Build A Model Robotic Hand

Georgia Science Standards

S7CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

S7L2. Students will describe the structure and function of cells, tissues, organs, and organ systems.

NGSS – Middle School Life Science

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

Crosscutting Concepts

Systems and System Models

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)

- Interdependence of Science, Engineering, and Technology
  Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

NGSS – High School Life Science

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
[Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. A n example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy , matter, and information flows—within and between systems at different scales. (HS-LS1-2)

Georgia Grade 7 Visual Art Standards

VA7PR.1 Understands and applies media, techniques, and processes with care and craftsmanship.
VA7PR.2 Creates artwork reflecting a range of concepts, ideas, and subjectmatter.
VA7PR.3 Uses the elements and principles of design along with a variety of media, techniques and skills to produce two-dimensional and three-dimensional works of art.

Supplies needed:

- cardboard
- scissors
- utility knife
- bendable straws
- string or yarn
- thick rubber bands
- hot glue
- gun and glue sticks
- pencil

Build A Model Robotic Hand

Supplies include:

- cardboard
- scissors
- utility knife
- bendable straws
- string or yarn
- thick rubber bands
- hot glue gun and glue sticks
- pencil

1. Trace an adult sized hand on cardboard and carefully cut it out:

2. Glue the bendable straws on each finger, so that the bendy part was on the hand and the long part of the straw was on the fingers. Trim the edges of the straw to align with the edge of the fingers.

3. Take your pencil and mark on the fingers of the cardboard hand the location of the joints and knuckles from the real-life hand. Then take the utility knife and carefully score the back side of the hand on those lines, so that the fingers would curl and bend properly.

4. Using your pencil marks as a guide, carefully slice a section of the straw off (at 45 degree angles) where the joints are located. This helps the 'fingers' to bend properly as well.

5. When you are done with all the joint cuts, it looks like this:

6. Take string and run it through each straw, leaving a long tail out both the top and bottom of the straw. Cut the rubber bands so that they would be a long strip instead of a circle. At the top of each finger, tie the string and rubber band ends together in a small knot.

7. Turning the hand over, and with fingers straightened out and laid flat, hot glue the loose ends of the rubber band down to the back of the hand. The glue should only be right at the end of the rubber band. The rest of it needs to stay loose so that it can freely move and guide the fingers. The rubber bands help the fingers to return to their natural state after being curled up.

8. Once the hand is completed, have lots of opportunity to 'play' with it and see how the tendons in a hand function, by pulling downward on the strings.