

# SCHOOL AGE

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Week

27

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Smart Activities



SMART CHOICE. SMARTER CHILD.®

## Robotic Straw Hand


### HOW DOES IT WORK?

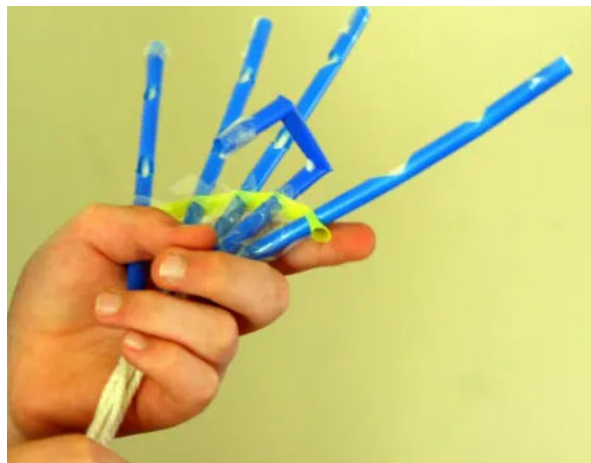
Most robotic prostheses work by recording—from the surface of the skin—electrical signals from muscles left intact after an amputation. Some amputees can guide their artificial hand by contracting muscles remaining in the forearm that would have controlled their fingers. Today you are going to get to make a robotic hand using a few materials.

**Materials:** cardboard or cardstock, marker, ruler, 5 plastic drinking straws, scissors, string or yarn, tape (adult help may be needed)

**Preparation:** Gather materials.

### Instructions:

1. Cut small divots  $\frac{1}{2}$ " from the end of each drinking straw. Do not cut all the way through the straw.   
 *This step may be performed by an adult prior to the activity.* 
2. Cut small divots 1" below the first set of divots. These cuts will create the "knuckles" for the robotic hand. *This step may be performed by an adult prior to the activity.*
3. Tape the bottom of the drinking straws to cardboard or cardstock to form and brace the straw fingers.
4. Thread string through each "finger," taping the string to the top of the straw.
5. Pull on the strings to move the fingers of the robotic hand!



## Tennis Ball Tower Challenge

### WHAT IS A TOWER? WHAT FORCES DO STRUCTURAL ENGINEERS HAVE TO CONSIDER WHEN DESIGNING TOWERS?

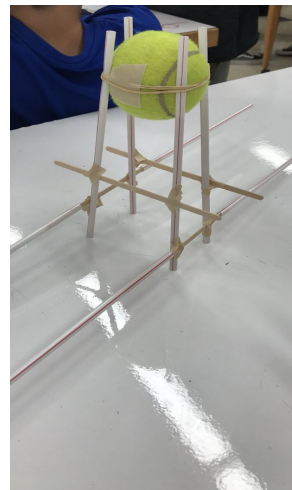
A tower is a building or structure that is higher than its length or width. Towers can stand alone or be attached to adjacent structures. The earliest known towers were vertical stone structures without windows. When iron and steel were introduced during the Industrial Revolution, towers became much stronger and taller, and the term "skyscraper" was coined. Structural engineers must consider all the weights a building must bear and carefully design and calculate the balance between the forces of compression and tension. When selecting designs and materials, the engineers need to consider the balance between the forces of compression and tension. If a straw is compressed end to end, then it is very strong, but when squeezed on its side, the straws cannot support much and folds flat. Engineers need to know how to use the building materials they are given so a balance of tension and compression can support the loads that the structure will be under. **Now it is your turn to design your tower.**

**Materials:** paper, pencil, plastic drinking straws, craft sticks, masking tape, rubber bands, scissors, tennis ball (or similar)

**Preparation:** Gather materials.

#### Instructions:

1. First, sketch some ideas of how you think you will build your tower. Will you use only craft sticks and tape, or straws and tape, or all 3 items?
2. Next, begin building your tower molding the straws and craft sticks to hold the weight of your tennis ball (or similar ball).
3. Add another challenge and build a tower to hold an egg (ask for permission first).



## Hula Hoop Balloon Wreath

**Materials:** balloons (various sizes), hula hoop, string, other materials if desired (ribbon, artificial flowers, leaves, etc.)

**Preparation:** Gather materials.

**Instructions:**

1. Think of the colors and what you want your wreath to have. (Christmas time - maybe only use red and green, birthday - multiple colors, etc.)
2. Design your wreath on paper. Are you going to cover the whole hula hoop or part of it?
3. Next, blow up your balloons varying the air in each one so that the balloons are in different sizes.
4. Secure the balloon's air by tying a knot at the bottom of the balloon. Then stretch the bottom knot as much as possible by pulling on the neck part.
5. Lastly, begin your design. You may want to lay out the balloons in the design you want for a visual (maybe even take a picture). Then, begin attaching your balloons using their ends and tying them around the hula hoop or use string to attach the balloons.
6. Hang it up and enjoy it. Once the balloons have deflated remove them and make a new wreath.
7. Remember you can even use flowers, leaves, ribbon, etc.



## Rubber Band Powered Helicopter

**Materials:** plastic propeller, craft stick, paperclips, rubber bands, cardstock, masking tape, scissors - OR you can buy the entire kit here:

[https://www.amazon.com/dp/B06X3Q8C24/ref=cm\\_sw\\_em\\_r\\_mt\\_dp\\_S96wFbDS0KVVJ](https://www.amazon.com/dp/B06X3Q8C24/ref=cm_sw_em_r_mt_dp_S96wFbDS0KVVJ)

**Preparation:** Gather materials. Check out this website for pictures and clearer directions.

<https://www.instructables.com/id/Rubberband-Helicopters-step-by-step/>

### Instructions:

1. First, lay out all your materials.
2. Next, attach craft stick to the plastic propeller - it should fit snugly.
3. Then, bend and attach the paperclip by holding the end of the paperclip between your thumb and forefinger. Now, pull the paperclip (the inside part) bend apart from the rest of the clip.
4. Attaching the paperclip can also be tricky. If it is not properly attached, it can be ripped off from too much tension. Hold the paperclip flat against the craft stick with the tip of the thumb, then tightly wrap a piece of masking tape around it. (Hint: It helps if the two ends of the paperclip are separated by the craft stick, but it's not necessary.)
5. Draw and then cutout a helicopter about 1.5" x 7" from cardstock.
6. Attach the cutout on the opposite side of the exposed paperclip - this will help ensure that the rubber band will not rub against it.
7. Attach the rubber bands (usually 2 does the trick) by putting your fingers inside the rubber band and stretch it.
8. Begin twisting the rubber until it becomes completely coiled.
9. To fly your helicopter, hold the top of the propeller and the bottom of the craft stick near the paperclip. Let it GO!



## Ice Lantern

**Materials:** bowl or container (freezer safe), clear cups, coins or small pebbles, leaves, rosemary or berries, twigs, food coloring, tape, water, freezer, battery-operated candle (tea light)

**Preparation:** Gather materials.

**Instructions:**

1. First, decide on what decorations you will use on your lantern and gather your materials. You can add other items than what is listed above
2. Then fill the bottom of your bowl with the items you have gathered.
3. Now take your cup and place in the bowl and fill it with coins or pebbles. (This is to add weight to hold the cup down and leave a space for the candle to go.)
4. Now, place the smaller cup inside the large cup. Tape it in place so the top of the cups are flush with each other. (Usually 4 pieces of tape will hold them in place.)
5. Carefully start to add water in the bowl, about  $\frac{3}{4}$  full.
6. Then add a few drops of food coloring (your choice or this is optional) to the water. Place in the freezer for 5 hours or until the water is completely frozen.
7. Take it out of the freezer and add a bit of warm water in the cup to release it from bowl and then on the outside of the bowl to release your lantern.
8. Add your battery-operated candle and enjoy until your lantern begins to melt.



## A Density Rainbow in a Glass

### WHAT IS WATER DENSITY?

Density is all about compactness of stuff in space. For this experiment, the more sugar in each glass of water, the greater the density of the water. The denser the substance, the more likely it will sink. This is how our density rainbowing a glass works! By increasing the amount of sugar in the solution but keeping the amount of water constant (the same), you create solutions that have increasing densities. The more sugar you mix into the same amount of water, the higher the density of the mixture. Density explains why the colored sugar solutions stack on top of each other inside the glass.

**Materials:** sugar, tablespoon, food coloring, water, microwave, 6 clear glass containers, spoons

**Preparation:** Gather materials. **Adult supervision is needed for microwave.**

### Instructions:

1. Measure 1 tablespoon of water into the first glass. Measure 2 tablespoons of sugar into the second glass. Measure 3 tablespoons of sugar into the third glass. Measure 4 tablespoons into the fourth glass, and 5 tablespoons into the fifth glass.
2. Preheat water until it is very warm using the microwave. (**Adult supervision**) Heating the water will help the sugar to dissolve.
3. Now, pour 3 tablespoons of warm water into each of the glasses. Stir until the sugar is dissolved.
4. Add 2-3 drops of red food coloring to the first glass, yellow food coloring to the second glass, green food coloring to the third glass, and blue food coloring to the fourth glass. Stir each glass to mix up the colors.
5. Then, pour half of the contents from the fifth glass into the empty glass. (This one has no food coloring in it.)
6. Using the back of a spoon (this will disrupt the flow of the liquid), very carefully pour half of the contents from the fourth glass (blue food coloring) on top of the layer in the fifth glass.
7. Using the back of a spoon, very carefully pour half of the contents from the third glass (green food coloring) on top of the layer from step 5.
8. Using the back of a spoon, very carefully pour half of the contents from the second glass (yellow food coloring) on top of the layer from step 6.
9. Using the back of a spoon, very carefully pour half of the contents from the first glass (red food coloring) on top of the layer from step 7.
10. Now, observe the separation of the density layers and the beautiful "rainbow" created in the glass!



## Hurricane Proof Tower

### WHAT DOES A HURRICANE DO TO TOWERS?

When the force of a hurricane bears down on structures, homes, and some buildings can be ripped apart by the storm's powerful winds. Then, add in flooding may cause a building or other structure to collapse due to the forces caused by moving water.

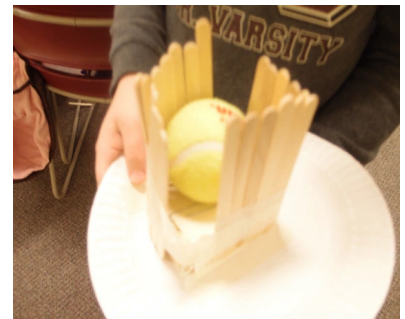
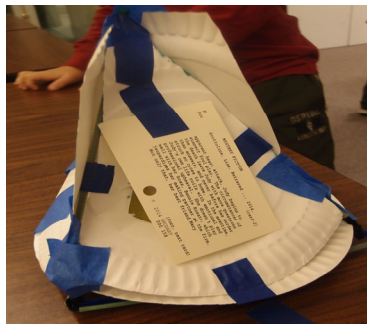
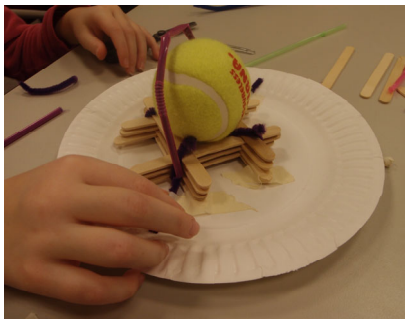
**Challenge:** Build a tower structure using the provided materials. You may have already built a tower structure, but this time you must make it hurricane proof.

**Materials:** paper, pencil, tape, pipe cleaners, paper plates, straws, craft sticks, yarn, paper clips, tennis ball (or similar), fan, spray bottle, water

**Preparation:** Gather materials. Fill spray bottle with water and place the fan in an area where other items will not be blown around.

### Instructions:

1. First, sketch some ideas of how you think you will build your tower and make sure it is hurricane proof. Your ball may not touch the ground.
2. Next, begin building your tower, molding the straws and craft sticks to hold the weight of your tennis ball (or similar ball). (If you are going to need to move your creation, build it on a plate to make it easier to move.)
3. Now, you have a tower strong enough to hold the ball, but what can you do to make it hurricane (wind from the fan) proof? What items can you build around it to protect it from being blown down?
4. Test out your hurricane proof tower by turning on the fan. Add the spray bottle to simulate rain during a hurricane.
5. Remember, we learn by trial and error. If needed adjust and try again.





## Wacky Sacks Stress Balloons

**Materials:** 12" balloons, playdough (1 can per balloon), markers

**Preparation:** Gather materials.

**Instructions:**

1. Roll out your playdough into a long, thin line.
2. Stretch your balloon as wide as you can and stuff the play dough inside.
3. Press the filled balloon to make it flat and get as much air out as possible. Tie it off with a knot.
4. Add a face using your sharpie, and you are finished!

