

Weather Fronts - Movement of Cold and Warm Air

Teacher Guide

Learning Objectives

At the end of this activity, students will be able to -

- explain that warm air rises and cool air sinks.
- describe how wind moves and is formed. (wind moves from a high-pressure area (an area of sinking air) to a low pressure area (an area of rising air).)
- explain, illustrate and label what creates/forms a breeze on the beach. (sea/land breezes)

Background Information

- Warm air rises. It also expands, spreading out. This creates an area of low pressure.
- Cold air sinks because it is heavier. This causes contraction of the air molecules.
- When cold air rushes in to replace the rising warm air, this is called wind.

Materials

- 2 balloons
- 2 bottles
- 2 glass liquid measuring cups
- ice water (extreme amounts of ice!)
- boiling water
- timer
- paper/pencil



Directions

1. Attach a balloon to the top of one of the bottles. (Review the fact that air is inside both the bottle and the balloon. Also, the temperature of the air inside is room temperature.)
2. Pour ice water into measuring cup, filling it two thirds of the way up.
3. Place the bottle in the bowl.
4. Make observations of the balloon for one minute. Record data.
5. Repeat steps 1-4 using the boiling water.

Resource -

College of Natural and Applied Sciences

http://kingfish.coastal.edu/GK-12/media/08/plans/middle_school/weather-fronts-lesson-plan.doc

NASA's S'COOL

http://asd-www.larc.nasa.gov/SCOOL/lesson_plans/Warm_and_Cold_Air.html

CASES

<http://cases.soe.umich.edu/plans.php?nav=showplan&dqid=320&lpid=32771>

Teach Engineering

http://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_air/cub_air_lesson04_activity4.xml

Name _____ Class _____ Date _____

Ice Water
(sketch)

Boiling Water
(sketch)



Describe what happened with the bottle placed in the ice water.

Why did this occur?

What kind of pressure area (low or high) formed? (Explain)

Describe what happened with the bottle placed in the boiling water.

Why did this occur?

What kind of pressure area (low or high) formed? (Explain)

How does this relate to the formation of wind?

Give an example of how a wind forms. Draw a diagram on the back of the paper.

As this experiment utilizes boiling water, educators should use best judgment on whether or not to allow the students to directly participate.

Levels of Inquiry

Confirmation – Provide the students with the overarching question and the procedure, as well as the materials. Place several instrument artifacts around the room so that students can check their progress.

Structured - Provide the students with the overarching question and the procedure, as well as the materials. Allow students to discover the finished product on their own.

Guided – Provide the students with the overarching question and materials. Students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Open - Students are given a scenario that describes a situation. From this scenario, students are to generate an overarching question. From that point, students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Possible scenario – Behind his house, Antonio observes hot air balloon lifting off from a field. Antonio wonders how the balloons are able to lift off, and then land.

Correlated Literature

(All literature can be found on the Galileo website unless otherwise noted.)

Vasquez, T. (2009). THE INTERTROPICAL CONVERGENCE ZONE. (cover story). *Weatherwise*, 62(6), 24. (Audio capable)

Brusso, C. (2012). "A World Without Wind." *Ask!*. Mar 2011: 6-10. *SIRS Discoverer*. Web.

Technology Integration

Digital Camera – Documenting your student’s work with a digital camera is a great idea. Not only do you have digital media, but students are usually excited about presenting their work to be captured by camera. With the media, there are endless possibilities, from PowerPoints to blogs to Glogs and beyond!!! (Always refer to your school’s policies about posting student’s pictures or work on the Internet.)

Presentation Platforms – Presentation platforms have evolved. PowerPoint is still effective, but here some examples of Internet based platforms. (Many of them allow the embedding of pictures, video, and audio, as well as text.)

<http://www.prezi.com> – zoomable slide presentation tool

<http://edu.glogster.com/> - Internet based poster maker

<http://museumbox.e2bn.org/index.php> - description of an event or person in an interactive box

<http://www.voki.com/> - create an avatar to speak for you

Common Core (Grades 6-8)

L6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

L6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

L6-8WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
- e. Establish and maintain a formal style and objective tone.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Georgia Performance Standards

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.

S6CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

- c. Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various quantities.

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) can become the input to other parts. (For example: El Nino's effect on weather)
- b. Identify several different models (such as physical replicas, pictures, and analogies) that could be used to represent the same thing, and evaluate their usefulness, taking into account such things as the model's purpose and complexity.

S6E3. Students will recognize the significant role of water in earth processes.

- b. Relate various atmospheric conditions to stages of the water cycle.

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.