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ONE WHEEL ON THE CART

LESSONS

WHEELS & AXELS

CREATIVE POWER
PLAY LEARN GROW
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Pre-K
teacher plan

Lesson 2: ONE WHEEL ON THE CART

Students consider including wheels in their designs. This lesson reintroduces the ideas of mechanical advantage and design process with criteria and constraints.

Objectives: Students will explore the ideas of work, effort, and enhancing transportation with wheels (mechanical advantage). At the close of this lesson, students will be able to describe how wheels help do work.

Vocabulary used in this activity: Work, effort, distance, weight, advantage, benefit, method, situation, constraint, design

Standards

NY State Pre-K Foundation for Common Core	Approaches to Learning - Actively/confidently engages in play as a means of exploration and learning; actively engages in problem solving; approaches tasks, activities and problems with creativity, imagination, and/or willingness to try new experiences or activities.
NY State Pre-K Foundation for Common Core	Foundations to Technology - Describes types of materials and how they're used - creates structures to determine which do/don't work. Explores and uses various types of tools appropriately. Expresses an understanding of how technology affects them in daily life, and how it can be used to solve problems - identifies examples of technology used in daily life.
NY State Pre-K Foundation for Common Core	Social Development - Exhibits self-confidence by attempting new tasks independent of prompting or reinforcement, displays accomplishment, contentment, and acknowledgement when completing a task or solving a problem by himself/herself.
NY State Pre-K Foundation for Common Core	Math - Analyzes, compares, and sorts objects; describes them using correct vocabulary; creates and builds shapes from components. Counting and cardinality - counts sequence; compares numbers.
NY State Pre-K Foundation for Common Core	Communication, Literacy, Writing - Participates in small or large group activities for storytelling. Asks questions, makes comparisons to words and concepts already known, begins to identify relevant and irrelevant information, understands and follows spoken directions, exhibits curiosity and interest in learning new vocabulary. With prompting and support, uses a combination of drawing, dictating, or writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
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

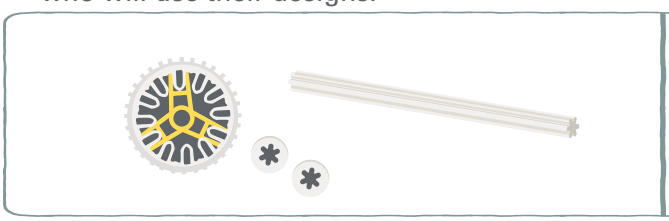
Time needed: 35-45 minutes

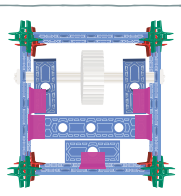
Materials and Supplies: Gingerbread character, paper, pencils/crayons, cart or wheeled chair, Brackitz planks (1x1 and 1x2), and 3 and 4-way hubs. Give out exactly one tire and axle-spline and two lock-washers to each group.

Resources/optional reading: Richard Scarry's Cars and Trucks and Things That Go.

Set-up and Preparation: Prepare trays of building materials ready to be handed out; 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 friend from Unit 1 can help them keep a user in mind who will use their designs.





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35-40 minutes

Whole Class-Ways to Get Around

10 minutes

"What are all the ways we get to places? How did you get to school? What would you use to go from your house to a friend's house?" Have students practice raising hands to share their contributions. Write them down or draw pictures of their thoughts.

"How many of those things have wheels?" Go back through the list and have them think about it - does walking have wheels? Do cars? Do bikes and busses?

"Why do so many ways of getting to places have wheels?" See if students can name that wheels help us move more people and things faster/easier.

Instructor Notes and Tips

You may read the Richard Scarry book to help prime the idea of transportation for students. You can also use the book as a reference for when students name ways to get to places.

You may also prompt specific examples:
How will we change classes/get to the cafeteria? (walking, wheelchairs)
What are fun ways to move when we are playing (roller skates, scooters, bikes)
If you wanted to go to your friend's house, what are three ways to get there? (car, bike, walking)
What brings some students to school? (bus)
How do we travel far distances?

Group Exploration - Force

10 minutes

Feel the work! "Getting from one place to another is always work. Let's see if we can feel the work being done. First, I'm going to ask you to carry these books (show pile of books in a box or bag) across the room. Then you'll move the SAME BOOKS for the SAME DISTANCE but on a cart (or rolling chair). Which one do you think will be easier?"

Try to reach this conclusion:

It's easier to move items with wheels - even items that aren't heavy. "Wheels give us an advantage - we can move more things easier, and move them faster. Think of an advantage this way - it's a head start or way to go faster. If two people were in a race but one was running and another was on a bike or skateboard, who can go faster? (The one on the bike!) Yes, they have the ADVANTAGE."

Create start and stop spots for each group, so that they can line up for this exercise. Have each student take a turn carrying a box or bag of books. Repeat the exercise but with students pushing the same amount of books on a wheeled cart or rolling chair. Each student's turn carrying the books should take 20-30 seconds or less, and if 4 or 5 students are carrying/rolling at once, this means "feeling the work" should take 6-7 minutes.

When you ask which is easier, help students think about how their bodies and muscles feel - tight, sore, working muscles indicate "feeling the work." Students may also talk about speed - point out that greater speeds are more achievable when using something with wheels because it gives us an advantage of doing work using less force to move the same distance.

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Group Challenge - Carts & Wheels

15 minutes

"So, wheels are easier! Then - if we want to give our Gingerbread character a way to move things around that uses less force and is easier, what should we use? (Wheels!) What can you build with ONLY one wheel that would help our character get around more easily?"

Pass out trays of planks, connectors, wheels, and axles that are already prepared for groups.

This is a chance for students to begin building. Watch to make sure groups are able to share tasks and ideas functionally.

Reflection

5 minutes

"I gave you only one wheel to see if you could build, even if I had a limitation on your building materials. Can one wheel still help create an advantage for moving around so you can move things more easily (using less force)?"

Help students consider that rolling books was easier than carrying them and that moving things with a wheel may be easier for Gingerbread. Both things that were easier used wheels because wheels give us an ADVANTAGE.

CHALLENGE ADVANCED STUDENTS

In discussion, ask them to name which things in Scarry's book have wheels and which use people-work to make them go. Then point out that some things use both! Bikes and skateboards and roller skates and scooters combine using the work of our bodies with wheels to get work done. Discuss how this relates to getting work done with an advantage.

In the group challenge, ask students, "With only one wheel, can this cart go on its own? Would it stay up and balanced?" Lead them to the idea that a user will still have to lift, push, and balance.

SIMPLIFY FOR YOUNGER GROUPS

Before the discussion, read Scarry's, Cars and Trucks and Things That Go. Have pictures ready to prompt ideas of how we move people and things from place to place.

In the group challenge, lead students directly to building a one-wheeled cart or wheelbarrow by using a picture or video to plant the idea.

In the reflection, show students pictures of wheelbarrows and one-wheeled carts. Ask how they are being used to help move things. Help students note similarities and differences between what they made and the carts on the pictures.

Name

Lesson 2: ONE WHEEL ON THE CART

Student Worksheet

Draw your favorite way to get from place to place

Draw what you think is the easiest way to get from place to place

Name

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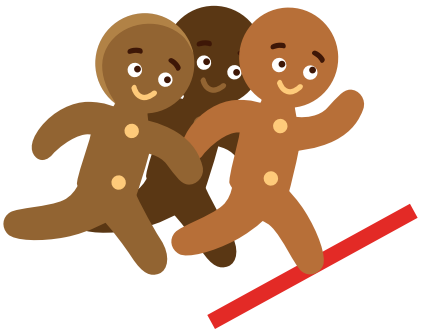
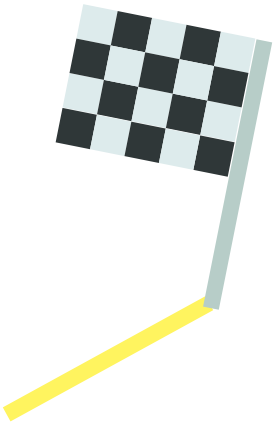
Student Worksheet

Who has an advantage in this race? (Circle)





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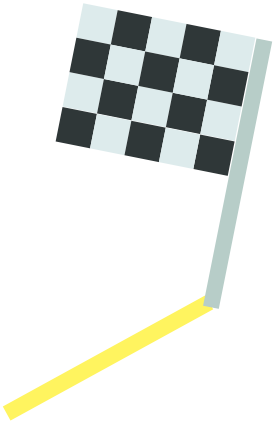

Name

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Student Worksheet

You made something with just one wheel. Draw your design here:

Count how many Brackitz pieces you used today: _____

Count how many wheels you got to use in building today: _____

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connecting imaginations