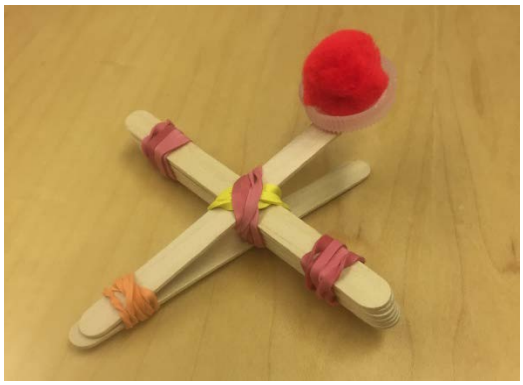
Classroom Central SUPPLYING OUR STUDENTS STEM LESSON KITS

STEM – Forces and Motion—Pom Pom Catapult



Suggested Grade Level: 3rd through 5th but can be modified for older students

NC Standard - 3.P.1 and 3.P.3; 5.P.1; 7.P.2; Physics

Words and Phrases to Discuss – Catapults work because energy is converted from one type to another and transferred from one object to another. When you prepare the catapult to launch, you add energy to it. This energy is stored in the launching device as potential, or stored, energy. The catapult you are about to make uses elastic potential energy stored in a wooden stick as you bend it. When you let go, this stored energy is released, converted into energy of motion and transferred to the missile (the launched object), which then flies through the air.

Materials List:

- Eight popsicle sticks
- 4-5 sturdy rubber bands
- Glue, double-sided tape or glue dots
- Plastic bottle cap to hold a pom pom
- Pompom or cotton ball—do not use hard objects!
- 2 – 3’ of sturdy flat surface such as a table or floor

Instructions: Take 6 popsicle sticks and stack them on top of each other. Secure these together by wrapping rubber bands around both ends of the stack. To add the launching stick, take one new stick and attach it perpendicular to the stack you just made by winding two rubber bands around the middle in a crisscross pattern. Next, add the base by attaching one stick to one end of the launching stick with a rubber band. Secure the bottle cap to the end of the launching stick allowing enough space for your finger to press down when launching your pompom cargo.

Activity: Split students into groups and explain that they are going to construct soft missile launchers using an ancient technology—catapults! Have students build their catapults (or you can have them pre-built to speed things up) and place them on a flat study surface and in an open area. Clear a few feet of open space for the launched pompom to fly and land. Each group will fire their pom pom by placing it in the cap, pushing the cup down and releasing. Students can test the impact of more pressure on the cap prior to launch, as well as adjusting the position of the launching stick—closer to or further away from the cap. You can also set up targets such as a group of cups to test accuracy as well as distance.

Science Notebook Helper - During the lesson, students can predict what will happen when with different changes or variations made to their catapults. They can record what happens with each variation.

Tips and Talking Points: Did you see your cotton ball fly higher and farther when you pushed you launching stick farther down? When you bend your stick, you load your launching stick up with energy. When you let go, this energy is released and converted to energy of motion. Most of this energy transfers to the missile, which shoots through the air. Pushing the stick down farther takes more effort from you. Maybe you felt you needed to exert more force or work harder to bend the stick farther. Bending farther means more elastic potential energy gets stored in the stick, and when you let go, all this potential energy is converted into energy of motion, so the missile flies through the air at a higher speed. In the case of your catapult, the missile probably flew higher and farther. Moving the stack of six sticks closer to the launching cup makes the launching stick lie flatter. This results in a missile aimed more upward than

forward. Pushing your six sticks the other direction creates a greater angle between the launching stick and the base. This helps you aim the missile forward.

Guiding Questions

- What happened to the pompom? Did it fly? Did it go high or low? Where did it land?
- What do you expect will happen when you push the cap farther down? Will this make it fly higher, farther, both? Will it take the same path and go faster?
- Does your pompom land farther or nearer when you push a lot compared to a little?
- In which scenario did you have to exert more effort/work? When you pushed a little or a lot?
- Did you get similar results with each variation? Is what you observed what you expected? Can you explain why?
- How did your changes affect the pompom's flight path?

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