

Step 1: Materials

For this design, you will need: (and extra for redesigning)

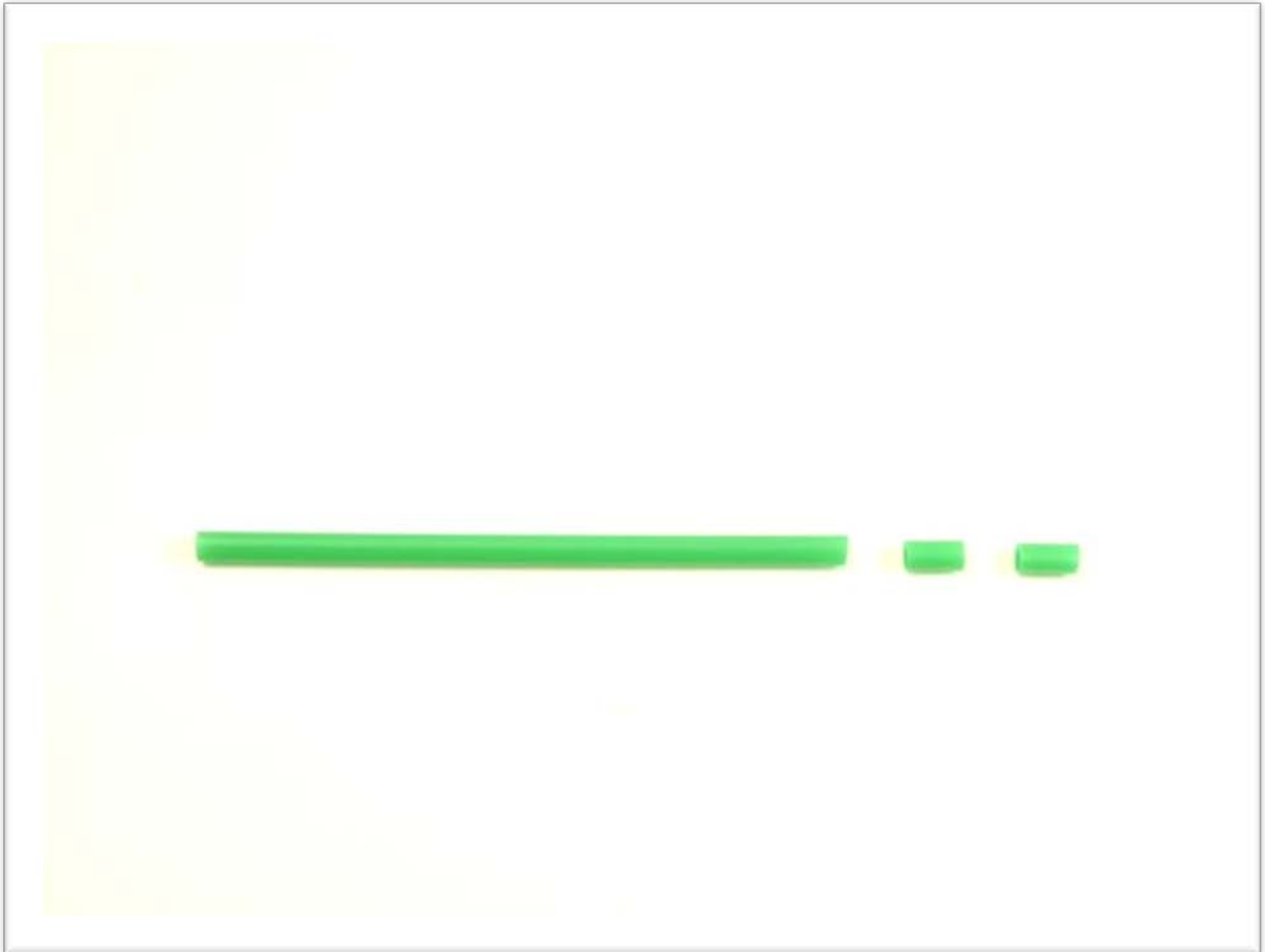
15 Craft sticks
8 [Craft cubes](#)
4 [Round cube beads](#)
Part of 1 Straw
2 Skewers
2 Rubberbands
Tape
Hot glue

And a box of straws for the challenge!

Step 2: Build the hinge

Cut two 1/2-inch pieces of straw. Wrap tape around the end of a skewer and thread the round cube beads and the straw pieces onto it as shown. Wrap tape around the other side and cut off the excess.

The straw pieces act as spacers to prevent the fingers from colliding.



Step 3: Make the fingers

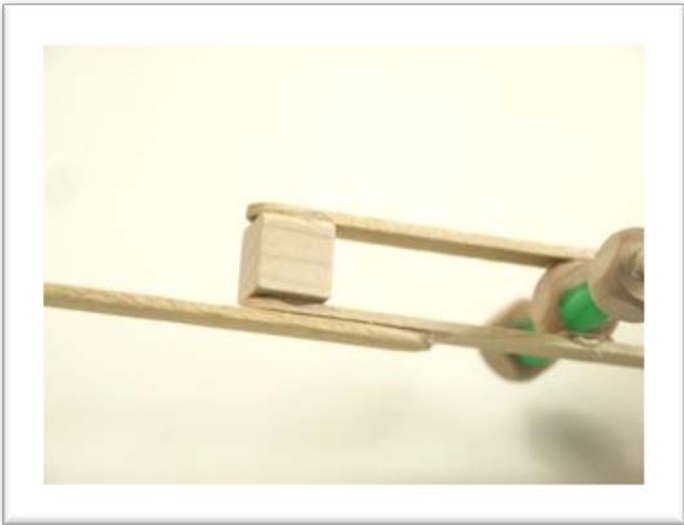


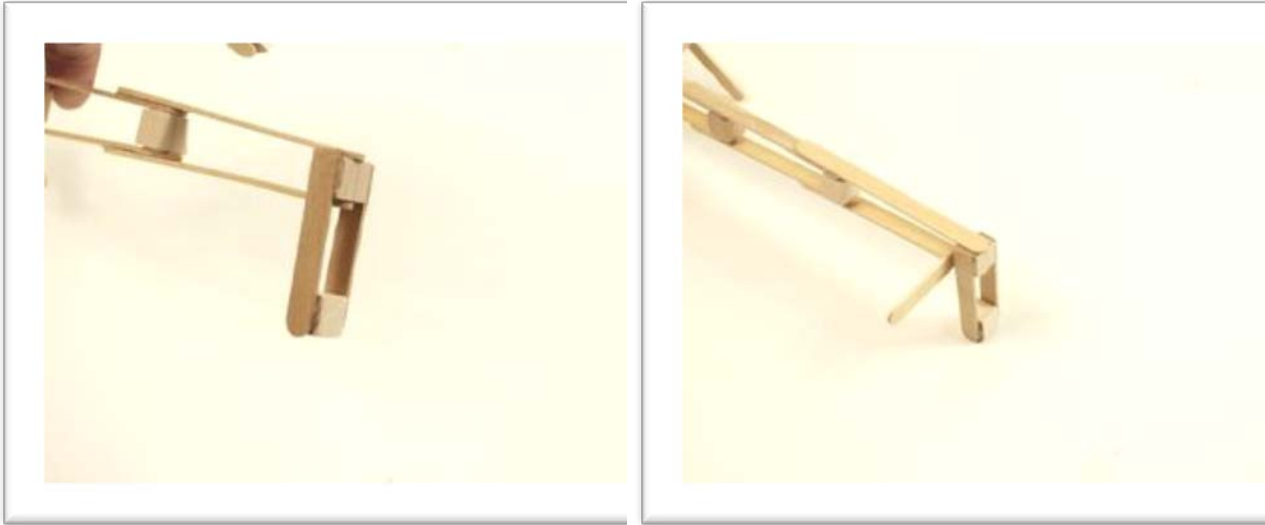
Create the center finger as shown in the picture. The half-sticks are glued onto the side of the cube at a 45-degree angle.

The two other fingers are built similarly on either side of the center finger. Make sure that the half-sticks on the outside fingers are glued on at an angle that is inverse to the center finger.

On the 'back' of the hand, glue a half-stick to the two outside fingers. These two fingers will be actuated at the same time.

Step 4: Make the arm

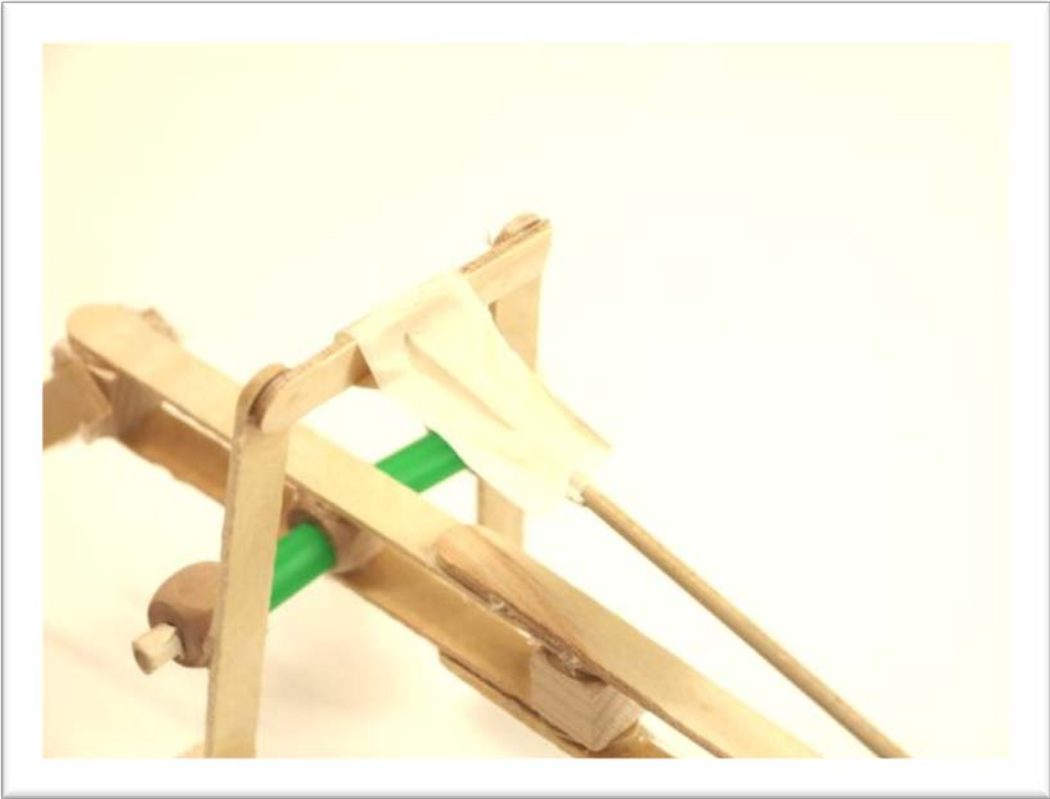


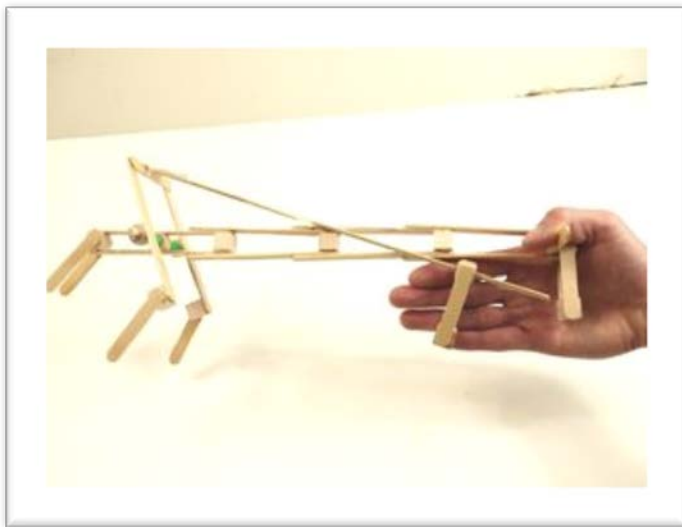
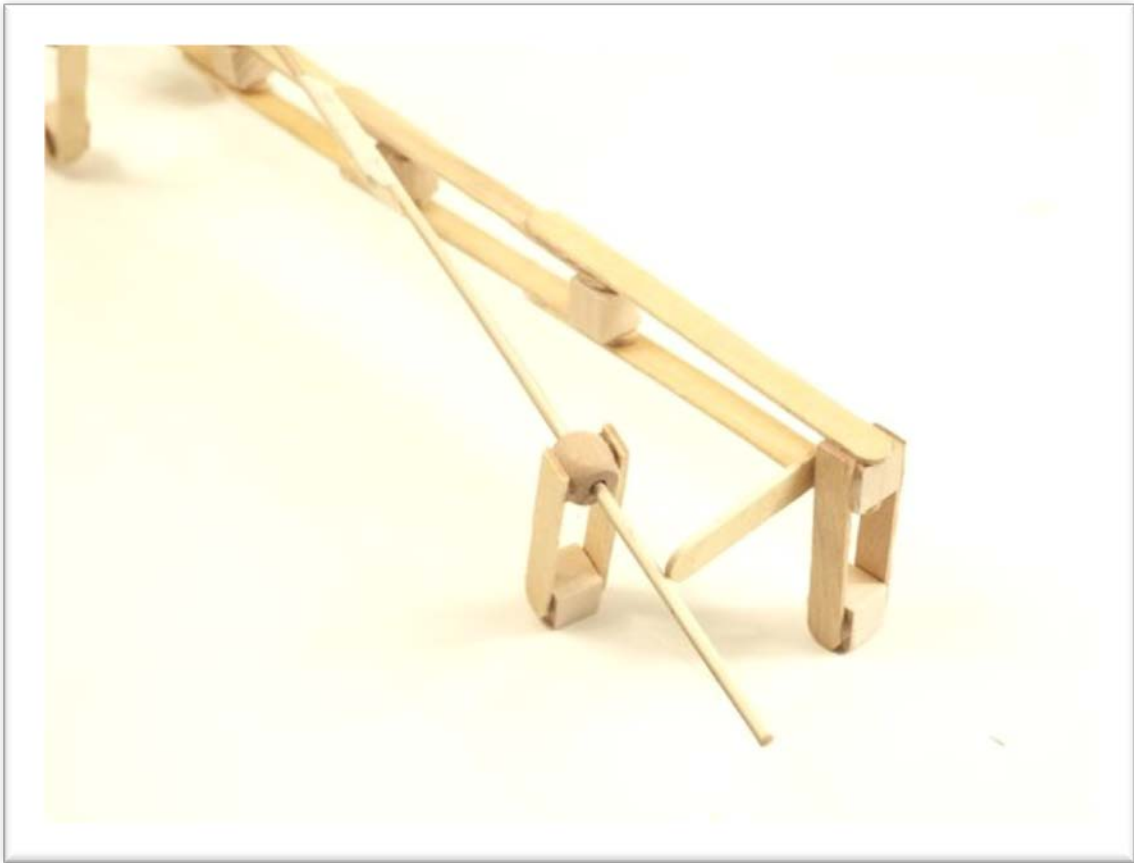


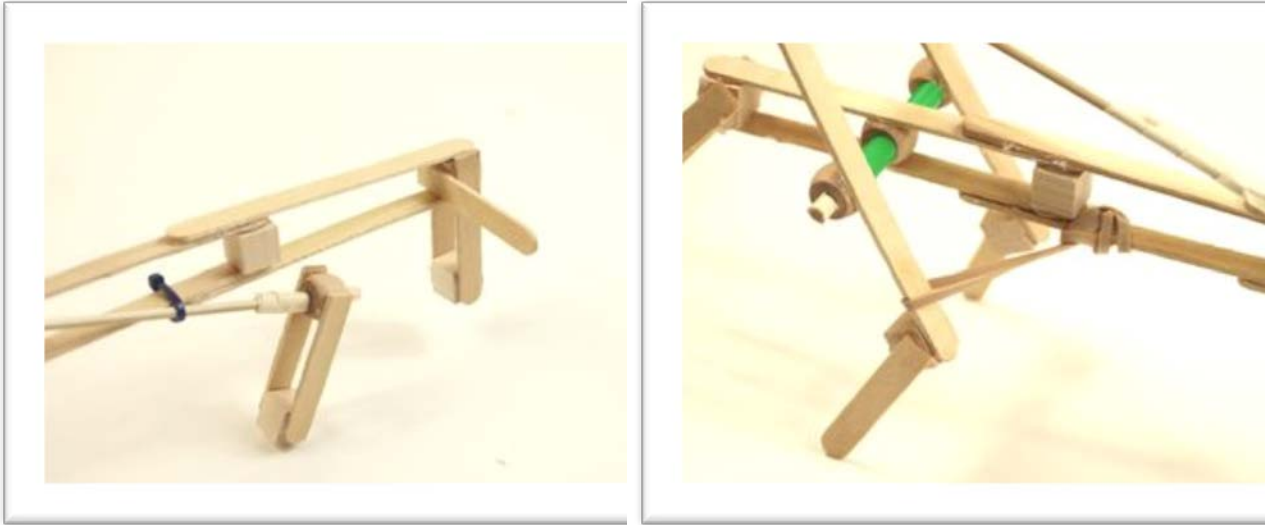
The arm is an extension of the center finger. Sticks are glued together with at least 1-inch of overlap to ensure a nice strong bond. The arm can be any length, but longer than 6 or 7 sticks is not recommended because it is more difficult to lift objects that are further away from your body. The arm also may not be able to support its own weight if it is extremely long.

Once the arm length is determined, add a handle and a thumb rest at the end. The handle and thumb rest that are pictured are very minimal - there is a lot of room for innovation and customization.

Step 5: The trigger







A trigger is anything that activates a mechanism - it's not a term just used for operating a gun. The trigger is what transfers the movement from the user's hand to the mechanical hand.

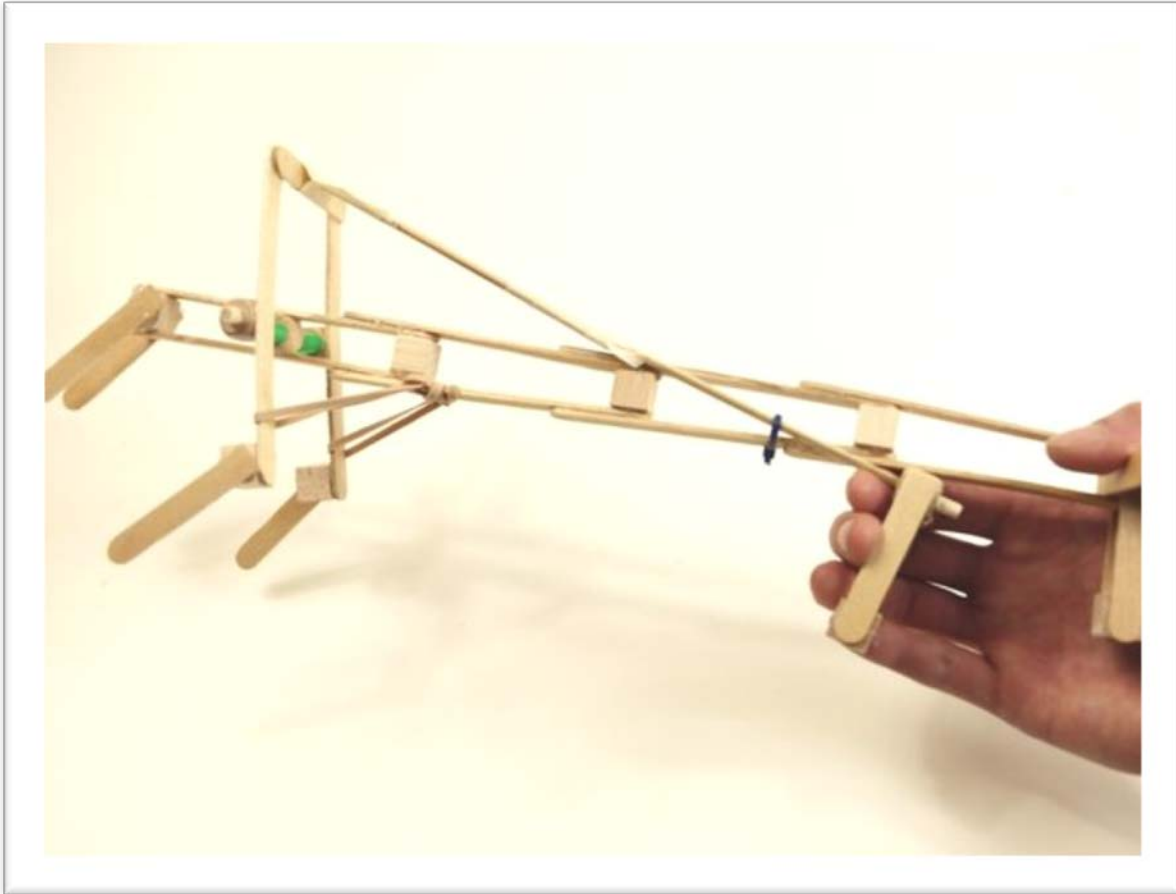
Place two skewers end to end such that the pointed ends are facing each other. Firmly wrap a 4" piece of tape lengthwise around the skewers. Attach one end to the 'back' of the hand with several layers of tape as shown in the picture.

Make the trigger as shown in the second picture. Thread it onto the skewer.

The mechanical hand needs to be calibrated to match the user's finger length. Hook your thumb around the thumb rest and place the handle against the base of your thumb. Extend the other 4 fingers and place the trigger just under the first digit of the user's hand. Wrap tape around either side of the trigger to hold it in place and cut off the excess. This can be tricky to do by oneself, so encourage students to help each other during this step.

Loosely tie a cable tie to hold the trigger in place. And finally, attach a rubberband to each of the outside fingers to the arm using a hitch knot. These will automatically open the hand when the user is not squeezing the trigger.

Step 6: It's alive!



Operation is simple. Hook your thumb over the thumb rest and place the handle at the base of your thumb. Wrap your fingers around the trigger and try it out! Try to pick up some everyday objects. What kind of things is the hand good at picking up? Where could it improve? How would you modify it? Ask yourself and your students these questions.

The placement of the trigger is important for easy operation. You may need to adjust the trigger by as little as 1/2-inch to achieve optimal range of motion. Avoid using hot glue to secure the trigger since it is more difficult to adjust.

Step 7: Tips and troubleshooting

