Unit 4 (Structures):
Containers and Boxes

Concept
Solid objects have differently shaped faces.

Content Objective
Students compare faces of solid figures and match shapes to the containers and boxes that came from home.

Language Objective
Students will listen to the teacher explain that edges are the sides of structures and faces are the surfaces of structures as this information is visually supported by the Figure 6 visual, the 3D objects, the boxes and containers that students can physically touch.
Students will use academic language to describe their box or container as they trace its faces with a partner including “edges,” “faces,” and “structure.”

Standards

- **NGSS:**
  - **K-PS2-1.** Conduct investigation comparing strengths and directions of pushes and pulls on motion of object.
  - **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.
- **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)
  - **2D** record and organize data and observations using pictures, numbers, and words (organize data)
  - **3B** make predictions based on observable patterns in nature such as the shapes of leaves (predict from patterns)
  - **3C** explore that scientists investigate different things in the natural world and use tools to help in their investigations (connect to adult scientists)
  - **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)
    - **5A** observe and record properties of objects, including relative size and mass, such as bigger or smaller and heavier or lighter, shape, color, and texture (prop of objects)
- **ELPS:**
    - **Listening 2A:** Distinguish sounds and intonation patterns of English with increasing ease [phonological awareness]
    - **Listening 2E:** Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language [Context Clues]
    - **Listening 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 [Listening Across Contexts]
    - **Reading 4G:** recognize directionality of English reading such as left to right and top to bottom
    - **LLS 1E:** Use accessible language and learn new and essential language in the process [Transfer]

Suggested Literature Connections:
"Perfect Square" by Michael Hall

Materials:
Funnels of different sizes; newsprint; crayons; cardstock paper; paper; recycled plastics: oatmeal & cereal boxes, aluminum cans; milk cartons; paper towel rolls. Solid Geometric Shapes: triangular prisms, cubes, rectangular prisms, pyramids, cylinders, cones.

Suggested Activity Centers

- **Sorting faces:** Let students sort various objects into categories by the number of faces the shapes have, and by the shapes of their faces.
- **Sorting objects and containers:** Let students sort objects and their containers according to shape, or by their own categories.
- **Reading/Listening:** Listen to audio books about shapes. Ideally, partner students with a student who is reading and can support the other student in matching finger to text as they listen.
- **Math:** Use tangrams or pattern blocks to create matching designs
- **Cooking:** Sort macaroni by shapes
- **Collage:** Make a collage from side panels and fronts of boxes such as cereal boxes

Day 1: Engage/Explore *Structures: Containers & Boxes*

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<tr><th>Teacher Says/Does</th><th>Student Says/Does</th><th>Language requirements</th></tr>
<tr><td>
1. Remind students that during the last activities, they have become engineers since they now think a lot about the best materials for things that they will make. Remind students that engineers design many things that we use and enjoy every day. Put together a quick PowerPoint of photographs showing things that engineers have helped to create, either located in your community or that they are familiar with, e.g. your school, other local buildings, bridges, airplanes, bicycles, their favorite toys or cereals, as well as carnival rides. Show the PowerPoint and ask students to share with a partner: What things or places have engineers helped make?
2. Show the photograph of the carnival rides, again. Ask students to think in their minds about what other things engineers must think of as they are getting ready to design and make something. Provide the following scenario and have students first share in partners and then whole class: Suppose an engineer is getting ready to design a carnival ride made out of steel and plastic.
• What else must she or he decide when planning the carnival ride? Think back to when you were designing your bendable toy.
• What do they need to plan? (Answers may vary and will probably include “What it will look like, what it will be shaped like, how big it will be, what color it will be,” and so on. Scribe students’ ideas on chart paper.
3. Explain that students are describing the STRUCTURES that engineers are concerned with.
</td><td>
Students discuss the work of engineers in their community.

Students share their ideas with partners and then the whole group.
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Vocabulary: structures, edge, faces.

Our community has ______.
Engineers helped make the (different parts of the place or thing).
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Teacher Says/Does	Student Says/Does	Language requirements
Structures are the shapes and supports of things that keep them strong. Some structures also provide space. Structures have different parts, and have different shapes. Introduce or come up with a gesture together to support students' understanding of the word STRUCTURES, e.g. flexing your biceps to remind students that structures keep the object strong. Have students chorally repeat the word while doing the accompanying gesture. Teachers may decide to use this as their transition signal.	Students create a gesture representing 'structures' and repeat the word several times.	
4. *Hold up* one of the boxes or containers, and ask students to describe the parts of the box. Present the word EDGE to students, demonstrating its meaning by running your finger along the different edges, or sides, of the box. Look at **Figure 5** below for reference.		
5. *Ask* students to share in partners to answer the question: *How many edges do you think it has?* Let them run a finger along an edge, counting how many edges there are as a class.	Student pairs discuss their ideas about the number of edges.	The _____ has _____ edges/faces.
6. *Show* students the FACES of the structure. Count together the number of faces, or flat surfaces, on the prism. The illustrated prism on **Figure 5** has six faces. Introduce models of other 3D objects such as a cylinder and a cone. Ask students to share with their partners how many edges and how many faces they each have, as 3D objects are passed around. Cylinders have three faces: two circles and one large rectangle. A cone has two: one circle and one half-circle.	Students count the number of faces as a whole group. Students discuss the number of edges and faces that each structure has.	
7. *Review* circle, square, and rectangle shapes for the faces. Find a shapes song online such as the one		

Teacher Says/Does	Student Says/Does	Language requirements
below. Encourage students to stand up and sing along to the following shape song videos. a. https://www.youtube.com/watch?v=2cg-Uc556-Q b. https://www.youtube.com/watch?v=xJxq0kR8yNc 8. *Discuss* with students how they could find out the number and shapes of faces in structures.	Students watch and sing along with the video.	

Day 2: Explain/Elaborate/Evaluate *Structures: Containers & Boxes*

Teacher Says/Does	Student Says/Does	Language requirements
1. *Review* FACES and EDGES with a few of the 3D objects, asking student volunteers to come to the front and lead the class in chorally counting the number of faces and edges of the objects.	Individual students lead whole group counting of faces and edges.	
2. *Connect* the concepts of 3D objects and of faces and edges to boxes and containers. Hold up a box and ask students if it looks like any of the 3D objects. Have them share in partners. Ask them to point out the edges and faces. Repeat these steps with different-shaped containers.	Student pairs discuss their ideas.	This structure looks like a ____________ because the _______ has ________ faces/edges.
3. *Model* for students how to trace around the faces of a solid structure. If teachers use cylindrical containers, students can trace the circles at the bottom and top and can set the container on its side and trace around it. The width would not exactly match but would give students the general idea of the faces.		
4. Teamwork: Have students work in engineering teams of two to select a container or box and trace the faces. Fast finishers can trace a second container or box. As teams work, pose questions such as: *Where are the faces? Where are the edges? How many faces does your structure have? How many edges? What shape are the faces?*	Student teams work together to trace the faces of a container.	
5. *Come together* once all have finished and lead a discussion: • *Which structures have mostly rectangles or squares for faces?* • *Which structures have circles for faces?* • *If you wanted to trace a circle, which structures could you use?*	Students discuss their ideas with partners and in the whole group.	Sentence stem: "My structure has __edges/faces."

Teacher Says/Does	Student Says/Does	Language requirements
• *How could we sort out the structures by their face shapes?* Questions about structures and space might include an investigation into forces: • *Where are pushes and pulls happening on a box of cookies or crackers?* • *What do engineers invent to solve problems like crushed cookies?* • *What containers are breakable? Permanent? Temporary?* 6. *Guessing game:* As a closing activity, have each engineering pair turn to the pair next to them and guess which structure the team traced onto the paper, judging by the shapes of its faces.	Student teams play guessing game with another team.	

Figure 5 *Structures: Containers & Boxes*