

# Bay Area Scientists in Schools Presentation Plan

Lesson Name Weather and Air Pressure

Presenter(s) Alan Poon

Grade Level 5 Standards Connection(s) Earth sciences core curriculum

**Abstract:** Concepts of air flow and air pressure will be introduced through a number of simple demonstrations. Students will participate in a contest to inflate a windbag, witness an ear-popping experience in cloud making, learn how to put an inflated balloon in a bottle and make a simple barometer.

## Vocabulary/Definitions:

- Air pressure,
- condensation,
- hurricane/cyclone,
- condensation,
- clouds,
- precipitation

## Materials:

### *What you'll bring with you*

- Bicycle pump+couplings,
- windbag,
- a few bottles,
- balloon,
- matches,
- work gloves,
- eye goggles,
- tapes,
- straws,
- bucket

### *What students should have ready (pencils, paper, scissors)*

- Several clean, empty spaghetti or jam jars would be great (preferably one jar per 4-5 students)

## Classroom Visit

### **1. Personal Introduction:** \_\_\_\_\_ 5 \_\_\_\_\_ Minutes

*Who are you? What do you want to share with students and why? How will you connect this with students' interests?*

### **Topic Introduction:** \_\_\_\_\_ 5-10 \_\_\_\_\_ Minutes

*Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?*

What is air?

How does air flow?

What is pressure?

### **2. Learning Experience(s):** \_\_\_\_\_ 30-35 \_\_\_\_\_ Minutes

*Demonstrations, hands-on activities, images, games, discussion, writing, measuring... What will you do, what will kids do? Describe in order, including instructions to kids.*

#### - **Air flow:**

- Bernoulli Principle activity with windbag – how to inflate a windbag quickly [1]

##### **[1] Windbag activity:**

Materials: "long" (~4-5 feet) bag (suggestion: Diaper Genie bag)

How it works: This demo shows one can inflate a long windbag with one breath.

As the speed of a gas increases, the pressure it exerts decreases. So when blowing into the bag, the reduced pressure caused by the long breath makes the ambient air flow in.

#### - **Air pressure:**

- What happens when you inflate a balloon?
- A balancing act - balloon in a bottle [2]

##### **[2] Balloon in a bottle:**

Materials: balloon, a 1-litre plastic bottle, drill a hole at the bottom of the bottle

How it works: With the lip of the balloon sealing the mouth of the bottle, it would be difficult to inflate the balloon when the hole at the bottom is covered. This is because our lungs are not strong enough to compress the air inside the bottle.

With the hole at the bottom of the bottle exposed, air inside the bottle can escape as the balloon is inflated. Once the balloon is inflated, and then the hole at the bottom plugged, the balloon stays inflated. This is because in order to deflate the balloon, additional air to fill in the volume left behind by the deflating balloon is needed (but the bottle is sealed).

#### - **Condensation:**

- What is condensation?
- Showing how pressure can affect cloud formation (clouds in a bottle demo) [3]



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### [3] Clouds in a bottle:

Materials: a clear 2-litre bottle, means to seal and pressurize the bottle (e.g. a rubber stopper with coupling to a bicycle pump).

How it works: With a small amount of water in the bottle, one can create clouds by changing the air in the bottle. Condensation depends on both pressure and temperature. When there is a sudden drop in pressure, water can condense more readily and clouds are formed.

### **– Reading the weather map**

- What does "L", "H" and all those arrows mean?
  - Make a barometer. [4]

## [4] Barometer:

Material: a clean spaghetti/jam jar (lid not required), balloon, rubber band, drinking straw, masking tape.

How it works: When one seals the jar with the balloon, the air pressure inside the jar is the same as the ambient environment. As the atmospheric pressure changes over days, the balloon inflates or deflates slightly, causing the straw (needle) to change its position.

### **3. Wrap-up: Sharing Experiences and Building Connections**

5 Minutes

*Putting the pieces together – how will students share learning, interpret experience, build vocabulary?*

#### 4. Close:

5 Minutes

*How can kids learn more? Thanks and good-bye! Clean-up.*

I like to end each class with a question period. Questions don't have to confine to the topics discussed during the class.

**TOTAL 50 – 60 Minutes**

## Follow-up – After Presentation

Suggest students write a letter explaining "How we learned about \_\_\_\_\_?"

The students can measure the atmospheric pressure (qualitatively) with the barometer made in class for a week, and send me their data.

**I Can't Take the Pressure** (*Integrated Teaching and Learning Program, College of Engineering, University of Colorado at Boulder*) Learners develop an understanding of air pressure in two different activities. They model the magnitude of air pressure as gravitational force per unit area, and they use cookie wafers to model how air pressure changes with altitude. Instructions are also included for a demonstration to crush an aluminum can using air pressure. This activity has connections to other activities to create a larger lesson or curriculum unit. Resource contains vocabulary definitions and suggestions for assessment, extensions, and scaling for different levels of learners.

[http://www.teachengineering.org/view\\_activity.php?url=http://www.teachengineering.org/collection/cub\\_activities/cub\\_air/cub\\_air\\_lesson04\\_activity1.xml](http://www.teachengineering.org/view_activity.php?url=http://www.teachengineering.org/collection/cub_activities/cub_air/cub_air_lesson04_activity1.xml)

**Make Your Own Weather Station** (American Museum of Natural History) This three-part activity shows learners how to build three meteorology tools: a wind vane, a rain gauge, and a barometer. Then, they can use their tools to build their own weather station to record data about the weather, study the data to detect patterns, and use the patterns to predict the weather. This lesson also includes information about the difference between weather and climate.

[http://www.amnh.org/ology/features/stufftodo\\_earth/weather\\_main.php?TB\\_iframe=true&height=500&width=770](http://www.amnh.org/ology/features/stufftodo_earth/weather_main.php?TB_iframe=true&height=500&width=770)

### **Reading Connections:**

- Scholastic Atlas of Weather by Scholastic - Packed with huge, colorful illustrations, the Scholastic Atlas of Weather shows exactly what causes weather to run wild. Clear, succinct captions underscore the vital scientific information kids need to fully appreciate Mother Nature's power. Exploring how Earth's location in space affects weather and climate, it covers topics like the atmosphere, wind, water and precipitation, temperature, and types of clouds. The book also includes amazing weather facts and records, a glossary, and an index. As a special bonus, there are instructions for weather-related science experiments and activities. Discover how to create your own clouds, collect raindrops, and more!

<http://www.scholastic.com/teachers/book/scholastic-atlas-weather>

- Facinating Science Projects: Air by Sally Hewitt <http://www.amazon.com/Air-Sally-Hewitt/dp/0761323376/>
- Experiment with Air by Bryan Murphy <http://www.amazon.com/Air-Bryan-Murphy/dp/1587282445/>