brackitz®

U3 L2
V2.5

GOING UP

LESSONS

PULLEYS & CRANKS

CREATIVE POWER
PLAY LEARN GROW
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2nd & 3rd grade
teacher plan

Lesson 2: GOING UP

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 making 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

NGSS K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change by defining a simple problem that can be solved through the development of a new or improved object or tool. 3 PS2, PS2.A Forces and motion

CCSS-Math MP.1, MP.3

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, CCRA.W.3.2, CCRA.W.3.3, W.K.8

Time needed: 35-45 minutes

Materials and Supplies:

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

Resources/Optional Reading:

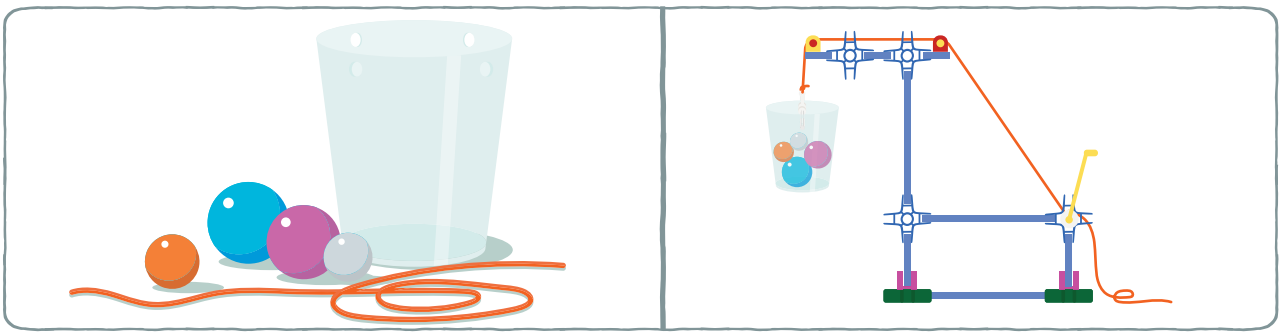
Monica Kulling's Going up!, Elisha Otis's Trip to the Top, and Amanda Askew's Cranes (Mighty Machines)

Set-up and Preparation:

Before class starts, instructor should build the Brackitz Elevator from the Pulleys Kit and make sure it's working. Help students cooperatively form groups of 2-3 to work together.

Background Knowledge:

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



Lesson 2: GOING UP

35-45 minutes

Class Pulleys — 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.)

"Let me show you again. Let's list what criteria we would need for this to count as a good solution for Gingerbread (or things s/he needs to go up and down with less work.) If we were in an elevator what would we want to happen?" (Make a class list.) "And what would we not want to happen?" (Make a class list.)

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.

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?

Ask students if they have been in an elevator? What was good about using an elevator?

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 - what ideas does your group have about where we would need the mechanical advantage, the extra help, of this kind of simple machine?"

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

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
- Wells (down to retrieve the water, up to bring it to us).

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Group Challenge 15 minutes

"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 about a situation that would cause this need. Is this elevator or something like it a good solution? Can you write a story that would explain why Gingerbread needed to move something? Make sure as you think of your story, you consider why is s/he moving it to a place s/he can't get to? How will the pulley elevator help?"
Record student group stories.

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, or maybe as a storyboard where they quickly sketch a series of pictures showing what happened to create this need/situation. Decide before this step how students should record their stories.

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."

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?

CHALLENGE ADVANCED STUDENTS

In discussion, ask students, "Do elevators only move people? What other things need to be moved up and down? What ideas do you have now that you've seen the Brackitz elevator?"
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 five 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)? (5) Any other parts of the story we should know?

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? If there was an elevator, "What is easier about this?"
In the group exploration, remind students of the book, Going Up! 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

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Student Worksheet

Draw at least three places "we" can't go without help, but still might want to move things to or from.

1

2

3

Name

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

What caused this situation?

Why can't the Gingerbread go there?

How will the elevator help?

Are there other parts of the story?

Draw how the elevator can help in this situation?