Unit 8 (Mechanisms): A Frame that Rolls

Concept
Axles hold wheels. Axles can be attached to a frame in different ways.

Content Objective
Try different ways to make wheels and axles that will roll.

Language Objectives
Students will learn new vocabulary regarding mechanisms (e.g., wheels, axles, frames) with the help of a graphic organizer
Students will share their understanding of the Design Brief task as applied to making a frame that rolls
Students will describe their projects using increased specificity and detail depending upon their level of oral English language development.

Standards

- **NGSS:**
  - **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define problem that can be solved with a new or improved object or tool.
- **TEKS:**
  - **1B** discuss the importance of safe practices to keep self and others safe and healthy (discuss)
  - **2B** plan and conduct simple descriptive investigations such as ways objects move (investigate movement)
  - **2E** communicate observations with others about simple descriptive investigations (communicate observations)
  - **4A** collect information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as terrariums and aquariums (use tools)
  - **6D** observe and describe the ways that objects can move such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow (how objects move)
- **ELPS:**
  - **A1** Use prior knowledge and experiences to understand meanings in English. [Prior knowledge]
  - **2D** monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed [Comprehensible Input]

- **2E** Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language (Context Clues)

Suggested Literature Connections:
"Roll, Slope, and Slide" by Michael Dahl

Materials:
K'nex kits (preferably); straws; beads; wooden dowels; wooden sticks; recycled round objects for wheels; cardstock paper; poster board; clay; box frames (milk or cereal); paper towel rolls; spools; glue gun; scissors; tape; wood glue; hand drill

Design Brief
Make a frame that will roll.

Suggested Exploratory Activity Centers
- **Wheel Making**: Students try to work with the junk materials to find things that would make wheels.
- **Toy Exploration**: Look at the wheels and axles on toys to find out how they turn.
- **Art**: Draw or paint pictures of objects with wheels and count the wheels.
- **Wheels of Many Shapes**: Students experiment with wheels of different shapes.
- **Sorting**: Sort pictures of objects by the number of wheels they have.

Day 1: Engage/Explore *Mechanism:*

Teacher Says/Does	Student Says/Does	Language requirements
1. Introduce the topic of the lesson by singing a song like "*The Wheels on the Bus* " with the children 2. Organize students in pairs and give each one of the pictures on the handout (**K.8.1**). Give them a few minutes to observe the picture, talk about and then share out with the rest of the class. 3. Make sure students know which figures refer to wheels and which to axles and frames. 4. Tell the students that they will experiment with ways to make wheels and axles attach to a frame on a box. Ask them to review with you what they know about axles. 5. Incorporate the following ideas into a discussion: that axles may be attached onto the body of a frame, with the wheels rotating freely on the axles. Other axles may rotate with the wheels, being held onto the frame in some sort of axle carrier. 6. Organize students in groups of 3-4. Tell them they will watch a video and will have to remember one thing about wheels or axles and share them with the rest of the class. Show them the video about simple machines with axles and wheels: https://www.youtube.com/watch?v=XlZYPFDjTJM 7. Have each group share with the class the one thing they remembered from the video	Students sing a song about wheels with the teacher Students share their observations of wheels, axles and frames Students watch a video about wheels, axles and frames and share with the rest of the class	wheels, axles, frame

Day 2: Explain/Elaborate

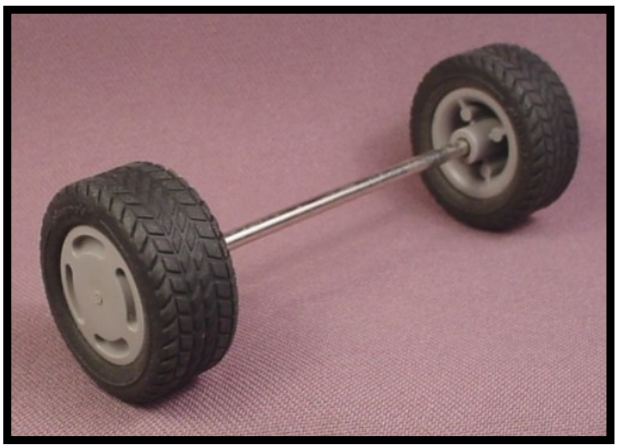
Teacher Says/Does	Student Says/Does	Language requirements
1. Before class starts, copy the Design Brief on the board or poster. Look over Figure 7 in handout (**K.8.2**) to review methods of making wheels and axles. If desired, make samples of several different ways to make wheels and axles. Put these at a table for student reference. **Design Brief:** **Make a frame that will roll** 2. Display the design brief title and read it orally with students, then read it with them. Ask them what they think it involves, and provide clarifications if necessary. Remind the student teams of how to work on the problem 3. Discuss some essential features of implementing the Design Brief: Step 1. Ask questions to be sure you understand the Design Brief. Step 2. Make a plan before you work. Step 3. Remember safety rules. Step 4. Check what you make. 4. Tell the student teams to make a sketch of their plan with crayons. 5. They should remember the SAFETY RULES about using tools and materials and wear SAFETY FIRST buttons when working at any woodcutting. Remind them of the placement of their hands when using tools. Show them again which tools are for teacher use only. 6. Let the teams work on the problem. While the teams	Students read with the teacher the sentences describing the design brief goal, share their understanding and discuss basic procedures.	Vocabulary: design brief, sketch

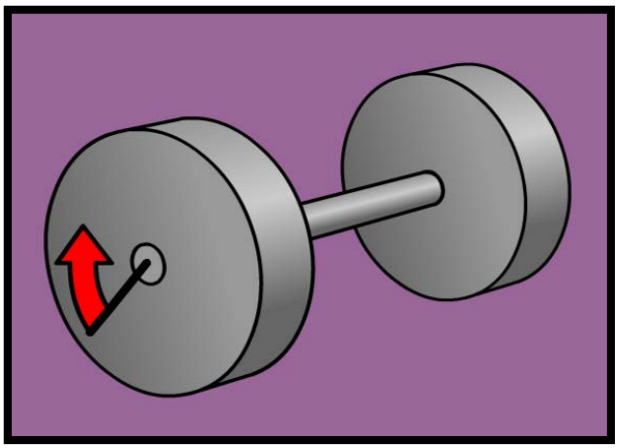
Teacher Says/Does	Student Says/Does	Language requirements
are working, visit with them and ask questions that help the children use observation, analysis, and troubleshooting skills.		

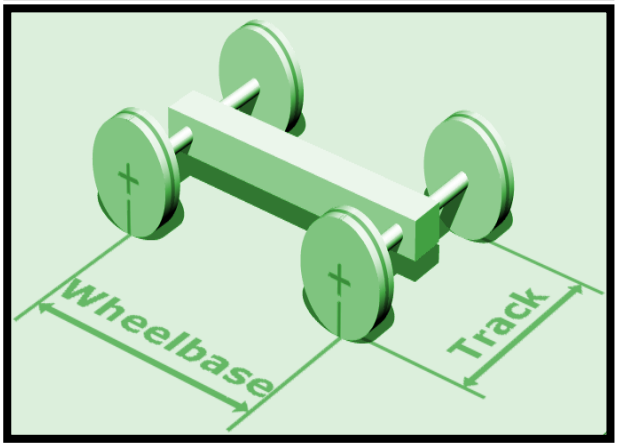
Day 3: Evaluate

Teacher Says/Does	Student Says/Does	Language requirements
1. When they have made a frame on wheels, have them show the group what they have done. You might ask these questions: • *What was the hardest part about this construction?* • *What did your team figure out to do to make it easier?* • *Does your frame roll? Did you have some trouble getting the wheels to work?* • *Tell who in the team did what jobs.* • *If you could do it again, what would you do differently?* 2. Tell the students that the next time they work on a Design Brief they will be making something to exhibit it for the entire school in a Technology Fair, and they will be able to see what other participating classes have done. 3. Write in your own class log what the teams have accomplished. Let the class help you write "Some different ways to make wheels and axles". 4. Set aside the teams' rolling frames for the next activity	Students reflect and share their reflections about their process of building a frame that rolls. Teams identify some different ways to make wheels and axles	Vocabulary: frame on wheels Sentence starters: The hardest thing about this construction was_____ Things we figured out were_____ If we were to do it again, we would not _____

Name: _____ Date: _____







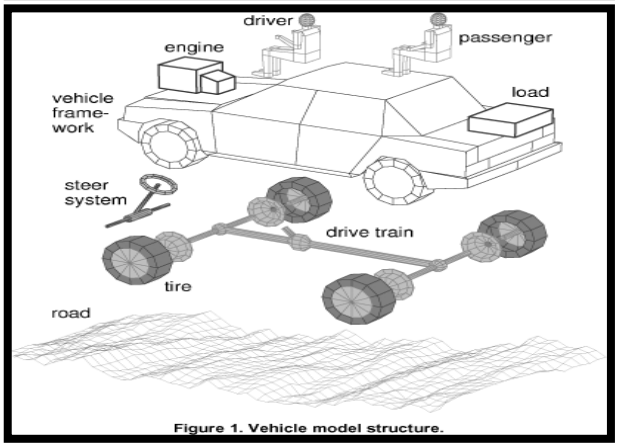
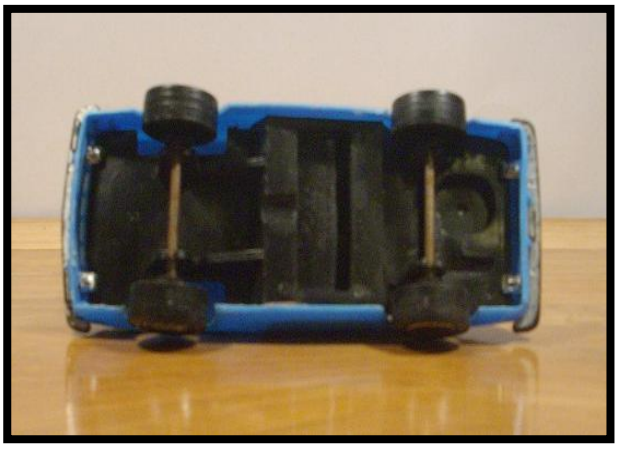
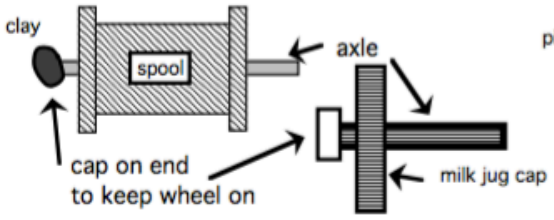
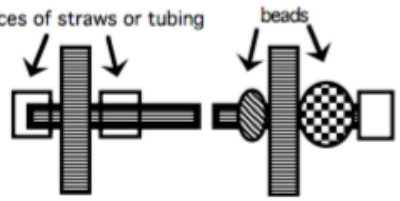


Figure 1. Vehicle model structure.

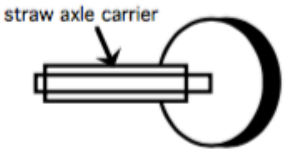




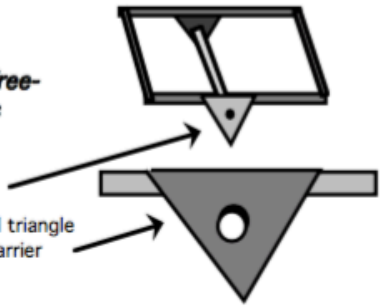
Free- rotating wheels on fixed axles



Spacers and bearings



Wheels fixed on free-rotating axles



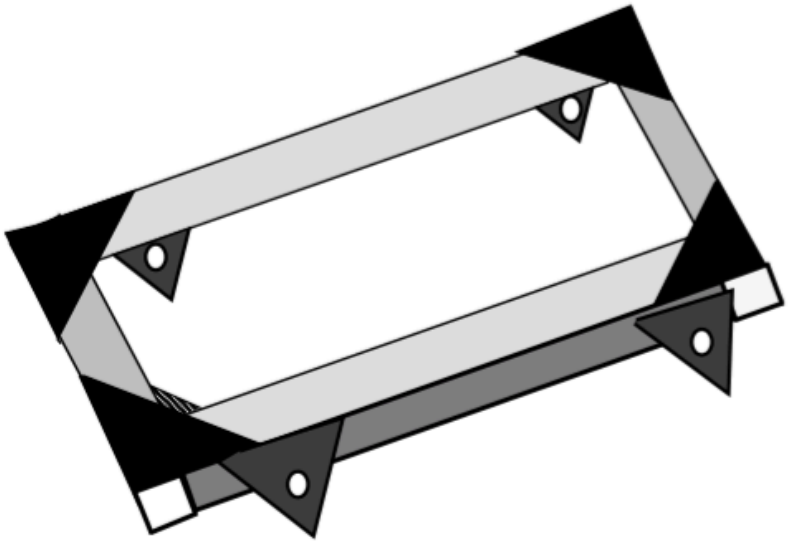


FIGURE 7. Ways to do wheels, axles and spacers