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THREE WHEELS ON THE CART.:

LESSONS

WHEELS & AXELS

Pre-K
teacher plan

CREATIVE POWER
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Lesson 4: THREE WHEELS ON THE CART..

This lesson invites students to add one more wheel and explore how the mechanical advantage of wheels, plus the added stability of more wheels, offers more design choices.

Objectives: Students will practice what they learned about transportation, work, effort, and mechanical advantage with more wheels. At the end of this lesson, students will better understand that creating stability/safety when enabling speed is desirable.

Vocabulary used in this activity: aprediction, vehicles, advantage, benefit, mechanical advantage, request, specific, constraint, criteria, environment

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

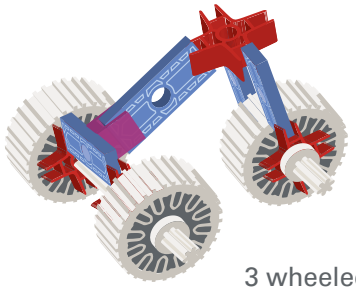
Time needed: 35-45 minutes

Materials and Supplies: Gingerbread friend, paper, pencils/crayons, Brackitz planks (1x1 and 1x2), and 3 and 4-way hubs, as well as 1-way pivoting hubs. Give out exactly three tires and axle-splines and lock washers to each group.

Resources/optional reading: Richard Scarry's Cars and Trucks and Things That Go and Gail Gibbons' Transportation: How People Get Around

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.



3 wheeled example

brackitz connecting imaginations

Lesson 4: THREE WHEELS ON THE CART.

35-45 minutes

Whole Class - Wheel Prediction

10 minutes

"Let's remember - first we used zero wheels, the next day 1 wheel, then 2 wheels yesterday. How many wheels do you think we'll use today?" (3? 3!)

"Yes, that's called making a prediction. Your prediction is good - we will use 3 wheels today."

Instructor Notes and Tips

Three wheels are not common - in this lesson it will be important to balance helping students generate ideas with still leaving the work of creating a solution up to them. For this reason it is recommended to not show them the pictures in this lesson (reserve them for your thoughts, as you guide students), but you may want to ask them to revisit the Scarry book and notice "three wheels" or "where a third wheel could go" to help students think about what three-wheeled vehicles might look like.

Group Exploration - 3-Wheeled Design

10 minutes

(Hold up 2 two-wheeled vehicle examples.) "Let's look at your 2 wheeled vehicles . . . where can we put a third wheel? We might need to redesign. Can you draw a plan showing where the third wheel could go?"

You can ask students to think about how they could put two wheels in back and one in front so that their vehicles can "stay up" (balance).

You can hold up real two-wheeled designs from the previous class or sketch them on the whiteboard/easel paper and ask students to suggest where a third wheel could go. Keep these up so all students can see them when building.

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Group Challenge- 3 Wheeled Challenge

15 minutes

"Build a vehicle design with EXACTLY three wheels as the design constraint. How and where will a small creature use it? When you test it, what CRITERIA must these three-wheeled designs meet to be useful?"

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.

Explain that constraints are limits on what we can use or make, and criteria is another design term that means "what counts as a success or a good design."

Reflection

5 minutes

"Let's consider - do you know any three-wheeled vehicles? Are they commonly seen? Do they have special uses? Are there any reasons why three wheels are better than two?"

You may use the recommended books to help students think of real-life three-wheeled vehicles.

As you discuss two wheels versus three wheels and their uses, work to helps students use and understand the words, "balance" and "stability."

Preserve the three-wheeled vehicles for the final lesson in the unit, if you can.

CHALLENGE ADVANCED STUDENTS

In discussion, discuss how having an odd number of wheels (1 or 3) causes the designer to have to think about vehicle shape and balance differently than having 2 wheels.

In the group exploration, notice if students design something that looks a lot like their Lesson 2 wheelbarrows. Talk about how it was two legs balancing the cart as it moved forward then, but now, the wheels do that job. Discuss the similarities and reasons for this! **OR**

Ask students to think of a place Gingerbread would like to have this vehicle - where would s/he like to go and what would s/he like to do? (Driving around a beach, moving our toys out of the way to make a new Gingerbread building in the classroom, etc.) Then ask how three wheels can help us design something that's the right size for the Gingerbread friend and will work in that environment.

SIMPLIFY FOR YOUNGER GROUPS

In discussion, help students predict that three wheels comes after two wheels if we're counting up. Show students specific examples of three-wheeled vehicles and direct them to notice some things three-wheeled vehicles may have in common - usually one wheel in front, two in back. Connect this design to how these vehicles are often used.

In the group exploration, show students pictures of their one-wheeled designs; ask if this gives them ideas on building something with three wheels. Show students their two-wheeled designs and ask if there were any drawback to two wheeled vehicles - balance! Can a third wheel help with that?

Name

Lesson 4: THREE WHEELS ON THE CART

Student Worksheet

Draw your three-wheeled design here:

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

Can you explain how a three-wheeled cart can be better than a one or two-wheeled cart?

_____

_____

Count how many Brackitz pieces you used today: _____

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

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