

Unit 3 (Mechanisms): Mechanisms Design Project

Concept

Mechanisms can change direction of motion.

Content Objective

Teams make a toy or device from context that changes linear to rotary motion or vice-versa.

Language Objective

Articulate cause and effect relationship using past tense verbs.

Explain changes in motion using new vocabulary.

Persuade using drawings and increasingly complex written sentences.

Standards

- **NGSS:**

- **3-5-ETS1-1:** Define a simple design problem, including criteria for success and constraints on materials, time, or cost.
- **3-5-ETS1-2:** Generate and compare multiple solutions based on criteria and constraints of the problem.

- **TEKS:**

- **3A** Students will analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing.

- **ELPS:**

- **1E** Students will internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment.
- **3E** Students will share information in cooperative learning interactions.
- **5G** Students will narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs.

Materials

Construction Materials: access to all materials from Units 1 & 2 including wheels, gears and pulleys

Handouts **5.3.1-5.3.2**

Literature Connection:

- Galimoto by Karen L. Williams

Day 2: Explore/Explain Mechanisms: Mechanimals Design Project

Teacher Says/Does	Student Says/Does	Language requirements
<p>1. Show the teams Design Brief (5.3.2) Mechanisms- Explore/Explain): Changes linear motion to rotary motion or rotary motion to linear motion. Use Charades motions to accompany words as a review. Remind students of the following features of creating their Design Brief:</p> <ul style="list-style-type: none"> • Ask questions about what the words mean. • Talk with your partner and plan what you might like to make. • Draw a Design Brief for the work that needs to be done. • Draw a side-view sketch of what you would like to make. <p>2. Let the teams begin their work on their Design Brief with access to all construction materials. Monitor the classroom asking and answering questions.</p> <p>3. While the students are working, use the Collaborative Dialogue Template (p. 32 in Teacher Handbook) to guide conversations and take a running record of students' progress on content and language objectives.</p>	<p>Student teams complete their Design Briefs. Once the maps are approved, they begin building the toy with changing motion.</p>	

Day 3: Explain/Elaborate *Mechanisms: Mechanimals Design Project*

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none"> 1. Hold a design review with the teams and their models in progress. Ask the teams to demonstrate their products as they are (it is perfectly acceptable if the mechanisms are not fully completed). Ask them to explain where and how the direction of motion was changed. Model use of the sentence stem. 2. Encourage the rest of the class to ask the team questions about their products. 3. Explain that the teams will have the remainder of class to make adjustments to their mechanisms based on feedback from the design review. 	<p>Each team presents and explains its design to the class.</p> <p>Other teams should ask questions as well.</p> <p>Teams continue working on their mechanisms and incorporate feedback from the design review.</p>	<p>The input: _____ motion changed to the output _____ motion because...</p>

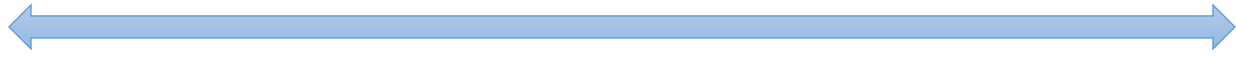
Day 4: Evaluate *Mechanisms: Mechanimals Design Project*

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none"> 1. Explain that students will have the opportunity to create advertisements for their mechanisms that explain how the device changes motion. 2. Brainstorm some ideas with the group about how they could persuade their 5th grade peers about the importance of their gadget. 3. Circulate around the room as the student teams create advertisements on chart paper. 	<p>Students brainstorm ways to persuade their peers.</p> <p>Student teams work on their poster advertisements.</p>	<p>Vocabulary terms: levers, pulleys, changing direction of motion, input motion, output motion, systems of mechanisms, black box models, cams</p>

Exit Slip: Mechanisms Vocabulary

Name _____ Date _____

For each vocabulary word or phrase, rate your understanding, make a drawing, and write the definition in your own words.



1

2

3

4

I do not know what the word means at all.









I have a vague idea of what the word means.

I know what the word means and can use it in my writing or conversations.

I know what the word means and I can use it in different ways. I can also teach the word to others.

Term	Rating	Drawing	Definition
levers			
pulleys			
changing direction of motion			
input motion			
output motion			
systems of mechanisms			
black box models			
cams			

Design Brief: Mechanimals Design Project

<p>Design Problem: Design & make a toy that illustrates [context] & uses some of these Black Box Models:</p> <p>Input  X  Output Linear Motion  X  Rotary Motion Input  X  Output Rotary Motion  X  Linear Motion</p>	<p>Words to Remember/ Palabras para recordar</p>
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Drawing or Model of Our Plan (You can use the back of the page, too!):

Steps

Task	Person Responsible