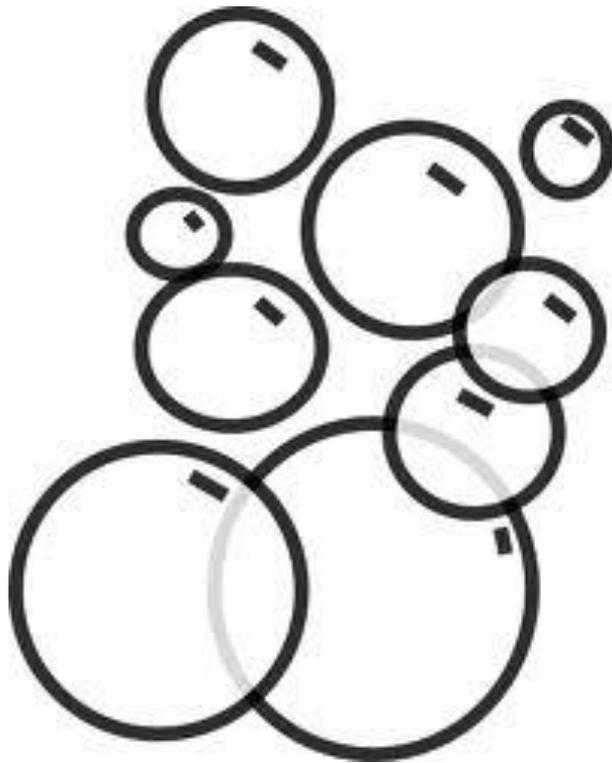


Double Bubble Trouble



Developed by:
Anthony D. Fredericks
York College
York, PA 17405

Overview

Everybody loves bubbles! Bubbles make you smile; bubbles are fun to watch; and bubbles are for kids of all ages – from 1 to 101. Bubbles can be found in a glass of soda, in your bathtub, or floating on the surface of a pond. Bubbles are everywhere! Some are short-lived; others last a long, long time. But, no matter where they are or how long they last – bubbles will always make you smile!

Main Ideas

- Bubbles are made from water and soap.
- Bubbles are always round.
- By definition, bubbles are “encapsulated gas” (air trapped inside liquid).

Materials Needed

- distilled water
- liquid detergent (*Joy* or *Dawn*)
- light corn syrup (or glycerin)
- various “bubble machines” (see the last page in this handout)
- straws
- several bubble wands [*Sizzlin’ Cool Bubble Jar* from *Toys R Us*]
- small plastic cups
- food coloring
- white construction paper
- cardboard
- various commercial bubble-making devices (from *Toys R Us*) [optional]
- two tubs, six aluminum pie pans, three cookie sheets

Preparation

1. Prepare the bubble solution (see “recipe” at the end of this handout) at least one week in advance. Store in milk jugs or similar containers.
2. Prepare and set up each of the various “stations” as described below. If possible, place each station on a separate table or in various sections of the room.
3. Read the “Background Information” to become familiar with the dynamics of soap bubbles.
4. Practice reading *Pop! A Book About Bubbles* by Kimberly B. Bradley prior to reading aloud to the group. Prepare to pause at desired places for asking questions.

Opening (10-15 minutes)

1. Invite children to sit on the floor in a large circle. Dip a bubble wand into a jar of bubble solution and blow a bubble. Ask children to tell you what you just did. Encourage them to think about times when they have seen bubbles (e.g. in a glass of soda, in a bubble bath, blowing bubbles in a glass of milk, etc.). Ask, “*Where are some places where you have seen bubbles?*” “*When have you ever made bubbles on your own?*”
2. Display the book *Pop! A Book About Bubbles* by Kimberly Brubaker Bradley and explain that this is a non-fiction book that tells how bubbles are made and how kids can make their own.
3. Read *Pop! A Book About Bubbles* out loud to the children.
4. Occasionally, point out the different kinds of bubbles illustrated in the book. Ask the children if they have ever seen bubbles similar to the ones illustrated in the book.
5. Stop once or twice during the reading (or after the reading) to ask some critical thinking questions. For example, you might ask: “*What do you like most about bubbles?*” “*What was the biggest bubble you ever saw?*” “*Where do you think we could find bubbles near here?*” and “*What is the coolest thing about bubbles?*”
6. At the conclusion of the book, review some of the information shared by the author (You may wish to refer to the **Main Ideas** listed above.).

Exploration Part 1 (7 - 10 minutes)

1. Place a container of bubble solution in the middle of a table. Arrange the following “bubble machines” around the container: 6-pack holder, tin can, pipe cleaners, plastic strawberry basket, toilet tissue tubes, rubber bands, cone-shaped paper cups.
2. Invite children to each select one of the “bubble machines” and dip it into the bubble solution. Invite them to blow through the “machine to create one or more bubbles.
3. Encourage children to work through all the various “machines” – using each one to create a variety of bubbles.
4. Invite children to discuss the various ways the different “machines” create bubbles.
5. As time allows, invite children to suggest other items – normally found around the house – which could be used as “bubble machines.”

[NEED: 1 tub of soap solution]

Exploration Part 2 (7 - 10 minutes)

1. Cover the bottom of a tray or cookie sheet with a thin layer of bubble solution. Make sure the solution coats the entire surface.
2. Invite each child to dip the bottom two inches of a straw into the solution to wet it.
3. Invite each child to blow a bubble through the straw onto the tray. When the bubble is sufficiently large (about 3 inches across), have the child gently withdraw the straw from the bubble.
4. Invite each child to coat the end of his/her straw in bubble solution again (It’s important that the straw is thoroughly wet.).

5. Invite each child to gently poke his/her straw through the first bubble and blow a second bubble inside the first, onto the tray. Make sure this bubble is smaller than the first one.

[NEED: 1 cookie sheet; small container of soap solution]

Exploration Part 3 (7 - 10 minutes)

1. Provide each child with a plastic bubble wand, some bubble solution and a small plastic cup.
2. Ask each child to dip his/her wand into the bubble solution and to create a single bubble floating free.
3. Quickly wet the rim of a plastic cup with some bubble solution.
4. Give the child the cup and invite him/her to catch the floating bubble so that it rests on the rim of the cup.
5. Invite the child to create two bubbles and see if he/she can catch both using two separate plastic cups.
6. Challenge children to try and capture two bubbles with a single cup. Is it possible?

[NEED: 1 tub of soap solution]

Exploration Part 4 (7 - 10 minutes)

1. Pour some bubble solution into a cookie sheet. Make sure the entire surface is covered.
2. Add a few drops of food coloring to different areas of the tray.
3. Invite a child to use a straw to create mounds of bubbles on the tray. Invite the child to make the bubbles in various sizes.
4. Place a piece of paper (e.g. construction paper) over the bubbles; this will pop them and leave behind a print.
5. Set the paper aside and allow it to dry.

[NEED: 1 cookie sheet; container of soap solution]

Exploration Part 5 (7 - 10 minutes)

1. Cover the surface of a cookie sheet with a thin layer of bubble solution.
2. Invite one child to dip his/her straw into the bubble solution and blow a large bubble on the surface of the cookie sheet.
3. Invite several children to each dip their straws into the bubble solution, put the ends of their straws into the bubble, and blow to make the bubble bigger.
4. Challenge children to work together to create the largest bubble possible. They may need several opportunities to do this.

[NEED: 1 cookie sheet; small container of soap]

Exploration Part 6 (7 - 10 minutes)

1. Invite each child to dip a wand into the bubble solution and blow a bubble into the air.

2. Provide each child with a fan or piece of cardboard to wave from side to side under the bubble to keep it falling to the ground.
3. Challenge children to keep their individual bubbles in the air for as long as possible.
4. Invite children to try and keep two separate bubbles in the air (using the fan) for as long as possible.

[NEED: 1 pie pan of soap solution]

Wrap-Up

1. Bring the children back together to share what they learned in the various activities. Encourage them to discuss the features or characteristics of bubbles they noticed throughout the various activities.
2. If there is time, introduce the children to the book *How to Make Bubbles* by Erika L. Shores. Invite children to check out the book from the library to use at home.
3. Invite children to share something new they learned or new questions they have about bubbles. Talk about some of the different kinds of bubbles they might see at home or around their neighborhood.
4. As a closing, inform children that they were using the same skills and talents that scientists use every day. These include the processes of:
 - **Observing** (using several of their five senses)
 - **Classifying** (putting bubbles into different groups – large, small, etc.)
 - **Predicting** (making educated guesses about future events)
 - **Inferring** (making educated guesses about current events)
 - **Measuring** (calculating distance, time, length)
 - **Communicating** (sharing information with each other)
 - **Experimenting** (trying new things; finding answers to questions)

(Optional Outdoor Activity)

1. Take all the children outside.
2. Pour bubble solution in each of several different size containers.
3. Distribute various bubble-making devices such as the following:
 - Bubble Gun (green and blue)
 - Long (yellow) bubble device
 - Various plastic bubble wands
 - “Sizzlin’ Cool” Bubble Machine (orange and blue)
 - Giant Bubble Maker (dowels and string)
 - All the “bubble machines” from *Exploration Part 1*
 - All the bubble wands
4. Invite children to create as many bubbles as they possibly can. Make sure they create bubbles of all sizes – large, medium and small. Challenge them to create as many bubbles as possible – all floating in the air at the same time.

Signs of Success

Children will:

- Share stories or experiences that relate to and reinforce the *bubbles* activities.
- Create and explore bubbles in numerous ways in their home and at school.
- Identify situations in which bubbles occur.
- Demonstrate curiosity, engagement, and creativity in seeking out and examining bubbles.
- Work cooperatively, taking turns with materials and sharing ideas.
- Conduct inquiry using a book as a source of information.

Other Ideas to Explore

1. Invite children to test out various “bubble recipes” to determine which one is the best. Which one produces the biggest bubbles? Which one produces the longest-lasting bubbles? Which one produces the most colorful bubbles?
 - A. 1 cup of *Joy* or *Dawn* liquid detergent, 3-4 tablespoons of glycerine, 10 cups of cold water.
 - B. 2 parts *Joy* or *Dawn*, 6 parts water, 4 parts glycerine.
 - C. 8 ounces of commercial bubble solution (e.g. *Mr. Bubbles*), 1 ounce of *Joy* or *Dawn*, 6 ounces of distilled water, 1 ounce of glycerine.
 - D. 2 parts *Joy* or *Dawn*, 1 part glycerine, 6 parts distilled water, 8 parts commercial bubble solution.
 - E. 6 parts water, 1 part *Joy* or *Dawn*, 1 part gelatin or glycerine.
2. Invite children to create bubbles on a very dry day and then create bubbles on a very humid day. What do they notice? How does the humidity affect both bubble production and bubble longevity?
3. What falls faster – a small bubble or a large bubble? As appropriate, invite children to stand on a ladder and create both large and small bubbles. Do they fall at equal rates?
4. What are all the various kinds of “bubble machines” that can be found in the kitchen? What about in the bathroom? What about in the garage? Challenge children to come up with as many different kinds of bubble-making devices as they can locate.

Background Information

A soap bubble is an extremely thin film of soapy water enclosing air that forms a hollow sphere with an iridescent surface. Soap bubbles usually last for only a few seconds before bursting, either on their own or on contact with another object.

The soap mixture on the outside of a bubble is actually made of three very thin layers: soap, water, and another layer of soap. This “sandwich” on the outside of a bubble is called a soap film. A bubble pops when the water that is trapped between the layers of soap evaporates. When glycerin or corn syrup is mixed with the bubble solution it tends to make a resulting bubble thicker. The thicker skin of the glycerin bubble keeps the water from evaporating so quickly, so they last longer. It also makes them stronger, thus making larger bubbles possible.

When light shines onto a bubble it appears to change color. The colors seen in a soap bubble arise from interference of light reflecting off the front and back surfaces of the thin soap film. Depending on the thickness of the film, different colors interfere constructively and destructively.

Books to Explore

Bradley, Kimberly B. (2001). *Pop! A Book About Bubbles*. HarperCollins. ISBN: 978-0-06-445208-3.

Brown, Sam Ed. (2004). *Bubbles, Rainbows & Worms: Science Experiments for Preschool Children*. Gryphon House. ISBN: 978-0-8765-9241-0.

Hulme, Joy N. (1999). *Bubble Trouble*. Children's Press. ISBN: 978-0-5162-6473-8.

Levine, Shar and Leslie Johnstone. (2003). *The Ultimate Bubble Book: Soapy Science Fun*. Sterling. ISBN: 1-4027-0042-3.

Mahy, Margaret. (2008). *Bubble Trouble*. Houghton Mifflin. ISBN: 978-0-547-99483-3.

Shores, Erika. (2011). *How to Make Bubbles*. Capstone Press. ISBN: 978-1-4296-6215-4.

Stein, David. (2005). *How to Make Monstrous, Huge, Unbelievably Big Bubbles*. Klutz. 978-1-57054-257-2.

Pennsylvania Educational Standards

Reading

1.2.3 A

1.3.3 A

1.6.3 A, B

1.8.3 A, B

NRC National Science Education Standards

Content Standard A: Science as Inquiry

Content Standard B: Physical Science

AAS Benchmarks for Science Literacy

1B Scientific Literacy

12A Value and Attitudes

12D Communication Skills

© 2014 Anthony D. Fredericks

This original work was developed

by Anthony D. Fredericks as part of

LEAP into Science, an NSF-funded project.

Master Bubble Solution

Ingredients

- Liquid dish soap (*Joy* or *Dawn*)
- Distilled water (not tap water)
- Glycerin or light corn syrup
- Clean container + several empty milk jugs

What To Do

1. Pour one gallon of distilled water into a large container or tub. Pour three cups of liquid detergent into the water and slowly stir the mixture for 2-3 minutes (do not let bubbles form).
2. Measure 8 tablespoons of glycerin **OR** two cups of light corn syrup and add it to the soap mixture. When in doubt (or when the outside humidity is low), add more, rather than less. Slowly stir for about 2 minutes.
3. Slowly pour the soap solution back into the jug (you will have extra left over). Put a top on the container and allow the soap mixture to "mellow" for several days (it improves with age). You may wish to pour the mixture into several clean milk jugs, cap them off, and let them all sit for a few days.
4. Your "soap brew" is ready to use.

Hints

- Use only distilled water (available at your local supermarket). Tap water has too many impurities which will affect the longevity of bubbles.
- The first choice for liquid detergent is *Joy Ultra* (yellow liquid). The second choice is *Dawn Ultra* (blue liquid). Please note that other brands do not work as well as *Joy* or *Dawn*.
- Glycerin is available at any drug store. Look for it in the hand care section. Keep in mind that it can be expensive to use (particularly when preparing large quantities of bubble mixture). Light corn syrup is a cheaper alternative.
- Depending on the size of the group you're working with, adjust the measurements above accordingly.
- Bubble making is best done in a humid environment (just before or after a rainstorm is best). If the humidity is low (a hot, dry day) add more glycerin or corn syrup to the bubble mixture.

“Bubble Machines”

Straw Frame

6-Pack Holder

Tin Can

Two Hands

Strawberry Basket

Pipe Cleaners

Cone Shaped Cups

Toilet Tissue Tube

Rubber Bands

Spatula