

**Lesson Title:** Cotton Ball Launcher

**Lesson Overview:** Students will construct a cotton ball launcher and gather data to help determine how pulling the rubber band at different strengths effects the speed and motion of the cotton ball.

**Topic(s):** Physical Science- Motion and Stability: Forces and Interaction

**Grade or Grade Band:** Kindergarten

**Lesson Objectives:**

- Construct a cotton ball launcher
- Gather data on the distance of a launched cotton ball
- Determine the best strength to use to launch a cotton ball a certain distance

**Next Generation Science Standards:**

K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions

**North Dakota Standards:** K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

**Time Needed (estimate):** 2 20-minute periods

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## Preparation/Materials

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### **Background knowledge students must have to be successful:**

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Kindergarten students will need support to analyze data from tests of an object or tool to determine if it works as intended.

### **Differentiation and accommodation to support learning for all students:**

Students may need assistance creating a tool or guide to measure how far they are stretching their rubber band. This can be done by marking different color lines on the smaller cardboard tube at various lengths.

Pre-cut the cardboard tubes for students who struggle with fine motor skills.

Ask extra adults or students from upper elementary to help punch out the holes with the hole punch.

### **Essential terminology:**

- **Launch**-to make something start moving

### **Resources:**

STEM at Home with ND ESPCoR Cotton Ball Launcher: <https://www.youtube.com/watch?v=mtcuu7bw28Q>

Printable Targets: <https://cdn.shopify.com/s/files/1/1514/4514/files/sighting-target-01.jpg>

### **Materials needed:**

- Popsicle stick
- Rubber band
- Duct tape
- Cardboard rolls
- Hole punch
- Scissors
- Cotton balls
- Printable Targets

## Procedure/Activities

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**Engage:** Give each student a cotton ball and ask them to set it on their desk. Ask students to think about and experiment with different ways they can make the cotton ball move. Allow students to share their ideas with a partner or small group. As they are sharing, listen to find ideas about using a pushing or pulling motion to make the cotton ball move. Ask a student or small group to explain how they would use a pushing or pulling motion to move their cotton ball. Explain to students that we are going to build a device to help us launch the cotton ball.

### Explore:

**Day 1:** Display the cotton ball launcher materials for the students and show the students an already constructed launcher. Watch the STEM at Home with ND ESPCoR – Cotton Ball Launcher video: <https://youtu.be/mtcuu7bw28Q> to give students a better understanding of how the launcher will be built. As you watch the video, pause it at each step to allow the students time to follow each direction individually. Allow students time to practice launching cotton balls with their launcher and ask them how they can make it go higher or further. Give them time to experiment with how they hold the launcher, the angle of their launcher and the strength they use to pull back the launching mechanism.

**Day 2:** Ask students what they figured out about how to hold their launcher, the best way to hold it if they want to launch the cotton ball high, the best way they should hold it if they want to launch the cotton ball far. What happens if you pull the popsicle stick a little way back? What happens if you pull the popsicle stick far back? Explain to students that we are going to try to find the best distance to pull the popsicle stick back to hit a target set out on the floor.

As students experiment with hitting a target placed on the floor, encourage them to use different colors of markers to make lines on the inner cardboard tube. They can use these lines to help judge how far they are pulling the popsicle stick back.

### Explain:

Ask students if they had to push their cotton ball launcher or pull it. Ask students to draw a picture to explain how their cotton ball launcher worked.

### Extensions for learning more about this topic:

Use a variety of lengths and widths of rubber bands to investigate how changing one variable affects the speed of the cotton ball.

Place the targets at various distances and ask students how they can use the colored lines on the inner cardboard tube to help them launch the ball consistently at certain distances.

### Evaluation of learning:

Formative assessment: Observe students as they are engaging in the discussion on Day 2.

Summative assessment: A drawing explaining how the cotton ball launch work.

