Unit 6 (Mechanisms):
A See-Saw Playground

Concept

Black box thinking can help us determine mechanisms that are in systems; movement of a lever depends on location of the pivot point.

Content Objective

Teams analyze input/output of a hidden lever system in terms of work and motion and use inference to determine the placement of the pivot point(s).

Language Objective

Listen to and comprehend a variety of media, including video.

Use and internalize academic vocabulary through repeated exposure and meaningful activities: *infer, predict, depend, pivot, lever* Infer using complex sentences and future tense verbs.

Standards

- NGSS:
 - **K-2-ETS1-2.** Make a drawing or physical model to illustrate how the shape of an object helps it to solve a problem.
- TEKS:
 - **3B** make predictions based on observable patterns (predict from patterns)
 - 4A collect, record, and compare information using tools, including computers, hand lenses, rulers, primary balances, plastic beakers, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and stopwatches; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums (use tools)
 - 6C trace the changes in the position of an object over time such as a cup rolling on the floor and a car rolling down a ramp (trace changes in position)
 - o 6D compare patterns of movement of objects such as sliding, rolling, and spinning (compare patterns of movement)

• ELPS:

- **1E** 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 (internalize vocabulary through meaningful use)
- **2F** listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment (understand a variety of media)
- **3E** share information in cooperative learning interactions (share information in cooperative learning)

 5E employ increasingly complex grammatical structures in content area writing commensurate with grade-level expectations, such as using correct verbs, tenses, and probnouns/antecedents, using possessive case correctly, and using negatives and contractions correctly (employ increasingly complex grammatical structures)

Materials:

Pieces of posterboard, strips about 14" x 1", tongue depressors drilled with holes, manila folders, paper fasteners, hole punch, construction paper, A wooden shelf or other plank, or an actual see-saw.

Suggested Literature Connections

"Levers in Action" by Gillian Gosman "Wheels, Levers and Pulley" by David Adler "How Machines Work" by Nick Arnold

Student Says/Does	Language requirements
Student pairs discuss their inferences using the sentence	l infer
frame and then sketch their ideas.	because
Student pairs discuss their ideas comparing their sketches.	
Students create a drawing of a lever with labels for the pivot	Vocabulary: Depende de (cognate), pivot
point, work, and lever.	point, work, lever
- -	Student Says/Does Student pairs discuss their inferences using the sentence frame and then sketch their ideas. Student pairs discuss their ideas comparing their sketches. Students create a drawing of a lever with labels for the pivot point, work, and lever.

Day 1: Engage Mechanisms-A See-Saw Playground

6.	Ask students to tell what they think would happen to the lever system if you moved the paper fastener to another place along the lever, in other words, if you changed the pivot point. After some have had a chance to say their ideas, punch another hole in the folder and lever for the paper fastener and move the pivot point. Have the children check and see if the lever in its new position moves differently than it did before.	Movement of one end of a lever depends on
7.	Write on a chart the generalization that "Movement of one end of a lever depends on," and have students talk about the words that will complete the statement. They should begin to understand that the location of the pivot point makes a difference in the movement of a lever.	
8.	Explain how students should complete the exit slip sentence and drawing from handout (2.6.2).	

Teacher Says/Does	Student Says/Does	Language requirements
 Review vocabulary by having students pronounce the words and then ask individual students to define the terms in their own words. Have students review their exit slips from the previous lesson. 	Students revise their exit slip if necessary.	Vocabulary: Pivot point, work, lever
 Show the following video: <i>What is a Lever</i> <u>https://www.youtube.com/watch?v=E8RA9Kw_laE</u> Ask students to explain how humans use levers in even/dev_life 	Students turn and talk with their classmates.	
 everyday life. 4. Explain that mechanisms like levers can change the size of "input work". Have a student use your lever model to prove this is true (a small movement on the short end of a lever can cause a large movement on the long end of the lever). Similarly, a light weight on a lever can move a heavy weight if the pivot point is in the right place. 5. Demonstrate this with a wooden plank or shelf: Challenge the students to find a way to lift you, the teacher, as you stand on one end of the plank. Use a broomstick or other round solid (such as a solid cylinder from your geometric figures) as the pivot point. A lighter weight can lift a 	Student teams discuss how they might lift the teacher with the plank.	Because , we infer that the will Since,
 6. For additional teacher reference, watch the following: <u>https://www.youtube.com/watch?v=IE6hUjjQVSc</u> 	Students make predictions using the sentence stems.	we predict that will
 Have students make predictions using the sentence stems. 		

Day 2: Explore/Explain Mechanisms-A See-Saw Playground

Teacher Says/Does	Student Says/Does	Language requirements
 Tell the students that their teams will make "guessing folders" for other teams and for display. Using folders to hide the lever mechanisms, they will create a see-saw for a bulletin board playground. If they are not familiar with the see saw as playground equipment, show them some photos online. Students create see-saws that extend from the sides of their folders and then add people (or animals) to the see-saws. Then other students can push their see-saw up and down and guess where the pivot point is. See handout (2.6.3) for a reference. 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. 	Student pairs make see-saw folders.	Because , we infer that the will Since, we predict that will

(Teacher Guide)

Hidden Lever System Model (Version 1)



Hidden Lever System Model (Version 2)





Exit Slip

Name _____ Date _____

Draw a lever. Label the pivot point, work, and lever.

Exit Slip

Name _____ Date _____

Draw a lever. Label the pivot point, work, and lever.

(Teacher Guide)

Hidden Lever System Model (Students)





(Hint: Compare the size of the input motion to the output motion.)