

Best Lesson
6th Grade Science

Grade Level – 6th grade

Title of Lesson – Cloud in a Bottle

Unit Title – Weather

Performance Standard(s) Covered –

- **S6CS2. Students will use standard safety practices for all classroom laboratory and field investigations.**
 - a. Follow correct procedures for use of scientific apparatus.
 - b. Demonstrate appropriate techniques in all laboratory situations.
 - c. Follow correct protocol for identifying and reporting safety problems and violations.

- **S6E4. Students will understand how the distribution of land and oceans affects climate and weather.**
 - a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.
 - b. Relate unequal heating of land and water surfaces to form large global wind systems and weather events such as tornados and thunderstorms.
 - c. Relate how moisture evaporating from the oceans affects the weather patterns and weather events such as hurricanes.

- **S6CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.**
 - a. Observe and explain how parts are related to other parts in systems such as weather systems, solar systems, and ocean systems including how the output from one part of a system (in the form of material, energy, or information)

Essential Question(s) – How does a cloud form in the atmosphere? What are clouds made of and how do they move?

Objective – The goal of my lesson is to demonstrate to students how different aspects of the environment, like air pressure, water vapor, etc. can come together in a defined manner to form a cloud. Other goals include learning what clouds are made of and how clouds move. Also, students should practice their ability to hold a scientific discussion with each other and the teacher. Finally, my last goal is to demonstrate a safe science experiment and good technique when using equipment. The students should be more accomplished in their weather and climate knowledge by the end of the lesson.

Key Terms –

- Climate
- Cloud
- Air pressure
- Atmosphere
- Condensation
- Water vapor

Abstract – For this lesson, students will watch the teacher perform a simple demonstration of forming a “cloud” in a bottle. Students will also participate in discussion after the demonstration to see if they can reason through what was going on during the experiment.

Materials –

- (1) one-liter plastic bottle, clear
- A foot-operated bike pump
- Bike pump needle
- Black rubber stopper, fitted to liter bottle
- Bottle of rubbing alcohol

Safety Concerns – The bike pump is a heavy metal object and when pressure is applied during the experiment, it takes some effort to maintain the pressure. Also, the rubbing alcohol is dangerous if ingested, so only the teacher should handle it. When the cloud forms in the bottle, the “cloud” could include some alcohol vapors, so students should not inhale or sniff the cloud.

Procedure:

- Preparation before class:
 - Make sure the rubber stopper fits into the liter bottle opening; the stopper is used to seal the pressure in the bottle, so it needs to be tight
 - Using an electric screw driver *smaller* than the bike pump needle, drill a hole through the center of the rubber stopper all the way through; insert the needle through the hole. There should be enough length on both ends of the needle for it to be inserted in to the bike pump as usual and for the air to come out of the other end
- During class:
 - If it's a small class, gather the students around in a circle; if a larger class, the demonstration is quick and can be repeated; it is best if students can see close up and be able to touch the liter bottle
 - Put about ¼ cup of rubbing alcohol into the liter bottle
 - Use the bottle cap to close the bottle and swish the liquid around so it coats the sides of the bottle
 - Remove the cap, but leave the rubbing alcohol in the bottle
 - Take the bike pump apparatus with the rubber stopper and insert it into the bottle, making sure the rubber stopper makes a tight seal with the cap
 - While holding the rubber stopper in place firmly, use your other hand or have a student depress the bike pump 5-10 times

- Once there is sufficient pressure built up (you should feel it), quickly remove the bike pump rubber stopper apparatus and watch the cloud form
- It can be easily repeated, simply pump air back in to the bottle
- During the activity, students should be paying attention to the teacher doing the demonstration, asking questions as they arise. If the class is small enough, one student could help pump the pressure into the bottle under the aid and supervision of the teacher

Notes and Tips – It would be good to warn the students that when you release the top, there will be a popping noise. Also, to demonstrate the change in pressure, have the students feel and squeeze the side of the liter bottle and how flexible it is. Then, have them feel it again once some pressure has been applied. The bottle will be firm and not flexible, showing the increased pressure. Based on previous lessons I've done in class, it seems to work better to do the demonstration first, and then ask the students what they think it is happening. It allows them to discover on their own.

Reference –

<http://www.stevespanglerscience.com/lab/experiments/cloud-in-a-bottle-experiment>