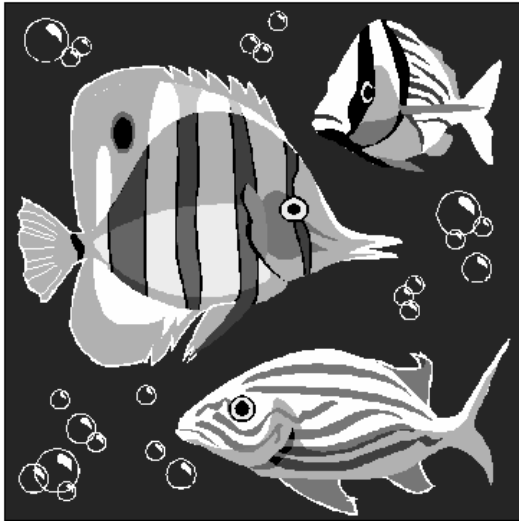




Science/Technology

Bubble-Mania



over the water and break the surface tension. A bubble is made of a sandwich-like covering made up of water and detergent that encloses some air. Light shining through a bubble makes beautiful colors. As the walls of the bubble become thinner, the light is reflected back, either from inside the soapy film or from the outside. When this happens, the colors of the spectrum appear. The colors will change by disappearing and reappearing as the bubble stretches to become thinner and thicker.

OBJECTIVES

- Understand that it takes air to make bubbles.
- Understand that water has a special force or “stick-togetherness” called surface tension and that it can be broken by soap.
- Understand that light bends as it passes through bubble film to produce colors.
- Enhance youth science skills of observing, communicating, comparing, and measuring.

GROUP SIZE

6–8 children per adult volunteer

TIME FRAME

This lesson is designed for a group meeting between 30 and 60 minutes. Each activity will take about 5–15 minutes to complete.

BACKGROUND

Water, like all substances, is made of molecules (H 2 O) that are too small to see. These water molecules are attracted to each other. The effect of this attraction is called surface tension. Surface tension makes the water act as if it has an elastic skin. When soap is added to water, the molecules of the soap spread


LIFE SKILL AREAS

- There will be opportunities for developing social-interaction skills when working together in teams and during group discussion and sharing.
- Learning skills will be developed as the children gain new information.
- Hand-eye coordination and fine-motor skills will be promoted by using scissors and making and using bubble blowers.

IDEAS FOR VOLUNTEERS

Safety Precaution: Remind the children before every activity that requires soap, not to touch or rub their eyes during the activity. At the conclusion of the activity the children should thoroughly rinse and dry their hands. Clean up all spills promptly so children will not slip.

- Choose one or two of the activities from each section.
- Try to create an appropriate atmosphere by decorating the room, thinking about activity arrangements, and playing background music.



Molly Gregg and Chuck Hill,
4-H Specialists

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Getting Started

ACTIVITY *Basic Bubbling*

Materials: Each child will need two straws and two cups. Other supplies needed are water, liquid soap and newspaper.

Note to the Volunteer: Prior to the activity label half of the cups “water” and the other half “soap.” Fill each with a 1/3 cup full of water. Add about ten drops of soap to the cups labeled “soap.” Cover the tables with newspaper and set out the cups and straws for each child.

Application: Invite the children to sit at the table with the cups and straws. Ask if any of them have ever blown bubbles into their beverage with a straw. Explain that today they will not have to worry about their table manners and will do an experiment with two different types of liquids. Invite the children to use the straws and begin blowing. Allow the bubbles to fill and overflow the cups. Encourage the children to observe and experiment.

Ask the children the following questions:

- What shape are the bubbles?
- Can you see any colors in the bubbles?
- Does it make a difference if you blow gently or hard?
- Do you think you can make a bubble without air or wind?
- Which liquid made the best bubbles?
- What makes the best bubble?

ACTIVITY *It Takes Air to Make Bubbles*

Materials: manual rotary eggbeaters, whisks, forks, large-slotted spoons, liquid soap, large containers of water, and newspaper

Note to the Volunteer: Spread several layers of newspaper on the work surface or do this activity outside.

Application: Ask the children what they think will happen if they mix water with soap by using the beaters, whisks, forks, and slotted spoons? Encourage the children to experiment by adding soap to the water and trying the different tools

you have provided. Ask the children the following questions:

- What happened when you mixed the soap and water using the tools?
- Why does beating or whisking the soap and water make bubbles?
- Compare the bubbles made by blowing in the straw to these bubbles. Do they look the same? (Beating forces more air into the soapy water making many tiny bubbles.)
- Which tool made the most bubbles?
- Which tool made bubbles the fastest?

Digging Deeper

ACTIVITY *Breaking the Tension*

Materials: Each pair of children will need a pie pan half-filled with water, 1 pinch of cornstarch or baby powder, a small amount of liquid dish detergent, and paper towels.

Note to the Volunteer: The pie pans must be clean and free of all soap or oil. Be sure to use a clean pan and fresh water each time the children try the experiment. The powder is able to float on top of the water because of surface tension. Detergent breaks the surface tension on the water where the soapy finger touches. The powder is drawn by the stronger surface tension at the other parts of the pan. Surface tension is a result of the natural attraction between water molecules.

Application: Working in pairs, the children should sit next to the pan of water. Have the children observe the water and describe what they see. Ask: What do you think will happen if we sprinkle powder on top of the water? One child in the pair should sprinkle the powder over the water. Look very carefully at the water. Ask: What happened to the powder? Why is it floating? Predict what would happen to the powder if someone dipped one of his or her fingers into the water? Allow time for the children to predict what might happen. Try dipping one finger. Discuss what happened. Have one child dip their finger into the liquid soap. Predict what will happen when the soapy finger is added. Have the



child dip the soap-coated finger into the water. Discuss what happened. Allow the children to repeat the experiment if time permits. Ask the children to try other substances to see what happens. Some items to try might include toothpicks, straws, or pepper. Be sure to use a clean bowl and fresh water each time. Ask the children the following questions:

- Why does the powder float on top of the water?
- Have you ever seen insects sitting on top of the water?
- What happened when you added soap to the water?
- Why do you think this happens?
- What happens when you add more soap? Why?
- Why do we add soap to water when we want to clean our clothes or dishes?

ACTIVITY *Make Your Own Bubble Blower*

Materials: Bubble solution (see activity below for recipes), shallow pans or trays

Bubble Blower # 1: pipe cleaners, duct tape, scissors

Bubble Blower # 2: straws, scissors, ruler

Bubble Blower # 3: straws, 20 inches of string, scissors, masking tape

Bubble Blower # 4: any of the following can be used as a bubble blower—funnels, hoops, plastic rings from a six-pack of soda pop, slotted spoons, strawberry baskets, fly swatters, etc. Be creative!

Note to the Volunteer: Consider the age of your children and the time available when making your choice of which or how many bubble blowers you would like to have the children make. If time is limited, make some of the other types of bubble blowers before the meeting so that the children can have several blowers to experiment with.

Bubble Blower #1 - Bend one end of the pipe cleaner to form a loop. Close the loop firmly by wrapping the pipe cleaner around the bottom of the loop. Make a thicker handle on the loop by wrapping tape around the straight end of the wire.

Bubble Blower #2 - Flatten one end of the straw, and cut up the middle about 1/2 inch. Flatten the two flaps, and cut up their middles the same distance. Bend all four flaps so they stick straight out. Dip the end with the flaps into the bubble solution. Blow through the straw.

Bubble Blower #3 - Using masking tape, mark the distance of 20 inches at several spots around the room. Using the marks, have the children measure and cut a piece of string. Cut the straw in half. Thread the string through both pieces of the straw, then tie the two ends together in a knot. When using this bubble blower, you need to place the entire blower in the bubble solution and let it soak for a few minutes. Use the straws as handles to carefully lift the bubble blower. Hold the string tight and wave the bubble blower through the air. You may need to practice.

Application: Lead the children through the steps for making bubble blower(s) as described above. Invite the children to join you in a shady area outside.

Ask the following questions:

- What could we use to blow bubbles?
- What shapes make the best bubble blowers?
- If you blow a bubble through a square or triangular object, what shape will the bubble be?

Let the children know that they are to experiment with their bubble blower and the different objects you have available. Remind the children that they will need to share with each other so that everyone will get a chance to use the blowers. Their job will be to report back to the group about the blowers they tried. Discuss safety issues concerning the bubble solution and blowers. Do not share blowers they have touched with their mouths, they should not swing the blowers, they need to walk carefully since bubble solutions can be slippery, and if too many children are around the container with the bubble solution they need to wait for a turn. When the children have had plenty of time to experiment with the blowers, invite them to put down the blowers and join you in a circle. Ask the children the following questions:



- Which blowers did you prefer and why?
- Are there any blowers that did not work well?
- Which blowers blew big bubbles? Little bubbles? A lot of bubbles?
- What other items would you like to try out as bubble blowers?

If some of the children did not see some of the blowers in action, children could take turns demonstrating how they worked. If time allows and the children seem interested, they could spend some time after the discussion further experimenting with the blowers.

ACTIVITY *Which Solutions Work Best?*

Materials: Bubble solutions (see recipes below), three buckets or trays, and bubble blower for each child (see instructions in previous activity).

Note to the Volunteer: Bubble solutions seem to improve with age. You may want to make the solutions a few days ahead of time, and you can definitely store the solution and reuse it. Any water will work for ordinary bubbles. Soft water works well, but for super bubbles, use distilled water that can be purchased from the grocery store. Glycerin can be purchased from a pharmacy. It would be best to do this activity outside. The very best bubble blowing conditions are outside, in a shady area, right after sunset, when the air is still or only slightly breezy, after a rainstorm, and in open areas where your bubbles won't run into dry objects.

Formula #1

1 part *Dawn Ultra* or *Joy Ultra* dish detergent
15 parts water

2 1/2 parts glycerin or white *Karo* syrup
For example: 1 cup dishwashing detergent, 15 cups water and 1/4 cup glycerin or syrup.

Formula #2

1 part regular *Dawn* or *Joy*
10 parts water

2 1/2 parts glycerin or white *Karo* syrup
Super Bubble Formula

2 parts regular *Dawn* or *Joy*
4 parts glycerin

1 part white *Karo* syrup
SOAP

Application: Find a shady place outside. Invite the children to sit down in a circle while you explain what is in each bucket or tray. Let them know that they are going to be experimenting to see which solution makes the best bubbles. As a group, determine what a good bubble is. Consider size, how long the bubble lasts, how many bubbles you can blow with one dip into the bubble solution. Have the same type of bubble blower available for the children to use for each solution. Set the buckets or trays at stations a short distance away from each other and divide the children into three groups. Have each group start at a different station. Give them enough time to blow plenty of bubbles. Rotate the groups until everyone has had a turn at each station. Bring the group back into a circle.

Ask the children the following questions:

- Which bubble solution do you think blows the best bubbles? Why?
- What do you think is different about the solutions? (Share the recipes.)
- Does the type of dish soap that you use make a difference? Why?
- What do you think that glycerin or *Karo* syrup does to the solution?
- Explain that there are adults who test products for their jobs.
- If you had a job as a product tester, what types of products would you want to test?
- How can you make sure that a test is fair?

Looking Within

ACTIVITY *Bubble Songs*

Materials: none

Application: Children may learn the following songs by acting out the words and then singing the songs during bubble-blowing.

Bubble-Making Song (to the tune of "The Grand Old Duke of York")

*I take my bubble wand and dip it in my soap,
wind is blowing, bubble's growing,
and away it floats.*

*First it floats up high, then it floats down low,
finally that old bubble bursts;*

I wonder where it goes!



Super Bubbles (to the tune of “Oh My Darling Clementine”)

*Super bubble, super bubble,
watch me blow it in the air,
wind is blowing, bubble’s floating,
whoops it burst, right over there!*

ACTIVITY *Bubble Art*

Materials: bubble solution, food coloring, several different types of bubble blowers, small containers, roll of white paper, and masking tape
Note to the Volunteer: Tape the paper to the activity tables, covering the complete surface. Fill the containers half-full of bubble solution, and add a different food coloring to each. Mix to provide a greater range of colors. Immediately clean up any bubble solution that spills.

Application: Encourage the children to blow bubbles over the table so that the bubbles will burst on the paper. Have the children experiment with different types of bubble blowers and mixing the solutions to form different colors. Ask the children the following questions:

- Did different blowers make different types of designs? Why?
- What colors were you able to make?
- How did you make different colors?
- How can we use our bubble art? (They might use it for wrapping paper, pictures, or stationery.)
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ACTIVITY *Seeing a Rainbow in a Bubble*

Materials: bubble solution, bubble blower # 1 or # 3, shallow containers, flashlight or sunlight

Note to the Volunteer: This activity may be done indoors. Spread several layers of newspaper under the work area. If done outdoors, make sure that the children are facing away from the sun.

Application: Ask the children if they would like to see a rainbow in a bubble? Have the children work in pairs. Tell one child to dip their blower

into the bubble solution and get a film of bubble solution on the blower. Do not blow a bubble. Hold the blower up. Have the other child shine the flashlight through the film. If outside the sunlight can shine through the film. Observe what happens as the light hits the bubble film.

Ask the children the following questions:

- What did you observe?
- What colors did you see?
- Did you see any patterns?
- What makes the colors change?

Reaching Conclusions

ACTIVITY *Standing in a Bubble*

Materials: a child’s small plastic swimming pool, a cinder block or other heavy object, a cloth-wrapped hula-hoop (or a hula-hoop wrapped with yarn), enough bubble solution to fill the pool about 4" deep, and an extra adult volunteer

Note to the Volunteer: This activity is preferably done outside. It is best to use the super bubble formula from the *Which Solution Works Best* activity, although the other solutions will work. Remember that bubble solution that has had time to age works the best. Before the activity begins, fill the tub with about 4 inches of bubble solution and carefully place the cinder block in the center of the pool. (There should be no bubble solution on the top of the cinder block.) Place the hula-hoop in the pool to soak.

Application: Invite the children outside. Have them sit somewhere near the pool of bubble solution. Ask them: What would it be like to be inside a bubble? Tell them that today they are going to get an opportunity to try it. Go over the following safety precautions before beginning: Do not climb onto the cinder block without the help of an adult, stand very still while in the pool, wait for an adult to take your hand before getting off of the block, sit quietly and watch the others until it is your turn. Allow one child at a time to come up to the pool. Have an adult volunteer on each side of the pool. The volunteers should help the child onto the



cinder block. Ask the child to stand still with their hands to their sides. The volunteers should wet their hands in the bubble solution and pick up the hula hoop. On the count of three, the volunteers should lift the hula-hoop up over the child. A bubble should form around the child. An adult volunteer should hold the child's hand and help them off of the block. Let each child have a turn. If time allows, they could each have another turn.

Ask the children the following questions:

- What was it like to be inside a bubble?
- Did you see any colors?
- What colors did you see?
- What was it like when the bubble popped?
- What do you think would be the biggest bubble you could make?

ACTIVITY *Make Your Own Bubble Blower*

Materials: bubble solution and miscellaneous supplies for children to build their own bubble blower. Invite the children to sit around a table. Ask them to recall all of the bubble blowers they have used. Tell them that now is their opportunity to design the “ultimate” bubble blower. Ask: What makes a bubble blower work well? Remind them to think about this while they work on their design. Have supplies in the middle of the table for them to use. They could work in groups or individually to design the blowers.

Give them enough time to build the bubble blower. During the design process, give them an opportunity to go outside and test their blowers. Let the children know when there are only a few minutes left to build. When everyone is done, take the children outside and let them show off their bubble blowers.

Application:

Ask the children the following questions:

- What was the easiest thing about designing your bubble blower? Or the hardest?
- Would you do anything different?
- What other plans do you have?
- Does the size or shape of the bubble blower change the bubble? How?

Going Beyond

ACTIVITY *Chemistry and Bubbles*

Materials: vinegar, baking soda, bubble solution, measuring spoon, measuring cup, bubble blower, and a jar with a wide mouth

Note to the Volunteer: This activity can be very messy. It would be best to do it outside. Place one tablespoon of baking soda into the bottom of the jar. Slowly pour 1/2 cup of vinegar onto the baking soda. Blow some bubbles and catch one on the bubble blower. Carefully lower the bubble into the jar. Hold it there for a minute and watch what happens. Discuss.

ACTIVITY *Snacking on Bubbles*

Materials: 2 1/2 gallon container, 2 pounds dry ice, 1 1/2 gallons of water, 10 cups of sugar, one small bottle rootbeer extract, long stirring stick, ladle, and cups.

Note to the Volunteer: Use caution with dry ice. Wear gloves. Touching the ice can cause freezer burns. Never allow the children to touch the dry ice. Once the dry ice is placed in the liquid it will quickly change into CO₂ gas, which is the normal carbonation that is found in soda pop.

Application: Mix everything together. Let the children take turns stirring the mixture. The mixture will bubble and fizz. Provide each child with a cup of the mixture. Empty clean plastic pop bottles could be used so the children can take the extra home with them.

Reading Adventures

This listing of reading materials can be used as background information, for sharing before the group activity to set the stage for learning, or for sharing afterwards to reinforce the activity.

Bubble Bubble, by Mercer Mayer

Bubble Trouble, by Mary Packard

Soap Bubble Magic, by Seymour Simon

Bubbles, by Joanne Arthur



References

Bubbles, by Bernie Zubrowski, 1979.

The Exploratorium: Bubbles, Exploratorium
(San Francisco), 1986.

Soap Science, by J.L. Bell, 1993.

Internet Connections

Professor Bubbles' Web site has interesting and helpful information concerning bubbles.

You'll find everything from bubble solution recipes to the history of soap.

<http://www.bubbles.org>

The Exploratorium Museum in San Francisco has a Web site with lots of facts and experiments on bubbles.

<http://www.exploratorium.edu/ronh/bubbles>

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