**ROBOTIC HAND**

**THE ADVENTURE:**
Build a robotic hand to explore how a human hand works. Make adaptations to improve the speed, strength and agility of the hand.

**PLAN:**
- How does your hand work? What parts of your body must work together to move your hand?
- How do humans rely on robots?
- What can robots do that a human cannot?
- Take a look at the photographic instructions.
- What materials have the Howlers and Scouters prepared before this adventure?

**DO:** (continued)

**Making the Fingers**
- Take a straw and the scissors. Cut out segments with the scissors or a hole-punch to create knuckle joints.
- It is best to keep the holes lined up along a single line of the straw. If the holes curve around the straw, the finger will twist instead of closing on itself when the string is pulled.
- Pass a string through the straw. Tape the string to the "pad" of your straw finger, on the same side as the holes.
- Test each finger as you go. How many fingers will you build?

**Making the Palm**
- Arrange the fingers on a cup to form a hand and tape them in place. You can wrap the tape around the cup a few times to add some support.
- To increase the strength of the hand, you can use two cups. Add a bit of glue between the cups to stick them together.

**Making the Arm**
- You will need an arm to support the load on the hand. Glue or tape a wood dowel, cardboard tube or an old broom handle to the bottom of the cup.
- Organize the finger controls to allow operation of the hand and fingers. Practise with the robotic hand to “train” it to perform certain functions such as closing onto an object.

**Games**
- Speed Game – Place various objects on a table and stand back. Use your robotic hand to reach the objects and move them from one table to another. This can be a timed activity, a race or part of a relay.
- Strength Game – Try lifting objects of increasing weight. How strong is your hand? The design of the hand will impact how much mass it can lift. Why did some fail, while others showed great strength?
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**REVIEW:**
- What do you know now that you did not know before?
- The hand works just like your own. How is your robotic similar to your own hand? How is it different?
- How did you find working with the hand?
- How could a robotic hand like this help someone you know?
- What elements of STEM were in this Adventure? Science? Technology? Engineering? Mathematics?
- What did you like about this Adventure? What did you not like? How would you do this Adventure differently?

**MATERIALS:**
- Adhesive tape or glue
- Scissors and hole punch
- Copies of the step by step guide
- Objects that can be moved with the hand (different shapes and different weights, e.g. empty pop cans, small toy balls, small toys, etc.)

For Each Cub:
- At least 2 m of string
- 10 plastic straws with vertical lines. The lines guide where the holes should be punched. The straws should pop back in to place after they have been bent.
- Two plastic or paper cups
- Wood dowel or old broom handle for the arm

**ONLINE RESOURCES:**
- Parts of a hand
- A similar project
- A more advanced model of a robotic hand
- The Canadarm

**SAFETY TIP:**
- What precautions do you need to take when using tools to build your robotic hand?