MIND TREKKERS

Giant Bubbles Lesson Plan

Amount of time Demo takes: 2 min
Set up: 5 min
# of time per hour: 30+
Container: large bin

Materials:
1. Baby Pool (1) and cinder block to place in center
2. 6 Tablespoons (2 oz) of Glycerin
3. 2 gallons distilled water (2/day)
4. 80-120oz of Commercial bubble solution, The best is Mr. Bubbles from Tootsie Toy [not the bubble bath!]. As a second choice try Super Miracle Bubbles. (Pustifix or Gazillion Bubbles work extremely well but are more expensive) (1/day)
5. 24 oz of classic Dawn Original Scent (non Ultra) (1/day)
6. 10 gallon mixing bucket (1)
7. Hula Hoop large and small (2)
8. Rug to step out of pool onto (1)
9. Rubber gloves

Set up instructions:
1. Into your mixing bucket add the entire gallon of distilled water
2. Stirring slowly so as to not make lather, add in the 24 oz of Non-Ultra/Classic Dawn Original Scent
3. Stir in 6 tablespoons (2oz) of Glycerin
4. Add the 80-120 oz of quality commercial bubble solution
5. Pour into kiddie pool
6. Use hula hoop as “wand” to make bubbles

SAFETY!
1. Area will get slippery; place rug out for volunteers to step onto when they get out of the pool

Lesson’s big idea bullet points
• Why are bubbles round?
  This has to do with the surface tension of the liquid in the bubble. The atoms in your bubbles solution all prefer to stick together. Because of that, the inside surface of the bubble and the outside surface of the bubble are both trying to stay close to the thin film of solution that makes the bubble. When you make a bubble, the air inside it is pushing out on the
bubble equally in all directions. That's why the bubble is round. The bubble breaks when the surface tension of the bubble solution is broken.

- **Why do soap bubbles have an iridescent color?**
  Bubbles reflect light. Differences in the thickness of the bubble cause the light to be refracted into different colors. Light can be reflected off of both the inside and outside of the film, and the combination of those reflections determines the color seen by the eye(s). In addition, the bubble’s solution has a different index of refraction than the air - the bubble causes the light waves to shift slightly when they enter the film, so the reflected light interferes differently at different thicknesses.

  ![Diagram of light reflections](image)

  *Light reflects off of both the outside and inside of the bubble. Interference between the reflections leads to us seeing different colors!*

- **Why can't I make a bubble with plain water?**
  A common misconception is that soap increases the water's surface tension - soap actually does the opposite, decreasing it to approximately ½ the surface tension of pure water. Soap does not strengthen bubbles; it stabilizes them, via an action known as the Marangoni effect. As the soap film stretches, the surface concentration of soap decreases, which in turn causes the surface tension to increase. This increase in inward tension keeps the bubble together. Thus soap works by selectively strengthening the weakest parts of the bubble, preventing any one part of the bubble from stretching excessively.

  The surface tension of pure water is great enough such that this inward force will pull the water together into drops, and not create bubbles.

**Instructional Procedure**
1. Mix together ingredients listed in materials according to set up instructions
2. Set out rug for volunteers to use when getting in and out of tub
3. Have volunteer stand in the kiddie pool on a brick, place the hula hoop around them in the pool, and pull it up creating a large bubble all around them.

**Clean Up**
Clean up between demonstrations if needed. When completely finished gather all materials listed for this demonstration and make sure everything is accounted for. If something was used up,
broken or damaged. Let someone know so it can get replaced or fixed.

References:
http://www.eclectichomeschool.org/articles/article.asp?articleid=149

National Standards
K-4 Content Standard B, Properties of objects and materials
5-8 Content Standard B, Properties and changes of properties in matter
9-12 Content Standard B, Structure and properties of matter