Unit 8 (Work & Energy):
Technology Fair

Content Objective
Teams of students respond to a design problem to make a toy that is safe, pleasing to look at, and has at least one moving part.

Language Objective
Use academic vocabulary from DTEEL curriculum orally and in writing.
Collaborate with peers to summarize prior learning from the DTEEL curriculum.
Summarize design and construction process in a cohesive paragraph using complex sentences.

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.
  - **K-2-ETS1-2.** Make a drawing or physical model to illustrate how the shape of an object helps it to solve a problem.
  - **K-2-ETS1-3.** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses.

- **TEKS:**
  - **1A** identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately (identify)
  - **3A** identify and explain a problem in his/her own words and propose a task and solution for the problem such as lack of water in a habitat (explain prob and solution)
  - **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)
  - **6D** compare patterns of movement of objects such as sliding, rolling, and spinning (compare patterns of movement)

- **ELPS:**
  - **2I** demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs (follow directions, summarize, collaborate with peers)
  - **3G** express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics (express opinions)

- **5B** write using newly acquired basic vocabulary and content-based grade-level vocabulary (write using content-based vocabulary)
- **5F** write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired(use a variety of patterns, connecting words, clauses)
- **5G** narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired (narrate, describe, explain in writing)

Materials:
Access to all construction materials and equipment, copy of the design problem on a chart

Suggested Literature Connections
"Forces and Motion at Work" by Shirley Smith
"Motion and Forces" by Rebecca Hirsh

Day 1: Engage Work & Energy-Technology Fair

Teacher Says/Does	Student Says/Does	Language requirements
1. Review with the students what they have learned about materials, structures, mechanisms and energy. They have looked at different materials' properties, equilibrium and stability of structures, mechanisms like levers and cams, and have experimented with energy, work and motion. Ask a few students to tell some things that they remember. 2. Explain the Table Points game (handout **2.8.1**) where you will ask a question and the student teams have 30-60 seconds to discuss the answer. Randomly select students so that all students are ready to answer the question. Teams can receive 'points' for correct answers. 3. Tell the students that there will be a Design Technology Fair in the school soon, and that their teams will be entering toy models that they invent. 4. Have the class decide what makes a toy different from other things, and ask them to think about models that could and couldn't be toys. Or pose a problem that could be solved with some sort of toy invention the teams create.	Students talk in groups as part of the game. Student teams brainstorm ideas for toys.	

Day 2: Explore Work & Energy-Technology Fair

Teacher Says/Does	Student Says/Does	Language requirements
1. Share with the students the design bref. **Design Brief:** Design and make a toy that is safe, pleasing to look at, and has one or more moving parts. 2. Remind the student teams how to begin working on the design problem for the Technology Fair. Talk about who will do what jobs, and how you will make sure both people have interesting jobs to do. Students should be encouraged to have more than one moving part in their toy, in other words, to have two different mechanisms for movement. This is up to the teacher, however, and may depend on available time. 3. Review what has been discussed about materials, structures, mechanisms and energy, so children will remember to draw from all they have studied in making this last project. 4. Using handout (**2.8.2**), teams should work on the planning, sketching, gathering materials and creating a toy. During that time, evaluate with them on their teamwork and plans. Ask them to identify the moving parts and the energy. 5. 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.	Students plan and create toys. Student teams discuss the design brief and write their steps in complete sentences.	

Day 3: Elaborate/Evaluate Work & Energy-Technology Fair

Teacher Says/Does	Student Says/Does	Language requirements
1. When the teams have finished their toys, provide them with examples of toy packaging. Ask critical questions about gender stereotypes, etc. Explain that the students will design their own packaging for the toys they made. 2. Explain how students will now design packaging for their toy that contains the following features in detail: • how the toy works, • what materials it is made of, • and what makes it fun and/or interesting. 3. Students will write a cohesive paragraph describing their packaging using the paragraph graphic organizer (**2.8.3**). 4. Using the Word Splash handout (**2.8.4**) as a reference, review some of the words below so that students implement them during the writing of their cohesive paragraph: • *Natural and synthetic materials* • *combinations of materials* • *durability, strength,* • *stability and flexibility* • *structures and stability* • *structures and balance* • *models* • *levers and pivot points* • *levers and motion* • *cams and levers* • *cams and shafts* • *how it is pleasing to look at* • *how it is safe to play with* • *what the mechanisms are for movement*	Students turn and talk with their classmates. Student teams write and revise cohesive paragraphs for their toy packages. Students use the word splash to say complex sentences using unit vocabulary.	Vocabulary: • Natural and synthetic materials • combinations of materials • durability, strength, • stability and flexibility • structures and stability • structures and balance • models • levers and pivot points • levers and motion • cams and levers • cams and shafts

5. Lastly, have students present their toy models at the Technology Fair (or simply in front of the classroom) as well as their manufacturing process and package design process.		

Table Points Teacher Questions

Ask these questions and/or create your own as you lead a game of Table Points.

- What is something that has natural and synthetic materials?
- What does durable mean?
- What is the difference between durability and strength?
- Give an example of a flexible material. Why would you want it to be flexible?
- Why might engineers want something to be stable? Why might they want something to be unstable?
- Think of an example of a system. Describe its input and output.
- What did the triangles do for the frames and boxes that we made?
- Why do engineers create plans and blueprints?
- Draw a lever and a pivot point.
- What happens with a lever as the pivot point moves?
- What is an example of a lever? Why do we use them?
- What is a cam? How are they used?
- How is a cam different from a wheel?

Name: _____ Date: _____

Design Brief: Experiments for Properties of Materials

Design Problem	Words to Remember/ Palabras para recordar
Design and make a toy that is safe, pleasing to look at, and has one or more moving parts.	

Drawing or Model of Our Plan (You can use the back of the page, too!):

Steps	
Task	**Person Responsible**

Graphic Organizer for Toy Packaging Paragraph

Names _____ Date _____

Write a cohesive paragraph describing the process, materials, and challenges that you encountered when designing your team's toy packaging.

Topic Sentence:

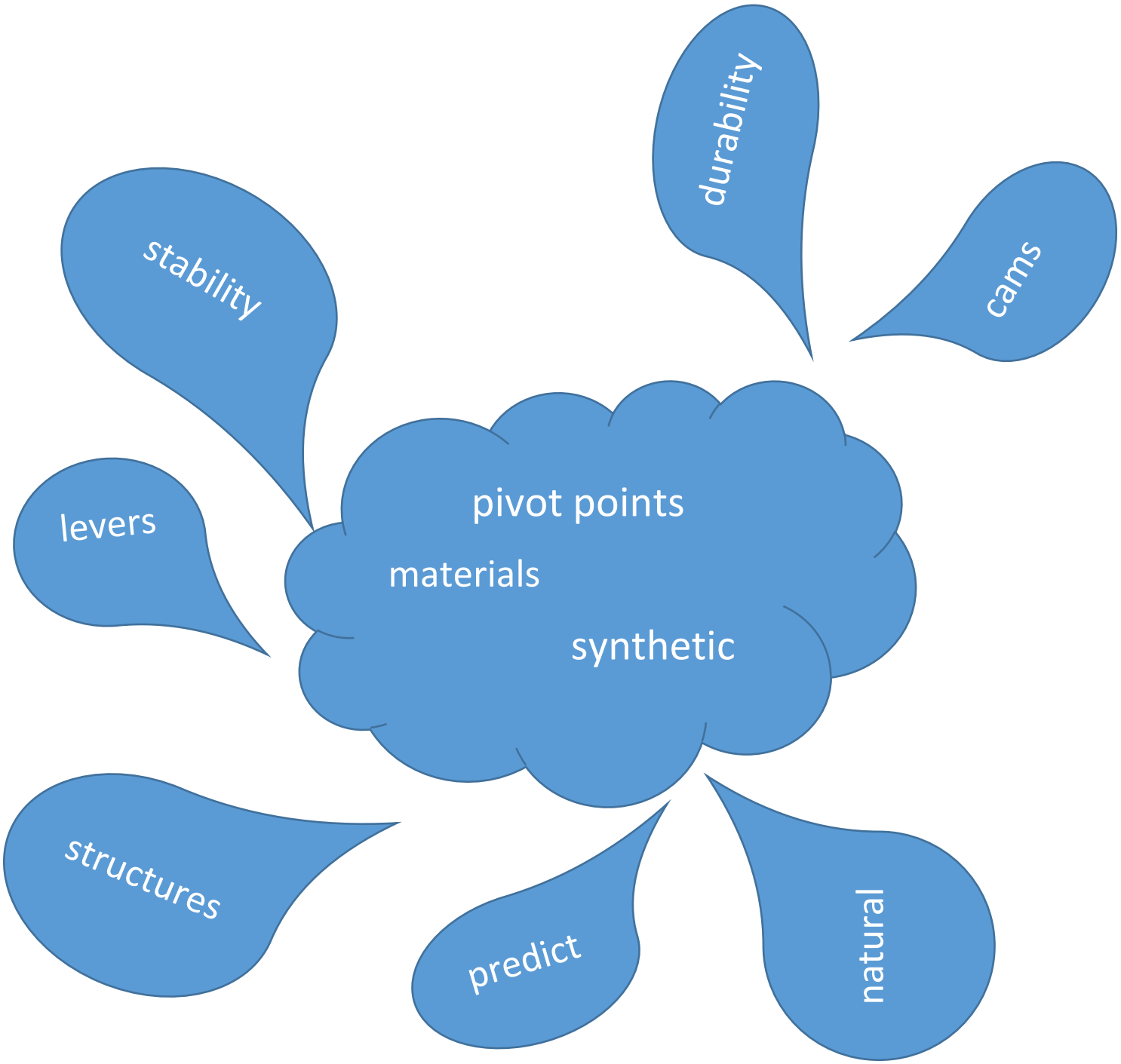
Process:

Materials:

Challenges:

Closing Sentence:

Word Splash


durability
cams
stability
levers
pivot points
materials
synthetic
structures
predict
natural