learners make a bubble over an object, like a small figurine or toy?

Art Activity: Paint Bubbles

By adding just a little tempera paint into your bubble mix you can create bubbles that leave a lasting impression. We recommend using a washable tempera for this project, as the pigment is concentrated and the paint will wash out (eventually) from clothing.

- Pour roughly ½ cup of bubble mix into as many containers as you have colors of paint that you want to use.
- Add 2-3 large spoonfuls of paint into each container.

- Mix thoroughly.
- Set out fresh sheets of paper.
- Learners can blow paint bubbles onto, or around the paper.
- Wherever the bubbles land, and pop, they will leave a colorful imprint behind.
- Repeat as needed!

NGSS Performance Expectations

2-PS1-2 Matter and Its Interactions: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.