Brewing Soda

Objective: Through brewing, students will learn about yeast (fungus) and their decomposition abilities as well as some physical science (simple machines, solubility, dilutions, pressure, displacement and more). This lesson can be used as either an accumulative activity or an inquiry activity by having students compare the use of sugar, molasses and honey or by using different amounts of yeast.

Parameters of Essential Instruction:

Science & Technology (6-8)

- **A1 Systems**
  - (a) Explain how yeast (fungus) feeds on glucose (sugar) within this system to create the carbonation within the soda.
- **D3 Matter and energy**
  - (c) Describe the differences between physical and chemical changes (the yeast metabolizes the glucose and gives off CO_2 to create a chemical change in the soda.
- **E2 Ecosystems**
  - (b) Describe ways in which two types of organisms may interact (competition) and describe the negative consequences of such interaction. The importance of disinfecting bottles and equipment before brewing due to the possibility of microbes being introduced into the soda, which can cause soda to sour.
- **E4 Heredity & Reproduction**
  - (c) Yeast (fungus) reproduce asexually (budding)

Resources:

Cresswell, Stephen. Homemade Root Beer Soda & Pop. United States: Storey Publishing, 1998. Print.

Equipment:

- Bottle capper
- Funnel with snap in strainer
- 5-gallon glass jug
- 5 – 6 gallon food grade bucket with spigot
- Bottles (heavy glass with unthreaded tops) & caps
- Bottle brush
- Bleach
- Small piece of plastic tubing
- Filler tube
- Root beer extract or spruce extract
- Sugar ~ 8 cups
- Brewers yeast (*Saccharomyces cerevisiae*)
- Measuring spoons
- Measuring sups
- Long plastic spoon
- Thermometer

Day 1

- Wash and disinfect all bottles and equipment you intend to use. Have a discussion with the students on why this is an important step to brewing soda.
    - Sock equipment for about 30 minutes in a chlorine bath (1 cap of bleach/gallon of water).
    - Rinse and allow all bottles and equipment to air dry.
    - You might want to do this portion of the brewing activity yourself the night before mixing all the ingredients.
- Design soda bottle labels

Day 2

- Prep brewer's yeast (as directed on package).
    - Discuss with the students that yeast is a fungus from the fungi kingdom and reproduces asexually.
- Mix extract, sugar and 1/2 water
    - Mixture, solubility
- Once yeast is active, pour into the extract, sugar and water mix and top off with more water, filling your 5-gallon glass jar to the appropriate level (bring up to 4 – 5 gallons as per your recipe).
- The above directions are only a vague guide. There are a plethora of recipes that you can choose to follow.

Day 3

- Transfer soda from 5-gallon glass jar to plastic pail with spigot (make sure spigot is closed).
    - Water pressure
- Attach plastic tubing tightly to the spigot and then attach the filler tube to the plastic tubing.
    - Displacement (filler tube displaces the correct amount for the soda to be capped).
- Bottle soda and handoff for capping.
    - Capper is a simple machine
- Once all the bottles have been filled and capped, store in a dark temperate location for one to two days (you should check carbonation after 24 hours).
    - Allow yeast to ingest some sugar to produce the CO_2 bubbles in the soda.
    - What would happen if we left the yeast to consume all of the sugar?
    - Discuss how and why pressure builds inside each bottle.
- Once carbonation is right, refrigerate the bottles
    - Refrigeration slows the yeast's metabolism of the sugars
- Soda should be consumed within about five weeks and since the yeast settles to the bottom on the bottles you may want to suggest students leave the last quarter inch in the bottle (although some people enjoy the flavor of yeast).
    - Check on bottle periodically. Although refrigeration does slow the consumption of sugars by yeast, it does not completely cease and therefore bottle may crack and leak due to building pressure.