

Wind Energy

CONTENT STANDARD: Earth and Physical Science

CONTENT TOPIC: Meteorology and Energy Physics

CONCEPT: Wind energy can do work.

CONTENT OBJECTIVE: To understand wind/air and the effect of using wind energy to do work.

INSTRUCTIONAL OBJECTIVES: The learner will:

- Predict, hypothesize the reasons for wind movement.
- Define wind energy.
- Describe how wind and air can be used to do work.

OUTLINE OF CONTENT:

- I. What is wind
- II. Definitions
 - A. Wind energy
 - B. Low pressure, high pressure

GOAL: To enable students to acquire scientific knowledge by applying concepts, theories, principles and laws from earth science.

STANDARD(S): The learner will understand that:

Science is based upon suppositions derived from observations of natural phenomena.

BENCHMARK: Unknown or unobserved variables may lead to unanticipated results.

The critical assumptions behind any line of reasoning must be made explicit so that the validity of the position taken can be judged.

BENCHMARK: Prior learning must be accurate and free of incorrect assumptions.

The validity of an investigation cannot be accepted unless the complete investigation can be independently duplicated.

BENCHMARK: Scientific truths must be supported by data in conjunction with logical evaluations.

CLASSROOM CONNECTORS

TIME REQUIRED: 30 minutes

MATERIALS:

Plastic container, straws, waterproof packing “peanuts”, paper and colored markers or crayons.

SET:

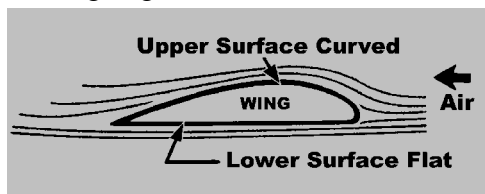
Can we use the wind to do work? If so, what kind of work can the wind perform? (response, *Look for sailing, energy generation, erosion, windmills used for grinding grain or pumping water, etc.*) “Wind energy has been used for thousands of years to do work. Before the invention of engines all traveling on water was done with the wind (and manpower using oars). We can also use the wind to create electrical energy. We can also use it to pump water and grind corn or wheat. Today we are going to see how wind can move “boats” and make airplanes fly.”

INSTRUCTION:

Kinder and 1st: Emphasis on: Wind is energy and can do work.

Students will gain a better understanding of how the movement of the air creates the wind.

For older students: How does an airplane wing work: The front edge of an airplane's wing is rounded and thicker than its rear edge. Notice that the distance across the top of the wing is greater than the distance across the bottom. Lift is produced by a lower



pressure created on the upper surface of an airplane's wing compared to the pressure on the wing's lower surface, causing the wing to be "lifted" upward. The special shape of the airplane wing (**airfoil**) is designed so that air flowing over it will have to travel a greater distance faster, resulting in a lower pressure area thus lifting the wing upward. Lift is that force which opposes the force of gravity (or weight)

Sometimes weather forecasters will say something about **high pressure** or **low pressure**. These pressure areas are important to weather forecasters because certain kinds of weather can be expected with each kind of pressure area. Because cool air is heavier than warm air, the barometric pressure would go up when a cold air mass moved in. The weather in a high pressure area (cold air mass dominant) is usually fair. Most of the time high pressure means no clouds and fair weather. Because warm air is lighter than cool air

the air moving up would make a low pressure area (warm air mass). This also makes clouds. Most of the time, a low pressure area means bad weather, because the warm air mass is unstable.

Vocabulary:

- **Air Pressure:** The force produced by air pressing down on the earth.
- **High Pressure:** When air molecules are close together. High pressure exists when the air is dry and usually brings fair weather.
- **Low Pressure:** Air molecules are far apart. The air is usually warm and moist and it brings bad weather.
- **Wind:** Air in motion as it shifts from high pressure to low pressure.

ACTIVE PARTICIPATION:

Split the students into 6 lab stations. One bucket for each station. One piece of Styrofoam for each student.

Let's race some boats!

1. Have each student pick a piece of foam. Have the students decorate and "name" their boat. Record the name of their boat in their science notebook.
2. Fill the plastic container two-thirds full with water.
3. Designate the starting point and the finishing line.
4. Begin the race by letting the boats sit in the water. Next allow the students to blow their boat to the finish line with a straw.
5. Let the races begin!
6. Have the students record the winners. Race as many times as time allows. Have winners from different tables compete against each other.

Let's make a plane:

1. Have each student take a piece of paper. Have the students decorate and "name" their plane. Record the name of their plane in their science notebook.
2. Show the students how to fold the paper into a plane. If the students know different types of "paper planes" let them build their own design.
3. Designate the starting point and have the students try to see which plane will fly the farthest..
4. Let the competition begin!
5. Have the students record the winners. Fly as many times as time allows. Have winners from different tables compete against each other.

CLOSURE:

- A. What caused the boats to move? Air/wind
- B. What was the difference in speed between just letting the boats float and using straws to blow them? Our air acts like the wind.
- C. What is wind? See E below.
- D. What causes the wind to blow? See E below.
- E. How does air pressure work? High pressure moves into low pressure areas.
- F: The wings on our paper planes is different than that on an airplane, but our planes flew. How is that possible? The air pressure of the moving paper wing creates lift just like on an airplane.