Curiosity Guide #405
Basketball Science

Accompanies Curious Crew, Season 4, Episode 5 (#405)

Design a Mini Free-Throw Machine

STEM Challenge

Description

Can you build a great launch system for a ping pong ball?

Materials

- Piece of paper, crumpled up
- Paper cups
- Plastic spoons
- Craft sticks in assorted sizes
- Binder clips
- Rubber bands
- Paper clips
- Wire
- Clay
- Cardboard
- Pipe cleaners
- Straws
- String
- Scissors
- Tape
- Rulers
- Ping pong balls to launch
- Bucket as the target
- Measuring tape

Procedure

1. Throw a crumpled-up piece of paper into a wastebasket. What arm motion takes place to cause the paper to be thrown with accuracy?
2. Use the available materials to build a launch system to launch a ping pong ball into a bucket.
3. Use any combination of the materials to build the launcher.
4. Test the launcher for accuracy.
5. Redesign and adjust for improved performance.
6. How does your design compare with another person's launcher?

My Results

Keep track of your original design, modifications, and results here.

Explanation

You will need to utilize some type of simple machine, probably a kind of lever that works around a stationary contact point, or fulcrum, to create your ball launcher. Include a rubber band or binder clip to take advantage of elastic potential energy, so that when the lever is released, it will spring back. Attach a ball holder to the top of the lever to transfer the forward energy to the ball and project the ball through the air. Experiment with the launcher to make the launcher more consistent in making the ball reach its target. For example, try adjusting the tension in the launcher. The launcher's accuracy will depend on how close the ball comes to the target, while the launcher's precision will depend on how frequently the launcher lands the ball in a similar spot.

The science behind shooting: Shooting a basketball is like our mini launchers. When you shoot a basketball, your elbow acts like a fulcrum, while your forearm acts like a lever. Your wrist joint is a second fulcrum, and your hand acts like a second lever. Applying a force to those joints transfers our energy into the ball and launches the ball through the air. Even though the basketball is a lot bigger than the ping pong ball, in both cases players are trying to accurately hit the target. Swoosh!

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