HEADS IN, HEARTS IN

Pulley Power

Instructions for Set-Up

Supplies

- ❑ "Guide for Families" handout
- ❑ Clear plastic standup display (optional)
- ❑ "Engineering Process" handout (1 per participant or family)
- ❑ Paper
- ❑ Pencils
- ❑ Jumbo craft sticks
- ❑ Small 3-ounce or 5-ounce paper cups (3–4 per participant or family)
- ❑ One-hole punch (optional)
- ❑ Scissors
- ❑ Small wooden or plastic spool, such as an empty spool of thread or spool purchased from a craft store (1 per participant or family)
- ❑ Unsharpened pencils (1 per participant or family)
- ❑ String
- ❑ Tape
- ❑ Small toy
- ❑ Display table

Activity Preparation

- Purchase or locate items on supply list.
- Print one copy of the "Guide for Families" handout. Laminate or place in a clear plastic standup display to allow participants to see it more readily.
- Print
- Using the one-hole punch or scissors, make a hole at the top of the cup (the part you drink from) approximately half an inch from the top. Next, make another hole directly across from the first hole.
- Using the scissors, cut the string into approximately 6-inch to 8-inch strips.
- Set up the display table and arrange needed supplies.

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Guide for Families

Learning Objectives

What you need to know:

Engineering is a process used to solve problems by designing, building and testing things. An engineer is a person who uses math and science to create new things, solve problems or make things better.

Pulleys are simple machines that use a rope or string wrapped around a wheel to move an object from one place to another. One end of the rope is attached to an object that needs to move and then the rope goes through a pulley. The other end is attached to a person or motor that works to help the object move.

In engineering, pulleys are used to move objects. An elevator uses pulleys to move people and objects to different floors in a building. Pulleys are also used in exercise equipment, window blinds and garage doors. Multiple pulleys can also be used in systems to reduce the force needed to move an object.

What you will do and learn:

In this activity, you will practice building different pulley systems. The goal of this activity is to build your own pulley to lift a small toy.

Instructions

1. Using the "Engineering Process" handout, start to work through building your first pulley.
2. Identify the problem: Build your own pulley to lift a small toy.
3. Brainstorm: Why do we use pulleys? Is it easier to pull down or push up? How can you build your pulley? What might happen if you pick a different solution?
4. Plan: Make a drawing or sketch of your tower design. Gather your materials.
5. Build: Build your first pulley using any of the materials provided.
6. Test: Place several washers in the cup and test your pulley. How well does it work? Does it support the weight in the cup? What happens when you add more weight or take weight away from the pulley?
7. Redesign: Make some changes to your design to improve your pulley. Try using different materials. Try some of the ideas you came up with during your brainstorming.
8. Repeat steps 6 and 7 as many times as needed.
9. Reflect and Discuss: Where else do you see pulleys used in the real world? Why would you want to change the direction you are pulling something? What do you think might happen if you used multiple pulleys?

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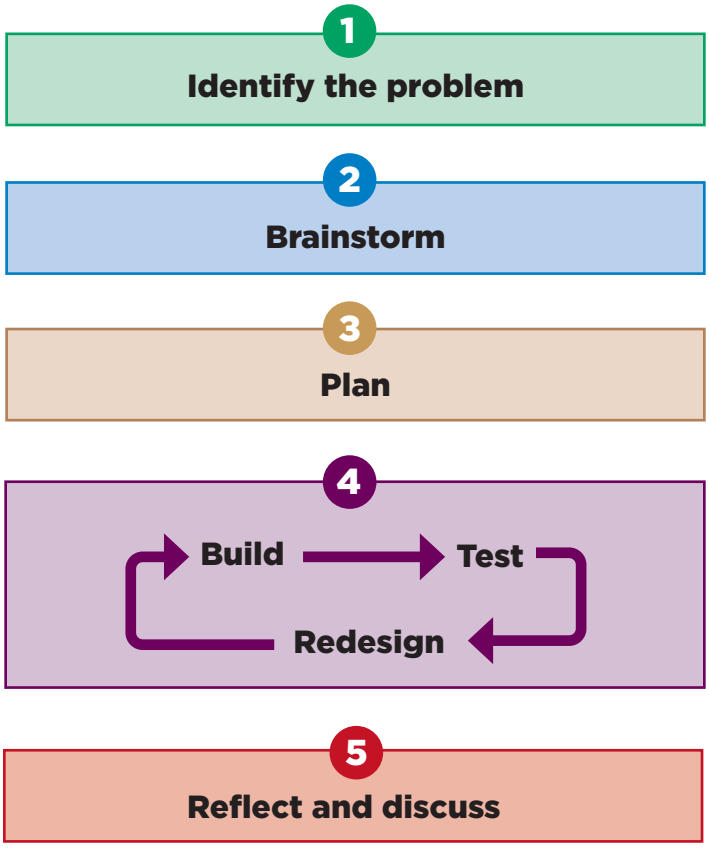
Engineering Process Handout

Engineering Process



1. **Identify the problem:** Engineering is about identifying problems and designing solutions. As you go through these activities, think of the goal you are trying to achieve.
2. **Brainstorm:** What are the many different ways I could solve this problem? What are the potential advantages and disadvantages of different ideas? What things do I need to think about to make that solution successful?
3. **Plan:** What are the different ways I can solve this problem or make the build? What steps can I take to try out my solution? What do I need to do to prepare my build? What might happen if I choose that solution? During your design phase, you might discover new problems that you need to brainstorm.
4. **Build:** Construct and carry out the design. As you build your design, you might come up with more problems that you need to brainstorm and design new ideas for.

   Test: How does my solution work? Does it solve the problem? Is it effective? Are there additional problems?

   Redesign: How can I improve my design? What can I try to make my solution work better?
5. **Reflect and Discuss:** How did the solution turn out? What could I do differently next time? How would my design be different if I had different materials?

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