

Unit 3 (Materials): Making a Bendable Toy

Concept

Some materials can bend and can be changed or connected with tools.

Content Objective

Students work in teams of two or three on the first Design Brief.

Language Objective

Students will listen to the teacher orally explain the Design Brief task, and will orally share questions they have, first with partners and later with the class, in order to seek clarification.

Students will express their opinions about the other engineering pair's plans for the bendable toy, using such phrases as "I like that you use (blank)" OR "I love that your toy (blank)."

Students will describe their bendable toy to the class 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.
- **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)
- **1B** discuss the importance of safe practices to keep self and others safe and healthy (discuss)
- **2D** collect data and make observations using simple equipment such as hand lenses, primary balances, and non-standard measurement tools (organize data)
- **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)
- **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:**

- **Listening 2D:** Monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed [Comprehensible Input]
- **Speaking 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; [Speech Production @ Grade Level]

Suggested Literature Connections:

“Have You Thanked an Inventor Today?” by Patrice McLaurin

Materials

Tools & Connectors: hole punch; low temp glue gun; scissors; tape dispensers; brads; construction materials: poster board; cloth; wood; foil; paper; Safety First Buttons; recycled plastic items; aluminum cans; cereal boxes; milk cartons; newsprint; paper tower rolls

Design Brief

Make a toy that can bend and is made of at least 3 different materials.

Suggested Activity Centers

- **Labeling:** Label things around the room that bend.
- **Art:** Draw or paint a picture of a toy that can bend.
- **Collage:** Cut out pictures from magazines and catalogs of toys and things to play with.
- **Cooking:** Draw or cut out pictures of foods that can bend. Alternatively, make and eat fruit leather cut-outs of toys that can bend.

Day 1: Engage/Explore/Explain *Materials: Making a Bendable Toy*

Teacher Says/Does	Student Says/Does	Language requirements
<p>1. Show example(s) of bendable toys prior to lesson (e.g., wooden pull puppets).</p> <p>2. <i>Review</i> the properties of flexibility and elasticity from Unit 2, Lessons 1 & 2, referring to graphic organizers from the activities. Ask students to <i>share with a partner</i> to recall what flexible/bendable means, what elastic or elasticity means, and what kinds of materials have these properties. Reintroduce the <i>elasticity gesture</i> from Unit 2 and use throughout these lessons for transition signals.</p> <p>3. <i>Display and introduce</i> the Design Brief</p> <div data-bbox="315 716 1024 805" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Make a toy that can bend and is made of at least 3 different materials</p> </div> <p>Tell the students that this challenge gives them a job to do in a team of two engineers.</p> <p>4. Read the Design Brief to the students. Tell them there are steps to follow in responding to a Design Brief:</p> <p style="padding-left: 40px;">Step 1. Ask questions to be sure you understand the Design Brief!</p> <p style="padding-left: 40px;">Step 2. Make a plan before you work.</p> <p style="padding-left: 40px;">Step 3. Remember safety rules.</p> <p style="padding-left: 40px;">Step 4. Check what you make.</p> <p><i>Note:</i> Include visuals next to each step, such as the ones in the “Bendable Toy Design Brief” handout (K.3), and display them so students can see them as they work.</p>	<p>Students discuss vocabulary from Unit 2 and perform elasticity gesture.</p>	<p>Review vocabulary: <i>elasticity, strength, flexibility</i></p>

Teacher Says/Does	Student Says/Does	Language requirements
<p>5. <i>Model.</i> Show students an example of a bendable toy that you created using three different materials, ideally with two of the materials different from available materials to encourage student creativity. Display the sketch that you first made on paper to plan your bendable toy. Tell the students that they will work in a team to make a bendable toy, or toys, together. Present samples of different materials and tools that engineering teams will have at their disposal to create the bendable toys.</p> <p>6. <i>Step 1 of Design Brief. Ask questions.</i> Have students sit with their engineering partners to brainstorm any questions that they have about the brief. Allow ample time for questions and check for understanding.</p> <p>7. <i>Step 2 of Design Brief. Make a plan.</i> Look at the Design Brief again. Ask the students to close their eyes and imagine what a bendable toy might look like and to imagine a bendable toy they might have at home. Tell them that this “imagining” is an important step in planning, because it will help them think of good ideas. Ask students to <i>talk with their engineering partners</i> to discuss what materials they think their imaginary bendable toy or the toy at home might be made of to possess that property of elasticity. Reinforce that a plan is just a starting point and that plans sometimes need to be changed in the process.</p> <p>8. <i>Pair work:</i> Send engineering teams to their tables with one paper and one pencil per pair to make a sketch of their plan for the bendable toy they will create. To encourage creativity and spread peer learning, teachers should emphasize that teams</p>	<p>Student pairs brainstorm questions.</p> <p>Students close their eyes and imagine bendable toys.</p> <p>In pairs, students discuss their ideas for the toy materials.</p>	<p>Could you explain _____?</p> <p>How does _____?</p> <p>I am not sure what _____ means.</p>

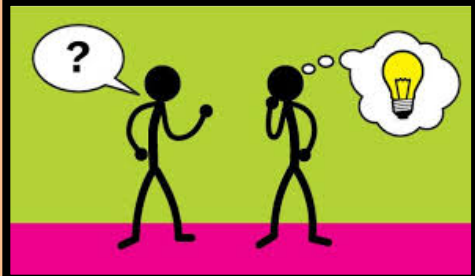

Day 2: Elaborate/Evaluate *Materials: Making a Bendable Toy*

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none"> 1. <i>Review</i> the Design Brief with students. Briefly review Steps 1 and 2 of a Design Brief. 2. <i>Step 3 of Design Brief. Remember safety rules.</i> Ask students to orally share with their engineering partners why it is important to be safe when working with tools. You may decide to create a class list of safety rules when working with tools. Ask students to come up and model the correct way to hold/use each tool. You may have a student purposefully model the incorrect way to use a tool, and then model its correct use. 3. <i>Step 4 of Design Brief. Check what you make.</i> Ask students to <i>share in partners</i> how they could check their toy as they work to make sure it aligns with the Design Brief goals, by asking questions like: <i>Do we have 3 materials? Are the materials staying connected? Does the toy bend?</i> Remind students that while they should try to follow their plan, they may need to make changes as they work such as trying a different material if their planned material runs out or does not work with the other two materials. 4. <i>Teamwork:</i> Send the teams of two to work tables to follow their plan and make a toy together that can bend and has at least three different materials in it. If a team finishes making one toy but other teams are still working, have them start a new plan and create a second toy until all are finished with their first toy. As a team is working, ask them questions to help focus their attention on close observation. Questions like these will help the teams think together: 	<p>Student pairs discuss the importance of safety.</p> <p>Different pairs of students demonstrate correct use of the available tools.</p> <p>Students find a partner and discuss their plan and the Design Brief.</p> <p>Student pairs work with materials to construct their toys.</p>	

Teacher Says/Does	Student Says/Does	Language requirements
<ul style="list-style-type: none"> • <i>How many different materials are you using?</i> • <i>What are some ways you can connect those materials?</i> • <i>Who can you ask for help if you get stuck? (Another engineering team)</i> • <i>Does each person in your team share in the fun?</i> <p>5. <i>Come together</i> when they have all finished. Each engineering team should present their products to the class and talk about what they made. Teachers may prompt students with sentence stems.</p> <p>6. Guide team presentations using questions such as these to connect the Design Brief with team work:</p> <ul style="list-style-type: none"> • <i>What is the name of your bendable toy? Why did you choose this name?</i> • <i>How does your toy bend?</i> • <i>What three materials did you use in your toy?</i> • <i>Did everyone have interesting jobs to do?</i> • <i>Why do we like/not like working in teams?</i> • <i>When do grown-ups work in teams?</i> <p>7. <i>Display</i> the items the children have made by beginning a Design Gallery in the hall of the school.</p> <p>8. <u>Natural Extensions into the Disciplines: Language Arts</u> Have the teams dictate stories about what challenges they overcame while making their own toy.</p>	<p>Student pairs present their toys to the class and discuss the building process.</p>	<p>Sentence stems: “My bendable toy is called...” “We used _____, _____, and _____ to make our toy.” “I liked/didn’t like working in teams because _____.” “Grown-ups work in teams when _____.”</p>

Names: _____ Date: _____

Bendable Toy Design Brief

<p>1. Ask questions to be sure you understand the Design Brief!</p>	
<p>2. Make a plan before you work.</p>	
<p>3. Remember safety rules.</p>	
<p>4. Check what you make.</p>	