Activities Background

The following Discrepant Event activities will help students understand Bernoulli's Principle by writing their own Principle of Lift. Each activity has a list of required materials.

After each demonstration, small groups of students will work the activity until each group can duplicate the same results as originally demonstrated by their teacher.

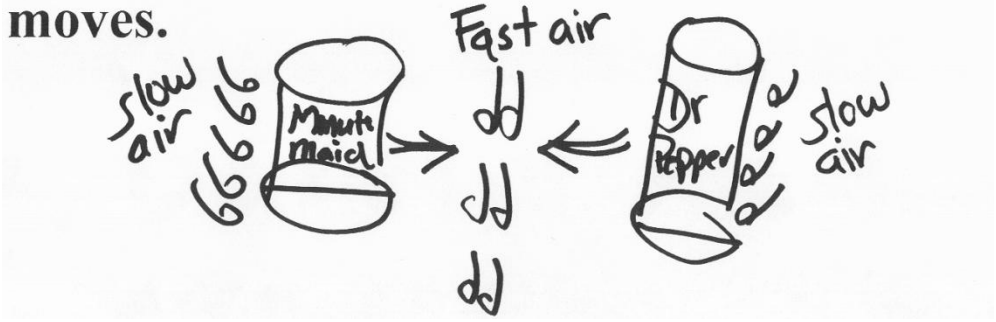
Each small group will write a description (after each demonstration) of what was observed and why they think the objects reacted the way they did when subjected to fast and slow moving air around the objects. They are to include a labeled illustration that indicates the flow of fast and slow moving air around each object (faster moving air equaling low pressure and slower moving air equaling high pressure).

After all the demonstrations have been given and each group has written their observations, explanations, and illustrations a final summary statement (principle) with a selected labeled illustration is to be written. This Principle should be written in a general, broad way to summarize how any object subjected to imbalanced flows of fast (low pressure) and slow (high pressure) moving air will behave.

An example of a Student's Principle of Flight is shown below:

Natalie's Principle

The slow air moves the object toward the fast air and the object moves. The high pressure moves the object toward the low pressure and the object then moves.

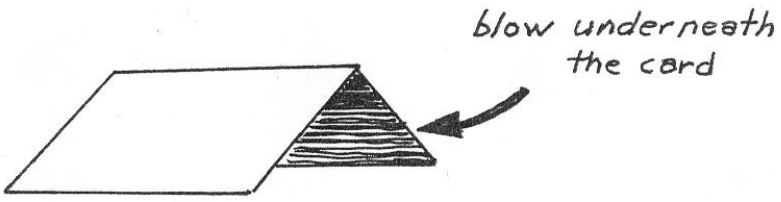


Activity #1

The Collapsible Paper Tent

Materials Required:

1. A pen or pencil and paper
2. 3 x 5 inch note card for each student



Procedure:

1. Distribute the note cards to each student.
2. Fold the cards in the center to form a tent structure.
3. Place the folded tent note card on a desk or table and try to blow the card off the desk or table by blowing underneath it.
4. Predict what will happen before you blow under the folded tent note card.
5. Make a sketch of what was observed. Use thick arrows to indicate stationary (or slower moving) air, thinner arrows for faster moving air, and a line arrow to indicate the motion of the paper strip.

Questions:

1. What did you observe when blowing underneath the paper tent? Describe the movement of the paper tent.
2. Stationary air exerts equal amounts of pressure on all sides of an object. What is different about the air on top of the paper compared to the air under the paper, when you blew underneath the paper tent?
3. What is different about the flowing air compared to the stationary air?

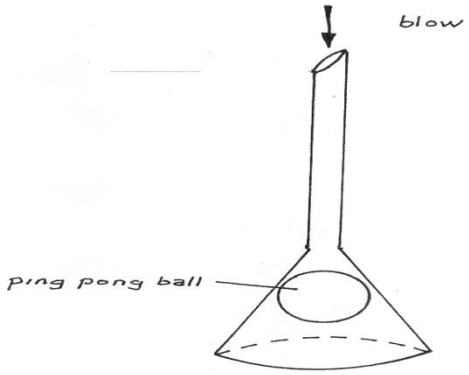
Explanations:
Stationary air exerts pressure. Flowing air exerts less pressure as compared to stationary air. The faster the flow, the lower the pressure it exerts. By blowing underneath the card, you actually created less pressure underneath the paper, so that the pressure above the paper became larger than below the paper, and this is why the card got pressed down against the table.

Activity #2

The Stubborn Ball and Its Funnel

Materials Required:

1. Pen and Pencil and paper.
2. One long-stem funnel (glass or plastic) per small group of students.
3. One ping-pong ball per small group of students.



Procedure:

1. Place the funnel and ball next to each other on a table.
2. Ask the question: “How can I pick up the ball with the funnel without sucking through the funnel? And I may not touch the ball.”
3. Pick up the funnel by the stem; place it over the ball and blow steadily through the stem, lifting the funnel while blowing.
4. Place one hand under the funnel and stop blowing. The ball then drops.
5. Place the ball in the funnel and have a student try to blow the ball out of the funnel. They will not succeed.

Question:

1. How did we pick up the ball with the funnel without sucking through it?
2. What happened when we stopped blowing?
3. Is it possible to blow the ball out of the funnel?
4. Where is the air moving the fastest when we blow through the funnel?
5. What is flowing (faster moving) air creating that stationary air doesn’t?
6. What is the difference about the inside compared to the outside of the funnel when we blow through it?

Explanation:

The ball can be picked up from the table with the funnel by blowing through it. When blowing through the funnel we create a lower pressure inside the funnel, especially at the spot where the stem is attached to the conical shape of the funnel. Here the fastest

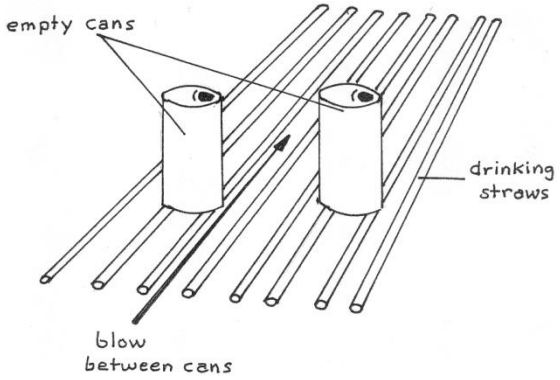
flow of air occurs because the air molecules have suddenly more space to move about. The faster the flow of air, the lower the pressure. This is why the ball is sucked into the funnel by blowing, and for the same reason it is not possible to blow the ball out of the funnel. The harder we blow through the funnel, the lower the pressure gets in the mouth of the funnel.

Activity #3

The Attracting Soda Cans

Materials:

1. Pen or Pencil and Paper.
2. Two empty soda cans per small group.
3. About one dozen straight drinking straws per small group.



Procedure:

1. Spread the straws parallel to each other on the table and spread them out with about 1cm between them.
2. Place the two empty cans upright about 2 cm from each other on the straws and show the students that they can easily move on top of the cans. The straws are used to reduce friction between the tabletop and the cans.
3. Ask the students: “What can possibly happen to the cans if I blow in between them?”
4. Now spread the two cans about 5 cm apart. Will I have to blow softer or harder to get the two cans to come together? Blow harder.
5. Now place the cans about 20 cm apart. Ask the students: “Can I still get the two cans to come together?” Take a deep breath and blow a constant stream of air on the right side of the left can and move your head towards the right, while constantly blowing. The cans will still come together.

Questions:

1. What made the cans mover closer together?

2. How far apart could the cans be placed and still move together?
3. What does the flowing air create in between the two cans?
4. Was a stronger flow of air necessary to bring the cans that were 20 cm from each other?

Explanation:

Blowing in between the two cans created a flow of air and thus a lower pressure compared to the stationary air on the other side of the cans. It is this lower pressure created on one side of the can that allowed the higher pressure on the opposite side to move the can. In other words creating an imbalance of pressure on the cans. The faster the flow of air, the lower the pressure it exerts.