

brackitz®

U2 L3a
V2.3

LESSONS

WHEELS & AXELS

TWO WHEELS
ON THE CART



★ Lesson 3: TWO WHEELS ON THE CART ★

Students continue designing transportation, and in this lesson, include two wheels in their designs.



Objectives: Students will practice what they learned about transportation, work, effort, and mechanical advantage, with more wheels, while still being challenged with a design constraint.

Vocabulary used in this activity: advantage, benefit, mechanical advantage, request, specific, constraint, request, limit, 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

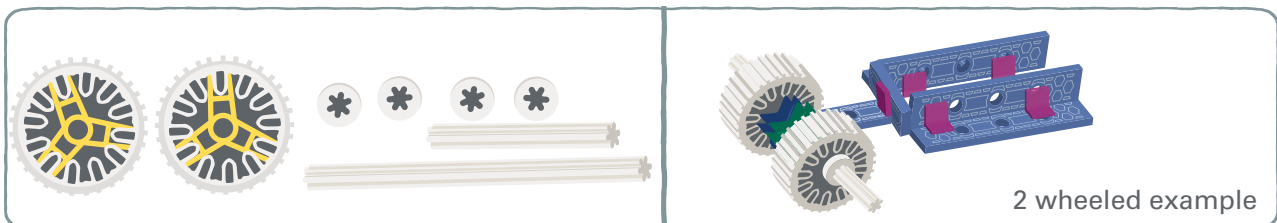
Time needed: 35-45 minutes

Materials and Supplies: Gingerbread friend, paper, pencils/crayons, Brackitz planks (1x1 and 1x2), and 3 and 4-way hubs, as well 1-way pivoting hubs. Give out exactly two tires and axle-splines and 4 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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35-45 minutes

Whole Class - More Moving



10 minutes

"Last class we tried moving things ourselves compared to moving with wheels. Which one made us use more force? (without wheels/just us doing the moving) Which way was easier and faster?"

So, wheels can help give us a mechanical advantage to use less force. Who wanted to use more wheels yesterday? Good news - today we're going to use more wheels, but only two. What are some things that use two wheels?"

Instructor Notes and Tips

Remind students of the ideas you came up with during the last class of all the ways to move things and people. You can also remind them of the Richard Scarry book, Things that Go, to help them remember vehicles and forms of transportation. Ask, "Which have only two wheels?" Then have them circle those. Help students consider options beyond just bikes - motorcycles, scooters, segues, and ripsticks too!

Group Exploration - How will it change?



10 minutes

"Let's take a look at some of your one-wheeled designs. If we add a second wheel, where will it go? Where is the best place for a second wheel? Can you draw it?"

Ask students to think about balancing the wheel placement so that the cart they are building doesn't "tip over" all the time - help them experiment with places to put two wheels so the cart can roll and stay steady.

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Group Challenge



15 minutes

"Build a design with EXACTLY two wheels. You can't have one or three wheels - it has to be two. This is called a design constraint - it means you have to meet a specific request, or not use everything you may want."

This is a chance for students to begin building. Watch to make sure groups are able to share tasks and ideas functionally. Having trays with prepared Brackitz pieces and exactly two wheels and axles will help.

Help as students use the wheels and axles. Since it is their first time building with these pieces, students may not understand how to fit these pieces together and how to "thread" the axles into the hubs.

Reflection



5 minutes

"When you roll your two-wheeled designs, how are you hoping they will work? What do we want to happen when we roll it across the floor, and what do we not want to happen?"

"Was a two-wheeled design better than a one-wheeled design? Why do you think so?"

"Can you think of any ways you'd like to redesign or improve your two-wheeled designs? What are your ideas?"

As you talk to students about their designs, praise what they have gotten working - perhaps it's a good size or built for a specific use. Ask them about parts of the design that are hard or "not working yet" - maybe the design needs stability. Talking about things that "aren't working yet" is a way to make the reality of redesign in the design cycle less negative.

CHALLENGE ADVANCED STUDENTS

In discussion, ask students to remember which vehicles had two wheels in Scarry's book. Ask them why two wheels may be better than one wheel, leading them to consider balance and stability.

In the group challenge, still help students understand how wheels and axle pieces work together, but you may also show them an assembly and see if they can "reverse" engineer it to gain understanding.

In the reflection, ask students to draw new design ideas that they have for two wheels, so they reflect on "redesign" and "improvement" as positive parts of the design process.

SIMPLIFY FOR YOUNGER GROUPS

In discussion, ask students if they have ever seen something with two wheels, aside from a bike or scooter. They may not have. You can show them YouTube videos of segues or ripsticks to show them other ways to get around with two wheels.

In the group exploration, have a couple of example carts built - you could show wheels horizontally placed, wheels vertically placed, and wheels placed in an unbalanced (kitty-corner) placement, so that students can explore what works and what doesn't, and why.

In the group challenge, provide extra help as students use the wheels and axles, attending to students' fine motor skills.

Name _____

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Student Worksheet

Draw your two-wheeled design here:

Where will this two-wheeled vehicle get used (school, roads, parks)?
Draw that place.

Is a two-wheeled design better than a one-wheeled design? (Circle) YES NO

Count how many Brackitz pieces you used today: _____

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