



Activity

Name: Simple Machines: Hoist Yo' Self

Question for Discovery: How do pulleys work?

Learning Objectives:

- Students will be able to construct a pulley system that resembles a working elevator.

Grade Level	Setup Time	Class Time
3rd Grade	10 minutes	60 minutes

Next Generation Science Standards

Standard:

- 3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object

Disciplinary Core Ideas (DCI):

- PS2.A: Forces and Motion

Science & Engineering Practices (SEP):

- Planning and Carrying Out Investigations

Crosscutting Concepts:

- Cause and effect

Materials:

Per group of 4 students

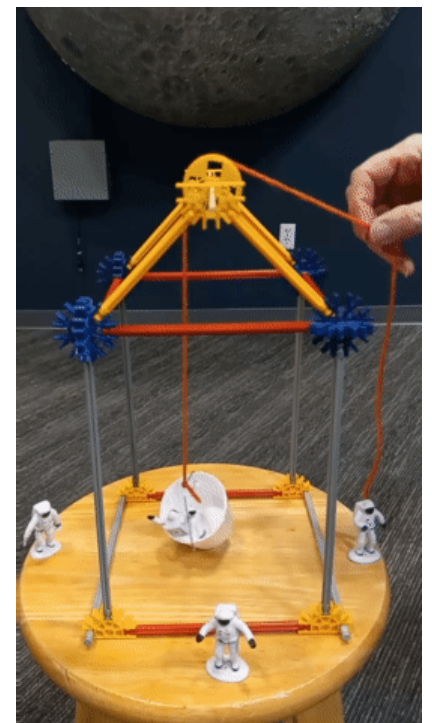
- K'nex *OR* Legos *OR* other toy building kit
- String up to 48" in length
- Cosmosphere 3D printed pulley wheels
- Cups
- Paperclips
- Yardstick
- Cargo (something to pull up in the hoist bucket)

How to Obtain a 3D-Printed Pulley Wheel

To request a sample or buy 3D printed materials, email schools@cosmo.org with the subject line "3D Printed Request - Pulley Wheels". If you want to print them yourself, the .stl files are included in the "Additional Resources" section at the end of this document.

Activity Instructions:

1. Have students plan out their hoist design. It should have three components - A) tower structure, B) pulley system, and C) Hoist bucket and string.
2. Split the students into groups, maximum four students per group. Pass out a building kit to each group. Each building kit should have the necessary materials to build a small tower on which to mount a pulley system.
3. Students will construct a hoist tower that is at least 12" tall. They need to keep in mind the planned path of their hoist bucket and make sure the tower doesn't get in its way.
4. After constructing their hoist tower, they need to install their pulley system, testing it to ensure that whatever method they've chosen



for construction allows their hoist bucket to be freely pulled up and down.



5. With the pulley system installed, they can attach a container to the pulley string. This may be complex or as simple as a cup with an attachment point for the pulley string.

6. Load some cargo into the hoist container and hoist the cargo to the top of the tower to test if it holds.

7. If time permits, let students increase the height of their hoist tower.

8. *Optional: A winner could be determined by who hoists their cargo to the greatest height.*



Additional Resources

- “3D Pulley Print” - .stl file by Cosmosphere
https://drive.google.com/file/d/1kofqGe96l5RK9UiRU4ipFEVhhAn1m2xE/view?usp=drive_link
-