
Air ...What Gives?

An Educator's Reference Desk Lesson Plan

Author: John Cowens; Greenwood Elementary, La Grande, OR 97850

Date: May 1994

Grade Level(s): 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Subject(s):

- Science/Physical Sciences

CONCEPTS: Force, Order, Equilibrium

PROCESSES: Communicating, formulating models, inferring, observing

OBJECTIVES: The students will demonstrate the ability to investigate what air is like and where it is found.

METHOD: The children will sense that air is real capturing it, squeezing it, carrying it, and feeling its weight.

BACKGROUND:

The bags in the jars will act somewhat like a hammock with a person lying in it. To pull up the hammock, one also has to lift the person resting on it. Likewise, to pull up the bag, one has to lift the air resting on it. This air extends as far up as air goes - hundreds of kilometers! No child can lift this much air; it weighs far too much.

MATERIALS:

gallon jars, 2 rubber bands for each jar, string, strong plastic bags

PROCEDURE:

1. Ask the students to fill their bags with air. Usually they will do this by blowing, but show them that a bag can also be filled by pulling it through the air quickly.
2. Have the students help each other tie an air-filled bag, upside down, to each jar with its mouth over the opening of the jar. They should wind a string (tightly) around the bag and jar several times without crossing ridges of glass, and tie it with a bow knot.
3. Ask the children to press down on the bags, lean on them, and rest objects on top of them. (Why don't they go down?) What other things act like this? Pupils may mention inflated beach toys, air mattresses, and tires.

4. Have the children untie the bags, put them down inside the jars with the mouth of each bag folded over the mouth of the jar and again tie them on tightly. When all are ready, ask them (at the same time) to hold the jars and pull out the bags. Surprise! Why is it difficult to pull the plastic out of the jar?

EXTENSION ACTIVITY: "Blowing Up the Teacher"

Background:

Air under pressure is used to operate many devices that require great force. Car lifts in service stations use compressed air. Air brakes on a truck apply far more force that drivers can with just muscles. Air-filled tires support cars and trucks. Because air is a fluid, it can enter small openings and fill spaces of all shapes easily. Also, the pressure at any point in confined air is the same. Thus, air can be squeezed into a tire through the tiny opening in the valve stem. Once in the tire, air presses on all parts of the tire equally. The larger the area on which the confined air presses, the greater is its total force.

Activity:

It is fun and exciting to combine air under pressure and a large area as follows. Get two large tables that are identical in surface area. (Folding tables about 1 by 2 meters in size works well.) Or take the class to a room where there are two large identical tables.. Have as many children as can fit around one table kneel at its edge. Give each child a gallon-size plastic bag. Have each one pucker the mouth of the bag as if to blow into it, but lay the bag flat on the table with just the mouth projecting.

Then, while the children move away for a moment, let others help in turning the second table upside down over the first. Only the puckered mouths of the plastic bags should protrude from between the tables. Now have the children return to their places at the tables' edge.

Now ask a volunteer to get up on the overturned table. (The pupils will be even more impressed if YOU volunteer.) Ask the children not blow into the bags until you give the signal. Then say, "One...two...three... BLOW!! When they all blow simultaneously, the table with you on it will rise a short distance. The children will have "BLOWN UP THE TEACHER!"

TYING IT ALL TOGETHER:

This dramatic display of great force resulting from air pressure applied over a large area can be put to use in a number of ways. Let the class try to move some

heavy objects by means of air pressure. A filing cabinet held away from the wall by a baseboard may provide enough space for inserting a number of plastic bags. CAN THE STUDENTS MOVE ONE BY APPLYING "LUNG POWER" TO THE BACK OF THE CABINET? Perhaps someone can bring in an air mattress. Then, while one person lies on the deflated mattresses, another can blow into it. CAN ONE PERSON LIFT ANOTHER WITH LUNG POWER? The pressure of the wind on a windy day is much less than lung power. WHY, THEN, MUST A BUILDER BRACE A LONG CONCRETE BLOCK WALL WHEN A BUILDING IS UNDER CONSTRUCTION?

May 1994

These lesson plans are the result of the work of the teachers who have attended the Columbia Education Center's Summer Workshop. CEC is a consortium of teacher from 14 western states dedicated to improving the quality of education in the rural, western, United States, and particularly the quality of math and science Education. CEC uses Big Sky Telegraph as the hub of their telecommunications network that allows the participating teachers to stay in contact with their trainers and peers that they have met at the Workshops.