



Students consider how to solve real world problems using a simple machine to make work easier.

Objectives:

Students will begin to understand simple machines in the context of their continued exploration of using simple machines to make work easier. During this lesson, students will interact with and build with pulleys.

Vocabulary used in this activity:

work, effort, pulley, simple machine, mechanical advantage, situation, mass

Standards

- **ECERS-R** Language-Reasoning: Books and pictures, Encouraging children to communicate Using language to develop reasoning skills | Activities: Fine Motor, Art, Math/Numbers | Program Structure: Group time
- NGSS K-2nd Engineering Design: K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-1 Ask questions, make observations, gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- CCSS-Math K Practice.MP5, K Practice. MP7, 1. MD.A.1, 1.MD.A.2, 1. MP8, 1.MP.5
- CCSS-ELA SL.K.1, SL.K.1.A, SL.K.1.B, SL.K.5, W.K.3, SL.1.1, SL.1.1.A, SL.1.1.B, SL.1.5, L.1.1i, CCRA.L.6, CCRA.W.3, W.K.8

Time needed: 35-40 minutes

Materials and Supplies:

Gingerbread friend, paper, pencils/crayons, pre-built Brackitz Elevator

Resources/Optional Reading:

Monica Kulling's Going up!, Elisha Otis's Trip to the Top, and Amanda Askew's Cranes (Mighty Machines)

Set-up and Preparation:

Gingerbread friend, paper, pencils/crayons, pre-built Brackitz Elevator

Background Knowledge:

Prior to this lesson, students do not need special background knowledge. Introducing students to the Gingerbread character from Unit 1, and transportation and simple machines from Unit 2, can be very helpful.



35-40 minutes

Lesson 2: GOINGUP

Whole Class

10 minutes

"Sometimes we need to move things up or down where we can't go. Yesterday we talked about elevators - I have a Gingerbread friend-sized elevator to show you. Do you think using the elevator will help make going up and down easier to do? How will we know?" (Demonstrate Brackitz Elevator and give students ideas on how we would know if this is easier: you can pull down on the rope to demonstrate making things go up.)

Goal: Get students to consider moving the same pebbles/marbles used in the cup in lesson 1 to see if it is easier/smoother/faster.

Group Exploration 10 minutes

"This elevator works by using a pulley to make the work easier: the pulley is a simple machine that helps us move mass (heavy stuff!) up or down. In real life, we sometimes use a pulley as a way to make work easier, but also to move things to places where we can't go. Can you think of places where we may need to lower things down or lift things up that we wouldn't be able to go to ourselves? Think about it."

Plan for students to work in small groups, or discuss with you in a large group, for about 6-7 minutes on this guestion. If you have already read the book Cranes, students may have some ideas, or you may reference it to generate ideas.

Instructor Notes and Tips

Ask students to recall how they felt during the

work/challenge in Lesson 1. How did their hands

feel?Their arm muscles?

Great real-life ideas:

- Salvaging a sunken ship
- Dropping off rescue supplies (to canyons or disaster areas)
- Moving items to the top of a building that is being built
- Raising and lowering a flag





Lesson 2: GOINGUP

Group Challenge

"I want you to think of a situation where our Gingerbread character needed to move things down or up to a place where s/he couldn't go. You can come test out this elevator while you think. What story would explain why Gingerbread needed to move something, and why is s/he moving it to a place s/he can't get to? How will the pulley elevator help?"

15 minutes

This is a narrative challenge, not a building challenge. Try to guide students to make this relevant to the real world; for example, "Does our Gingerbread friend need to lower supplies to another friend that fell into a hole and is hurt?"

Work with student groups to record their stories either as a quick paragraph that you help write, or as a short video where they narrate the story.

Reflection

5 minutes

"Tell your story, and explain how the pulley in this elevator can help our Gingerbread friend solve the problem s/he is facing in the story."

CHALLENGE ADVANCED STUDENTS

In discussion, ask students how they think the elevator works. "What is easier about this?"

In the group exploration, ask students to come up with needs for an elevator-like simple machine with a pulley. "Gingerbread needs to _____, and an pulley can help by _____."

In the group challenge, ask students to tell the story in four parts: (1) What happened (2) What is the need (3)What are the constraints or limitations (4) How will we know if this design is working and helping (criteria for success). Help groups tell their story briefly. If your students struggle to stick to a time limit, ask each group a couple of pointed questions and have them share their ideas as an interview instead of a story. Good questions:

- Why can't our Gingerbread friend get there herself?
- •Why is this a problem for him?
- How does the pulley help get that work done/make this challenge easier?

SIMPLIFY FOR YOUNGER GROUPS

In discussion, remind students where they felt the work in their bodies the other day. Would Gingerbread be able to do that same work without breaking?

In the group exploration, remind students of the book, <u>Going up!</u> Let them revisit the book to remind them of reasons for pulleys other than moving people up and down.

In the group challenge, ask for a one or two part story only. "Gingerbread has a friend in a hole. We want to give her food safely" is a great story to motivate design need.



Name

1

3



Student Worksheet

Draw at least two or three "places we can't go" but still might want to move things to or from.

2







Draw the story of why Gingerbread needs a pulley-elevator.

What caused this situation?	Why can't Gingerbread go there?
How will the elevator help?	Are there other parts of the story?

