The Itch to Pitch

What is this about?

Don't you wish you had a major league fastball and a biting curve? You will after this activity!

What do I need?

You need Styrofoam ball about the size of a baseball. Paint half of it a dark color.

What will I be doing?

You will get to learn how to throw a curveball and a "rising" fastball by controlling the spin on the ball. A curveball from a right-handed pitcher breaks down and toward the left. A rising fastball is a relatively straight-ahead pitch, but it doesn't drop as fast as a fastball thrown with less spin.

What do I think will happen?

Look back at the Spin Doctor experiment to be sure you understand how the spin direction is related to the direction of the Magnus force. Take a minute and write a prediction about the direction of the spin needed on a rising fastball. Perhaps a picture would be the best way to explain it. Do the same thing for a curveball.

What really happened?

1. Hold the ball with all four fingers on the top and your thumb on the bottom. Throw straight overhand and be sure to let the ball go by rolling it off your fingers as shown in the photo at the right. This should produce a "rising" fastball.
2. Adjust the ball until you can throw a rising fastball in such a way that the painted side appears to not be spinning. Now you know that the ball is spinning along the "equator" between the painted and unpainted halves.
3. To throw a curveball, start by holding the ball as shown at the right. Note that two fingers are above the ball and the thumb is bent below.
4. As you bring your arm forward move your elbow toward your body so that you can flip your hand over and extend your thumb as you release the ball (lower photo). After a bit of practice, you will be able to throw a pretty amazing curve.
5. Adjust the initial orientation of the ball until you can figure out the direction of the spin.

Write a description of your results. Again, a picture might explain the spin direction best. Did the rising fastball spin the way you predicted? What about the curveball?

What did I learn?

We know that three forces act on a baseball during its flight; gravity which always acts downward, air drag which always acts opposite the motion, and the Magnus force which acts perpendicular to the airflow and depends upon the direction of the spin. The skill that a pitcher brings to the mound is to impart the correct velocity and spin on the ball so that it moves in such a way as to fool the batter. You now understand what sorts of spins produce various movements of the ball.

What else should I think about?

You might want to investigate other pitches such as the "split-finger" fastball, slider, screwball, and knuckle ball. Can you figure out the spin that each one has based upon knowing how it moves? Can you replicate these pitches using the Styrofoam ball?

Catch it in the Web!

- http://www.hardballtimes.com/main/article/a-mechanical-model-of-pitching/
  This article by Matt Lentzner describes a mechanical model of pitching. It explains how to throw good fastballs and cutters.

- NIST and the National Pastime
  (http://www.100.nist.gov/baseball.htm)
  For the better part of the 20th century, the curve ball was a hotly debated topic among fans and players. The National Institute of Standards and Technology (NIST) proved the curveball actually breaks back in 1959. This site has other interesting physics of baseball work at NIST.