

Bernoulli's for the Birds!

Simple STEM Activities You Can Do at Home

Purpose:	The purpose of this activity is for students to investigate balanced and unbalanced forces, and explore how balanced forces help create flight.
Standard:	S4P3. Obtain, evaluate, and communicate information about the relationship between balanced and unbalanced forces. a. Plan and carry out an investigation on the effects of balanced and unbalanced forces on an object and communicate the results.
Materials:	Hair dryer, ping pong balls, balloon, penny
Procedures:	<p>Part 1:</p> <ol style="list-style-type: none"> 1. Set the hair dryer to a cool setting. 2. Turn on the hair dryer and face it towards the ceiling. 3. Put the ping pong ball directly over the nozzle of the blow dryer, leaving about six inches between the ball and the hair dryer. 4. Release the ball. Does it float? 5. Move the hair dryer from one side to another. Does the ball stay in the stream of air? <p>Part 2:</p> <ol style="list-style-type: none"> 6. Try floating two ping pong balls in the air stream, one over the other. Does it work? How many ping pong balls can you float at once? 7. Place a penny into the balloon, and then blow it up. Try floating the balloon in the air stream. Does it work the same way? 8. How about a ping pong ball AND a balloon? Will that work?
Science Behind It:	<p>The floating ping-pong ball activity helps to explain Bernoulli's Principle (pronounced Burr-new-lee). Bernoulli was an 18th-century Swiss mathematician. He discovered that as air moves around an object, different air speeds create different air pressures. Faster moving air produces less pressure an object. Slower moving air produces more pressure. He found that the faster air flows over the surface of something, the less the air pushes on that surface, and the lower its pressure. The air from the hair dryer flows around the outside of the ball and, if you place the ball into the middle of the stream of air, the air flows evenly around each side of the ball. The ball stays in the stream of air because it is at a lower pressure than the air that is not moving on the outside. If the ball tries to move out of the stream of moving air, the non-moving air is at a higher pressure, and will push the ball back into the fast-moving stream of air.</p> <p>While this is happening on the sides of the ball, air from the hairdryer is pushing up on the ball from below. Meanwhile, gravity is also pulling the ball downward with a force proportional to its mass. Usually, the upward force from the hairdryer is nearly equal to the downward push from gravity. When this happens, the upward, downward, and sideways forces acting on the ball are <u>balanced</u> and, as a result, the ball hovers unexpectedly in midair.</p>
Questions to Ask:	<ol style="list-style-type: none"> 1. How would Bernoulli's Principle help explain how a bird flies? 2. Would the same idea apply to how a plane flies?