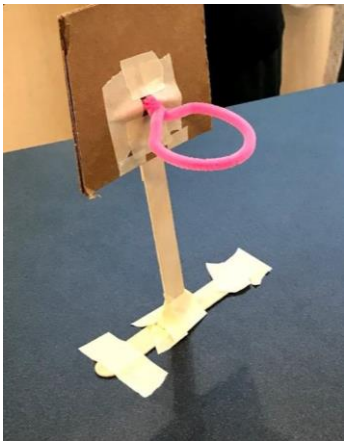
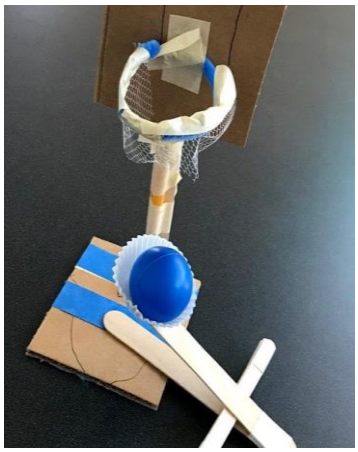
March Madness STEM

With March Madness canceled and not being able to watch our favorite college and NBA teams compete, can leave any sports enthusiast a little forlorn. Here is a fun basketball STEM Challenge everyone will have fun partaking in…both basketball fans and non-fans alike, will enjoy this challenge.





Challenge: Build a basketball hoop and shooter (catapult device)

Objective:

1. Design and build a standing basketball goal and throwing device.
2. The bottom of the backboard must be at least 6-8 inches from the table or floor.
3. The hoop and net must allow the ball to pass through easily.
4. The throwing device "shooter" must propel the ball through the air so that it can go through the hoop and net.
5. The throwing device must rest on a table or floor (flat surface) and operate as the only mechanism throwing the ball.

Note: If you have more than one child at home, they can either work together designing and building the basketball hoop and shooter. Or break it up and have one work on the basketball hoop and one work on the shooter. Then they come together to test and re-design.

Materials:

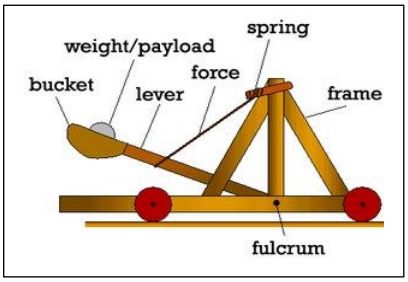
Here are some possible materials. However, kids are very inventive and can be creative with what they can find around the house.

- Cardboard Boxes
- Tape and glue
- Straws or sticks
- Pipe cleaners
- Paper cups/plates
- Paper towel rolls
- Plastic spoons
- Rubber bands
- Pencils
- String
- Card stock
- Ping pong ball, bouncy ball, pom-pom, cotton ball
- Plastic lid
- Popsicle sticks
- Shoe box

The Science Behind Catapults

Catapults were mighty handy for pirates in the golden age of piracy (during the 17th century). And medieval knights used them centuries earlier for taking down massive castle walls. Even Greeks and Romans used catapults about 2,000 years ago! These simple machines are quite handy, as long as you know how to aim them!

- **Newton's 3 Laws of Motion: An object at rest stays at rest until a force is applied, and an object will stay in motion until something creates an imbalance in the motion. Every action causes a reaction.**



- **When you pull down the lever arm all that potential energy gets stored up! Release it and that potential energy gradually changes over to kinetic energy. Gravity also does its part as it pulls the object back down to the ground.**

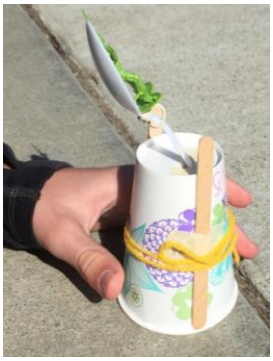
- **You store energy in a rubber band every time you stretch it out - the pull you feel from the rubber band is called potential energy. Catapults store potential energy by stretching ropes and rubber bands, and even by bending and flexing the wooden lever. The more energy you pack in, the higher your ball will go.**

- **Elasticity is the tendency of solid material to try to resume their original shape after deformation. Rubber is an example of an elastic material. So, once you stretch your rubber band – that is, deform it – it tries really hard to get back to its original shape.**

Catapults

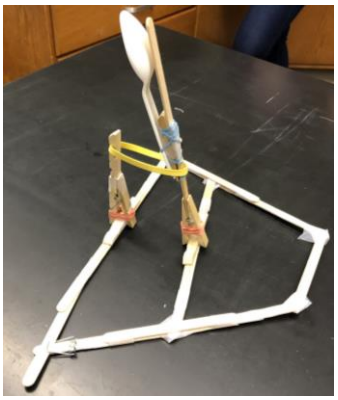
Here are some examples of the many ways one can design and build a catapult out of materials found at home. Do not show the pictures to your young engineers right away. First, let them be creative - designing, building and testing – their catapults. Its all about the Engineer Design Process.











Ask (What is the challenge?)
How can you use the materials to design and build a basketball launcher with a hoop and net that can reach it's target and allow the ball to pass through the hoop?

Imagine (What are some solutions? Brainstorm ideas with your team)

Plan (Draw your diagram. Label parts with listed materials used. Make a list of your ideas regarding how you will construct a catapult and hoop w/ a net.)

Create & Test (Evaluate your design. What works? What doesn't work?)

What happened?

Improve & Test (Make needed changes. Describe changes made to the catapult and hoop. Test your design.)

If it still does not work…

Ask (What is the problem or challenge?)

Imagine (What are some solutions? Brainstorm ideas with your team. If needed, research your problem or challenge on the internet. What did you discover?)

Plan (Draw your diagram. Make a list of the ideas for your problem.)

Create & Test (Evaluate the project. What works? What didn't work?)

What happened?

Improve & Test (Make needed changes. Describe changes to the problem. Test your design again.)

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Improve & Test (Make needed changes. Describe changes to the problem. Test your design again.)

How many tests did your team make?

Reflect:

- Was your designs successful? Why or why not?
- How many times did your basketball go through the hoop?
- What was your favorite part of the challenge?

Fun extension ideas:

- Create a competition. Who can make the most baskets in a minute? Let them practice beforehand.
- If each child made their own design, keep a scoring sheet and allow siblings to test out each other's designs.