



Principles of Flight



Lesson Plan: Have a Ball with Bernoulli I

Grade level: 3

Subject Area: Science

Time Required: *Preparation:* 10 min.
Activity: 20 min.

National Standards

Correlation:

Science (grades K-4)

- Science as Inquiry Standard: Understandings about scientific inquiry.
- Physical Science Standard: Position and motion of objects.
- Physical Science Standard: Properties of objects and materials.
- Unifying Concepts and Processes Standard: Change, constancy, and measurement
- Unifying Concepts and Processes Standard: Evidence, models, and explanation.

Summary: Students will construct and use a simple device to demonstrate Bernoulli's Principle that fast moving air has less pressure than slow moving air.

Objectives:

Students will:

- Construct a tube and funnel device.
- Explore the effects of blowing air through the tube and the movement of a ball in reaction to the fast moving air.
- Explain how the reaction of the ball demonstrates Bernoulli's Principle.

Background:

When you blow fast moving air under the ball, the ball wants to go up but the slow moving air above the ball pushes it back down causing the ball to stall and spin in mid-air. When you turn the funnel over with a ping-pong ball suspended in it then blow fast, the slow moving air exerts enough pressure to keep gravity from pulling the ball down.

Materials:

You will need:

- Ping pong balls
- Flex straws
- Index cards or 3" squares of heavy paper

Procedure:

A. Warm-up

Ask the class what would happen if you blew on the ball and how they could make the ball go up into the air using air. Ask the students what they know about the speed of air and air pressure.

B. Activity I

1. Students hold the ball over the short end of a straw bent into L shape and blow through to observe the reaction.
2. Students experiment to find a speed that will cause the ball to stall and spin above the straw in mid air.



C. Activity II

1. Cut a 3” circle from the index card.
2. Cut a 1-1/2” slit into the center of the circle.
3. Overlap the cut edges to form a funnel shape and glue or tape in place.
4. Cut off tip of funnel just enough for the straw to fit through.
5. Fit the straw into the bottom of the funnel and repeat activity one. (Note : You may need to secure the straw to the funnel with tape.) Now invert the funnel while blowing through the straw. (Make sure you take a very deep breath so as to sustain your blowing through this maneuver.) The ball should stay in the funnel. Several attempts may be needed to accomplish this feat. Students may record number of tries or seconds the ball stayed in the funnel.

D. Activity III

Students should make a sketch of air molecules and movement for the two activities above. Use arrows as needed.

E. Wrap-up

Have students discuss the reaction of the ball in terms of Bernoulli’s Principle. Describe conditions that were helpful and attempts that were unsuccessful and evaluate the causes and effects. Students then relate this knowledge to airplane lift.

Assessment/ Evaluation:

Students will be assessed on their ability to follow directions, their time on task throughout the exploration and their ability to relate orally or in written form the relationship of the activity to principles of flight.

Extensions:

1. Students can research Bernoulli and his experiments with air pressure.
2. Students can design and demonstrate other simple devices that illustrate Bernoulli’s principle.

