Dragon’s Breath Lesson Plan

Amount of time Demo takes: 3-5 mins.
Don’t try this at home!

Materials
- Graham crackers (1 box/hr) (4/day)
- Wire scoop (2)
- Tupperware serving container (2)
- Safety goggles
- Liquid Nitrogen (“LN2”)
- Styrofoam bowl and thick rubber gloves (2)

Set-up Instructions
1. Safety equipment for handling liquid nitrogen must be worn: goggles and thick rubber gloves.
2. Put holes in bottom of Styrofoam bowl and place bite size broken graham cracker pieces in the bowl.
3. Fill an empty bowl with liquid nitrogen.
4. Carefully submerge the first bowl with holes and graham crackers into the liquid nitrogen. Feel free to use the wire scoop to make sure all crackers are submerged in LN₂. Lift the bowl out and let it drain.
5. Using the wire scoop, take the graham crackers out and put them into the serving container.
6. Wait at least 15-30 secs. before serving to let the remaining liquid nitrogen evaporate off the graham cracker. Serve to people around the table.

SAFETY!
- Goggles and protective gloves must be worn at all times while handling the liquid nitrogen, because liquid nitrogen is -321 °F, it can cause frostbite if it touches skin. Use caution when pouring it and follow appropriate LN2 SOP procedures. Make sure the participants stay back far enough not to be hit by splashing liquid nitrogen. Don’t be afraid to tell the kids to step back when pouring. Take extra care to ensure no droplets get into your glove; if so to avoid serious injury, remove the glove IMMEDIATELY. We don’t want to cause injury to yourself or public.
- Do this on a table away from students, or make sure they stay back while
working with the liquid nitrogen.

- Wait a minute or two before handing them out to make sure the excess liquid nitrogen has boiled off the graham crackers. You can also blow warm air on them (see picture at right) to warm them up – this way, the crackers will not stick to people's tongues as easily.

**Lesson’s Big Idea**

- This is a great demo of condensation. Water vapor condensates due to a change in temperature forming a small cloud, as the person with the graham cracker in their mouth breathes out.

**Instructional Procedure**

1. This is a quick demo. Once the graham crackers are prepared from the directions above, hand out the Dragon’s Breath graham crackers.

2. Tell participants to chew right away and breathe out of their mouths/noses to produce “dragon’s breath.” This is similar to going outside on a cold day and seeing your breath - your warm, moist breath hits the cold air. Cold air can’t hold as much moisture as warm air and you get a little cloud from your breath. In a similar fashion, the moisture from your breath condensates when it comes in contact with the cold graham cracker.

3. Concepts and vocabulary that may be helpful to know when describing this:
   - Condensation - change of a state of matter from gas to a liquid
   - Dew point - temperature at which the air can no longer hold all of its water vapor, and some of its water vapor becomes liquid water. The dew point is always lower than the air temperature. If the air temperature cools to the dew point, or if the dew point rises to equal the air temperature, then dew, fog or clouds begin to form. At this point where the dew point temperature equals the air temperature, the relative humidity is 100%.

**Assessment/sample questions you can ask**

1. Why do you think you can see your breath?

**Clean Up**

- Make sure to dump crumbs out of the liquid nitrogen bowls. Always make sure that a dewar or bowl filled with liquid nitrogen is moved out of reach. Excess liquid nitrogen can be disposed of.
References
- http://www.weatherquestions.com/What_is_dewpoint_temperature.htm

Next Generation Science Standards
- K-5
  - 5-PS1
- 6-8
  - MS-PS1-4
  - MS-PS3