



# Mini Bow and Arrow

Learn about the importance of bows and arrows in Native American culture and construct a miniature version with a craft stick and cotton swab. Watch potential energy turn into kinetic energy as your arrow launches across the room!

## TEKS:

SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.

SCI 6.8 A: The student is expected to compare and contrast potential and kinetic energy.

SCI 6.8 B: The student is expected to identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.

## Materials:

- Cotton swab
- Craft stick or tongue depressor
- Cup
- Dental floss
- Scissors
- Water

## How To:

Each bow and arrow that you make requires one craft stick, one cotton swab, and approximately 15 inches of floss. These instructions will take you through the process of making one mini bow and arrow, but we recommend making multiple!

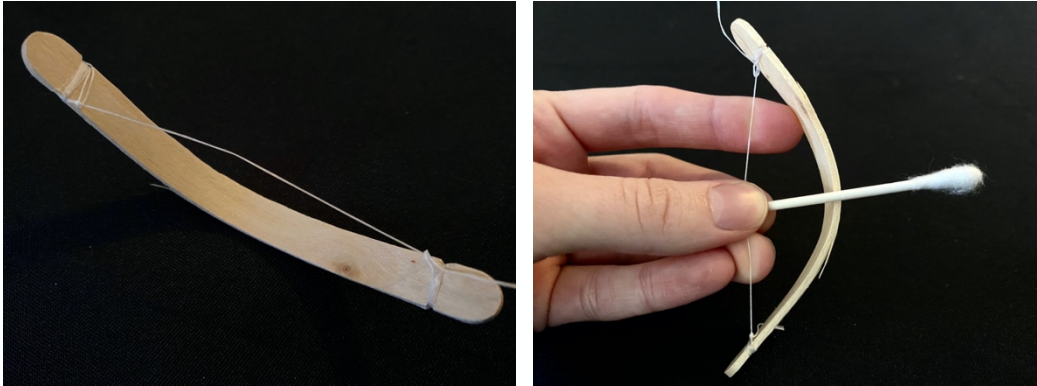
1. Use scissors to carefully cut small notches on both sides of the craft stick, approximately  $\frac{1}{2}$  an inch from each end.

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2. Soak the craft stick in water for one hour. This will allow it to bend without breaking as you construct your bow.
3. Tightly wind a piece of dental floss around one end of the craft stick 2-3 times, making sure it catches in the notches. Tie 2-3 knots to secure.
4. Gently bend the craft stick into a crescent or shallow "U" shape and, while the craft stick is bent, wrap floss tightly around the opposite end of the craft stick 2-3 times, making sure it catches in the notches. Tie 2-3 knots to secure and cut off any excess floss.
5. Cut the cotton tip off one end of the cotton swab.
6. Position the non-cotton part of the cotton swab on the bow's floss. Pull back on the cotton swab arrow and release it!



### STEM Explanation:

Were you surprised how far the teeny-tiny craft stick bow launched your arrow? A bow and arrow is designed to maximize the amount of energy it can store, specifically potential energy. Potential energy is energy that is stored by an object, and a bow is a special type of spring that can store a *lot* of potential energy. When you pull a bowstring (dental floss) back, your muscles exert a force that causes the limbs of the bow (craft stick) to bend toward your hand. The more that you pull the bowstring and bend the limbs, the more potential energy the bow stores. Then, when you release the bowstring, you release the stored potential energy! If you have something resting on the bowstring, like an arrow (cotton swab), this released potential energy is transferred into the arrow and turns into kinetic energy. Kinetic energy is the energy of motion and can cause arrows to fly at over 200 miles per hour!

Bows and arrows have been around for thousands of years. In fact, we have found evidence of bows that are 20,000 years old, and arrowheads that are over 65,000 years old! The bow and arrow was very important to almost every Native American tribe across North and South America. They used bows and arrows for hunting, war, and sometimes even fishing. Most Native American bows and arrows were made of wood, their bowstrings were constructed from plant fibers like yucca, and their arrowheads were made from hard stones like flint, or even copper and bone. Because bows and arrows have such a long history, Native American tribes had many years to perfect the weapon's technology and used arrows to hunt animals as large as buffalo!

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## Career Connection:

*Physicists* study the natural world, from the tiniest subatomic particles to the largest galaxies. They do experiments to discover the laws of nature. They study what things are made of (matter) and how things behave. They also learn about energy, studying how it changes from one form to another.

## Resources:

<https://untamedscience.com/archery-physics/>

<http://physicsbuzz.physicscentral.com/2009/02/howd-they-do-that-tuesday-bow-and.html>

<http://www.native-languages.org/weapons.htm>

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