

Biomimicry as an Authentic Anchor - Fruit Harvest Design Challenge (Resource Exchange)

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Kathryn Hobbs



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Suggested Grade Levels

Middle School (6th-8th grade)



Estimated Time

2-4 hours (depending on students' familiarity with the materials and tools)

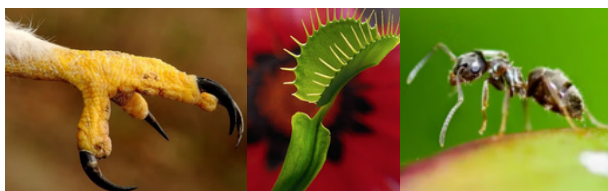
Design Challenge

Harvesting fruits from tall trees can be slow, unsafe, and tricky to do by hand. To solve this problem, please **design a biomimetic device that can safely and efficiently harvest fruits**. Test out your device by grasping a ball attached to the ceiling.



Bio Inspirations

Bird Talon; Venus Fly Trap;
Trap-jaw Ant



Learning Goals



- Use the **NGSS** crosscutting concept of **Structure and Function** to analyze how organisms **grasp**.
- Implement a **biomimetic design process**.
- Use craft materials and tools to construct a **physical prototype** with moving parts.
- Investigate the **strengths and weaknesses** of different **nature-inspired** design ideas.

What is Biomimicry?

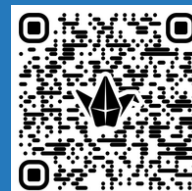


"A practice that learns from and mimics the strategies used by living organisms to solve challenges." (Biomimicry Institute, n.d.)

Procedure

- **Pose the design challenge.**
- **Study natural organisms** that can grasp using provided resources on the Padlet.
- **Analyze their structure and function** for bio-inspiration.
- **Build a prototype fruit harvesting device.**
- **Test and iterate** the design.
- **Reflect and share** the final design.

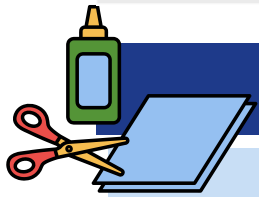
Grasping



Design Challenge: Fruit Harvest (Grasping)

Structure Function Analysis Worksheet (sample answers)

Organism	Parts that support grasping	Properties or characteristics of those parts	Action(s) enabled by parts and their properties
Bird Talon	Toes, Foot, Ankle ligament	Toes: flexible, pointing backwards. Ligament: muscle-like, connective.	Ligaments: shorten and lengthen. Toes: curl inwards when ligament shortens; uncurl when ligament lengthens.
Venus Fly Trap	Two leaves, Inner and outer layer of leaves, Hinge	Divided in two halves, jaw-like	Outer layers: expand. Halves shut together when outer layers expand
Trap-Jaw Ant	A pair of Jaws, Peg, Groove Muscle	Jaws: straight and long. The pegs and grooves: latch-like. Muscle: spring-like.	Jaws: closes when pegs slip out of the grooves. Muscle: relax and stretches.



Tools and Materials

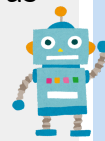


Craft Materials

Construction paper, cardboard, tissue paper, tracing paper, paper clips, craft sticks, pipe cleaners, florist wire, tape, rubber bands, foil, paper cups, binder clips, balls...

Technology Tools

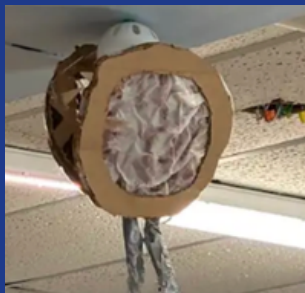
Optional **educational robotics** kits (such as VEX, LEGO Spike, Hummingbirds...)



Craft Tools

Hole punchers, scissors, hot glue guns, glue sticks, ruler, tape measure

Student Work Examples



Inspired by the Venus Fly Trap



Inspired by the bird talon



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