

## Science of Flight in your Classroom

These four simple experiments will demonstrate to students Bernoulli's principle. Bernoulli's principle states that as airspeed increases, air pressure decreases. This is what makes heavier than air flight possible.

### Supplies:

Two balloons

Two pieces of string roughly 3 feet long

Tape

A hair dryer

Ping-pong balls

Small kitchen funnels

Bendy straws

Tube with inner diameter between 1.75" and 2". (You can use a paper towel tube, but it must be perfectly round or else the ping pong ball will get stuck. We prefer to order a clear acrylic tube from amazon with the proper diameter and a length of 9 to 12 inches)

### Experiment one

1. Inflate the balloon and tie one end of the string to the end of the balloon. Do this for both balloons.
2. Tape the other end of the string to the door frame of the classroom so that the balloons are at the same height and roughly 2 inches apart
3. Take a straw and blow air between the two balloons. Observe what happens.
4. Now take the straw and blow air outside of one of the balloons and see what happens

Teacher explanation: the increased speed of the air will lower the pressure and the balloons will deflect towards the straw

### Experiment two

1. Take your hairdryer and point it vertically and turn it on.
2. Place a ping-pong ball in the airflow.
3. Try gently pushing the ball to the side with your finger and notice that it returns to the middle.
4. Try SLOWLY rotating the hairdryer to the side about 30°. Notice that the ball stays in the airflow and doesn't fall.

Teacher explanation: the ping-pong ball is sitting in a region of low pressure due to the movement of the air. If the ball moves to the side, the higher pressure air of the atmosphere will push it back into the lower pressure zone.

### Experiment three

1. Take your tube and set it at a gentle angle by propping one end up with a book or two.
2. Place the ping-pong ball at the lower end at the entrance to the tube.
3. Place the hairdryer at the high end of the tube so that it will blow across the opening of the tube.

4. Turn on the air dryer. The ball should be drawn up the tube. If the ball gets stuck, try gently squeezing the tube to make it round and release the ball.

Teacher explanation. We are creating a lower pressure zone at the top of the tube with the airflow which will cause air to move up the tube, which will draw the ping-pong ball up the tube.

#### **Experiment four**

1. Take the bendy straw and bend it at a right angle
2. Connect the short end of the bendy straw and the funnel.
3. Place the ping-pong ball in the funnel
4. Have the student try to blow through the long end of the bendy straw and pop the ball out

Teacher explanation: The moving air lowers the pressure along the sides of the funnel, which allows the higher pressure air above to push the ball down into the funnel.

**Bonus experiment:** Flip the funnel upside down and hold the ball in with your finger. Blow through the straw and release your finger. If done properly, the ball should remain stuck in the funnel.