



ENERGY STICKS: MAKING POTENTIAL AND KINETIC ENERGY

I wonder...

What is the difference between potential and kinetic energy?

In this experiment, you will use craft sticks to harness energy (potential energy)—then release it (kinetic energy)—by weaving craft sticks into powerful chains.

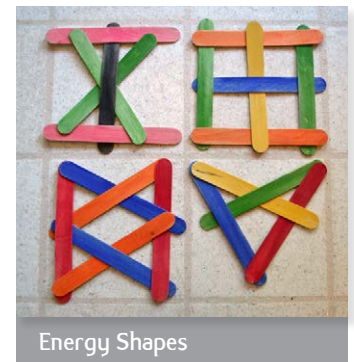
MATERIALS

- Jumbo craft sticks (painted as described below)
- Books or bricks to act as weights during building of a chain
- Yardstick
- Lots of floor space

In this activity, you will make two different styles of energy stick assemblies. The basic style is an **energy shape**, made from just a few sticks. These designs are good for practicing how to “weave” craft sticks. The more challenging—and more exciting—style is an **energy chain**. The energy chain demonstrates the release of potential energy and can be made as long as you want, even all the way around the room. Many children can participate in building an energy chain.

Set up the experiment:

- Before Family Science Night, color the craft sticks with thinned watercolor paint. Use at least two different colors. This will aid in teaching the students how to build the shapes/chain. Do not use thick paint as it may cause the sticks to bond together when the shapes are assembled.
- With tape or chalk on the floor, draw two parallel lines, about 3 feet (1 m) long and 5 inches (12.5 cm) apart.





EXPERIMENTS

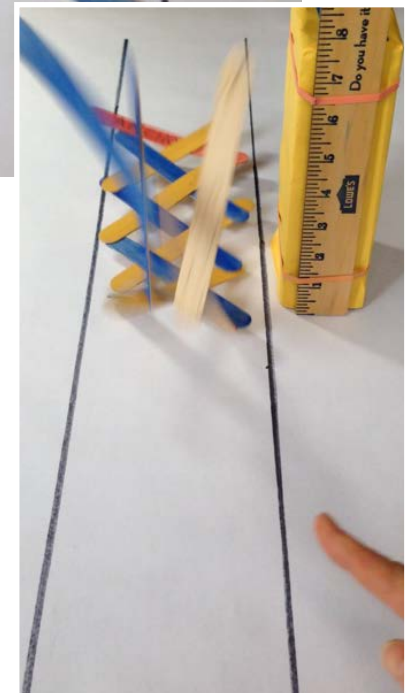
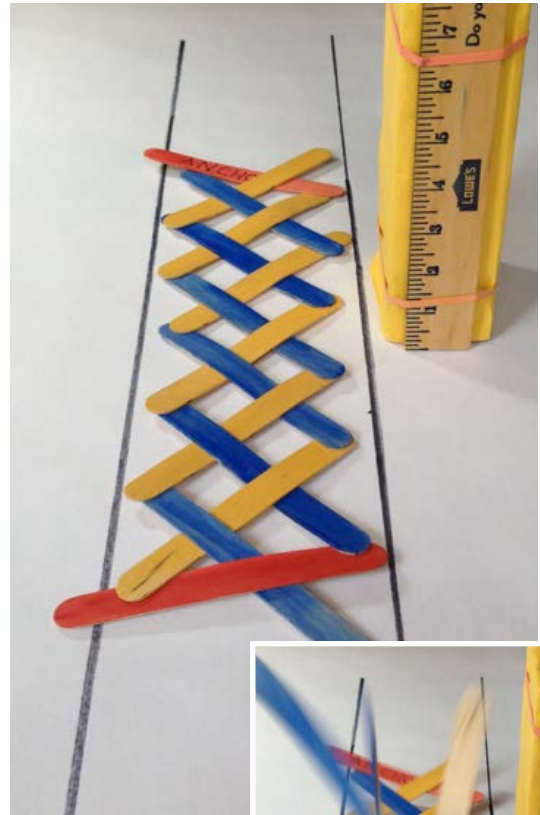
NOTE: See the Journal page for additional pictures and setup instructions.

Energy Stick Shapes (4-stick and 6-stick)

Practice weaving the craft sticks together to make energy shapes as shown in the picture above. The tension in the sticks as they are flexed (bent) holds the shape together without glue or tape. The tension is a form of potential energy. You are releasing the potential energy if your shape “pops” apart as you are trying to weave the sticks. If you drop the completed shape and the sticks scatter apart, that releases the potential energy, too.

Energy Stick Chain

- Record your predictions:
 - o What is the highest a stick will jump?
 - o How many sticks will jump completely outside the boundary lines?
- Build the chain using 12 woven sticks and one anchor stick at the beginning. 12 sticks make a chain about 16 inches (40cm) long.
- Use your hand to hold the active end of the chain (the end with no anchor) flat while you are building.
- Position the yardstick upright next to the midpoint of your chain, with the 1-inch (2.5-cm) mark on the floor.
- Release the active end of the chain.
- As the chain “explodes,” watch carefully to measure the height of the highest-jumping stick against the yardstick.
- Count the number of sticks that jump completely outside the boundary lines.
- Record your observations.
- Repeat for a total of three trials. Do you get the same results every time?
- Is there anything you can do to increase the height? To scatter more sticks outside the lines? (Hint: Does the length of the chain make a difference?)



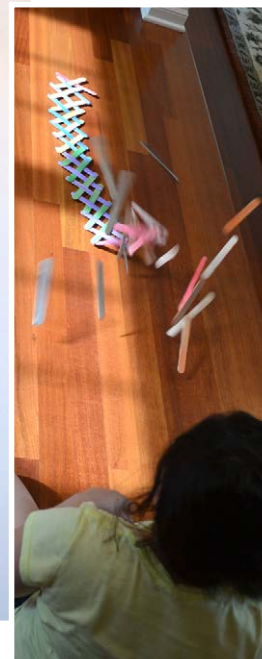
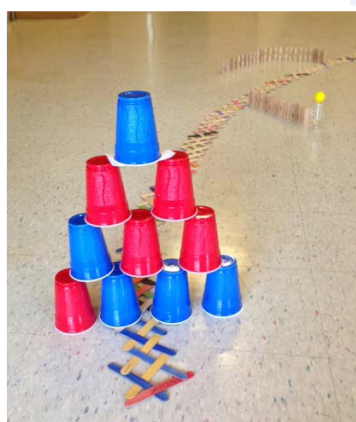


What is happening here?

Wonder why the sticks in the chain jumped off the ground all on their own when you release the end of the chain? The wooden sticks are slightly flexible. When you assemble an energy stick chain, you are harnessing that flex as **potential energy**. That means the sticks store the potential energy—and, if conditions are just right, when you let go of the active end of the chain, the sticks flex back to their original shape, and the potential energy is released as “kinetic”—or moving—energy. The **kinetic energy** is what you see when the sticks jump up off the ground.

A cool variation for older kids:

Build a massive energy stick chain around the room. Try different designs to see whether the design changes the amount of energy released. Weave some turns in your chain, add plastic cup towers, domino chains, and more! Go for a world record! (The current world record is held by a Japanese corporation, which built a chain using 9,911 sticks.) One box of 500 jumbo craft sticks will make a chain about 55 feet (17m) long.



SAFETY SMART® TIPS

Energy does work for us. Energy can never be created or destroyed; it can only be converted from one form to another—it's the Law of the Conservation of Energy. When we talk about the environment, there are many sources of energy, and it's important to use renewable energy sources when we can because they are constantly being replaced. Using renewable sources like solar and wind is not only energy smart, it's Safety Smart!

LEARNING MESSAGES

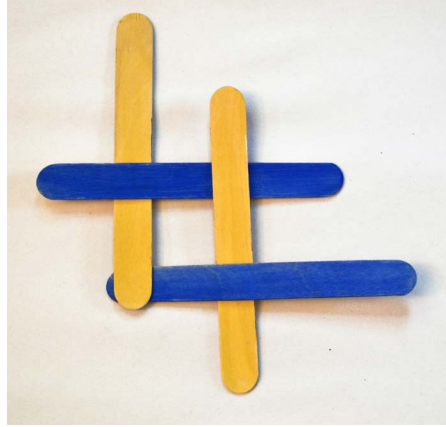
Complementary Next Generation Science Standards

- ◇ Topic focus: Engineering, Physical Sciences, Energy
- ◇ Disciplinary core ideas:
 - PS3B Conservation of Energy and Energy Transfer
 - PS3C Relationship Between Energy and Forces
- ◇ Cross-cutting concepts: Energy and matter; patterns

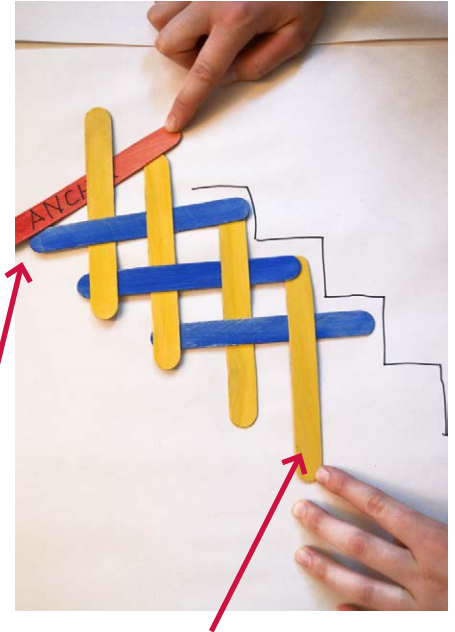
Safety Smart Science Investigator's Journal: Energy Sticks: Making Potential and Kinetic Energy



Step 1: Weave together 4 sticks, keeping same colors parallel.



Step 2: Weave in more sticks, making a stair-step, and keeping like colors parallel.



Step 3: Add a stick to anchor the chain once it is about six sticks long. This locks the beginning of the chain.

Step 4: Hold down the last stick as you continue to weave. This is the active end.

How many sticks did you use to make your chain?

	Prediction	Observations		
		Trial 1	Trial 2	Trial 3
How many sticks will jump outside the boundary lines?				
What is the highest a stick will jump?				

SAFETY SMART® TIPS

- Energy can't be created or destroyed, only converted from one form to another.
- It's important to use renewable energy sources when we can because they won't get used up the way other sources of energy can.

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